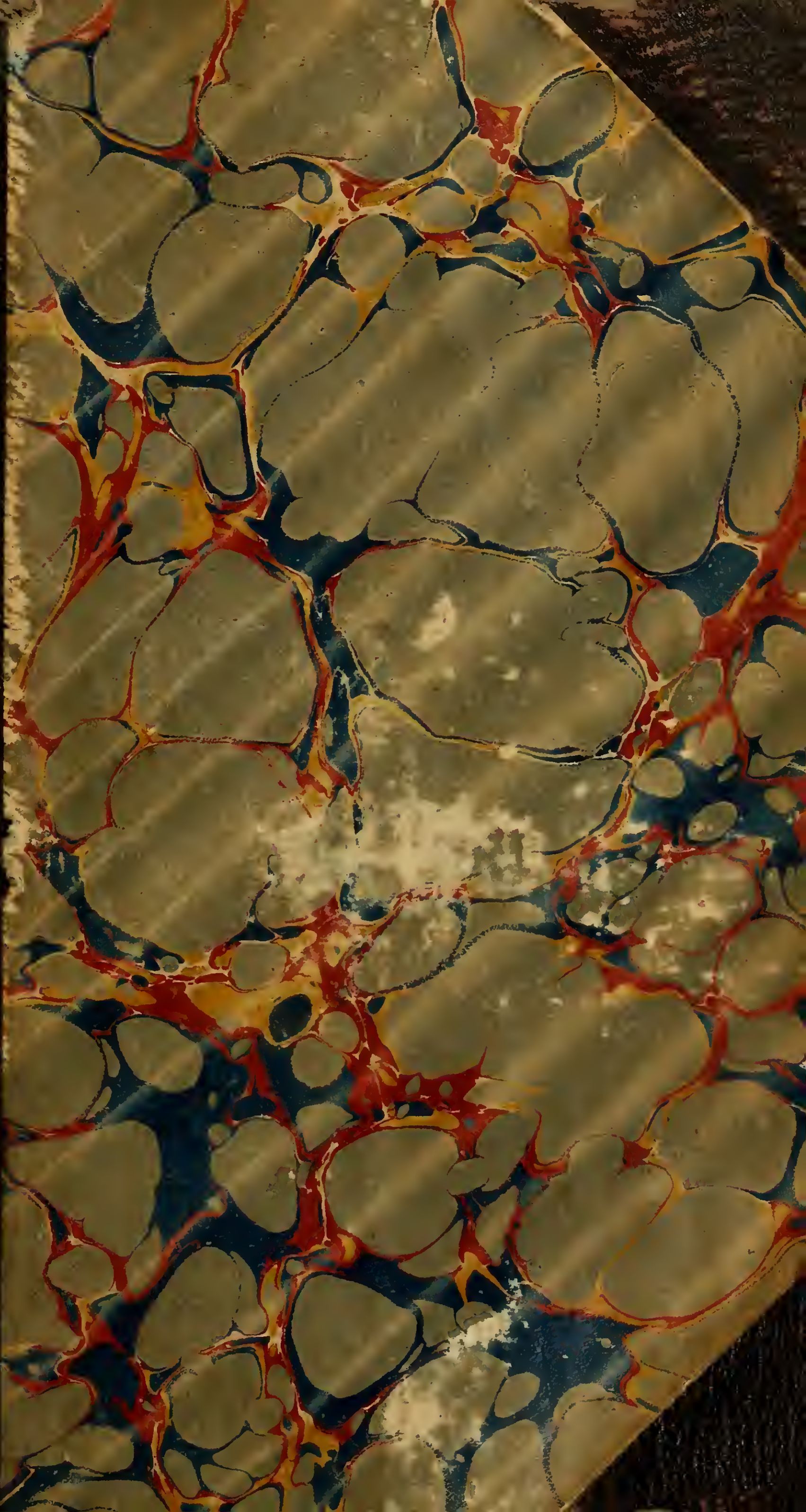

J Homans Jr
April 1861.

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DICTIONARY

OF

PRACTICAL SURGERY:

COMPREHENDING

ALL THE MOST INTERESTING IMPROVEMENTS, FROM THE EARLIEST TIMES DOWN TO THE PRESENT PERIOD;

AN ACCOUNT OF THE INSTRUMENTS AND REMEDIES EMPLOYED IN SURGERY;

THE ETYMOLOGY AND SIGNIFICATION

OF THE

PRINCIPAL TERMS;

AND

NUMEROUS REFERENCES TO ANCIENT AND MODERN WORKS, FORMING A "CATALOGUE RAISONNE" OF SURGICAL LITERATURE.

THE FIFTH EDITION,
CORRECTED AND ENLARGED.

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PREFACE

TO

THE FIFTH EDITION.

The great and increasing demand for this Dictionary of Practical Surgery, and the changes and improvements, which are incessantly taking place in this useful branch of knowledge, have rendered another edition of it necessary. In the present age of unexampled industry, when a boundless love of information may be said to pervade all classes of society, the arts and sciences are never stationary, but continue their steady, and sometimes even rapid, course towards maturity and perfection. Amongst them, the several divisions of medical knowledge are constantly advancing, especially surgery, which must always be cultivated with ardour, not only for its very important and general usefulness to mankind, but also on account of the many plain and interesting facts, in which it abounds. These have a more extensive relation than may at first be supposed; for, though it be true, that a great number of them are suggested by anatomy, they in their turn make that science more available to the relief of diseases and injuries, which would otherwise prove fatal, while they also tend to throw light on various points of consequence in that study itself, as well as in medicine, and physiology. In short, as a correct knowledge of surgery elucidates various topics, relative to the minute structure, organization, functions, and uses, of different parts of the animal economy, and has a close and inseparable connexion with the judicious practice of medicine, no man, without such knowledge, can be expected to shine either as a sound physiologist, or an eminent physician.

In preparing this Fifth Edition, I have spared neither time, nor pains, to render the work still more worthy of all the favor that has been conferred upon it. Every article has been most impartially reconsidered; whatever seemed objectionable, or of inferior value, has been expunged; and new suggestions, or methods of practice, likely to conduce to the real improvement of surgery, have been faithfully recorded. All this has been done, as far as my own humble talents, and long application to the subject, have enabled me; more could not be expected: and, with respect to perfection, if my own qualifications had been higher, its attainment would have been impossible; for, surgery itself is imperfect, and, therefore, every treatise on it must necessarily be defective. However, if I have succeeded in adapting the publication to the actual state of the science, my design has been fulfilled, and my duty to the public and the proprietors honestly performed.

A few observations, with which I have become acquainted, subsequently to the printing of the articles to which they relate, are subjoined, as a short supplement to the present edition.

AMPUTATION.—When this operation is necessary in crowded hospitals, where hospital gangrene is prevailing, Delpech particularly recommends the practice of cutting off the ligatures, close to the knots on the vessels, so that the lips of the wound may be more completely, and accurately brought together. By this means, as his experience has taught him, the risk of the wound being infected is materially lessened. (*Chirurgie Clin. T.* 1, *p.* 83.) The small particles of the ligatures, enclosed in the stump, he says, are discharged at a period when the patient has regained strength enough to be moved into a healthy atmosphere, little openings being produced for their escape, and healing up again within twenty-four hours: he assures us, that he has never seen the practice give rise to an abscess.

ANTRUM.—A case of aneurism by anastomosis, situated in the branches of the internal maxillary artery, and cured by tying the carotid, is recorded by Professor Pattison, of Baltimore. The centre of the tumor occupied the antrum; but, the sides of this cavity having been destroyed, the swelling made its way out of it in every direction; upwards into the orbit, from which it had displaced the eye; laterally into the nostril, which it completely filled; and against the septum narium, so as to produce a considerable distortion of the nose. It was as large as a new-born child's head, and attended with profuse, and sometimes nearly fatal hemorrhages. Immediately after the performance of the operation, the appearance of the tumor in the nostril underwent a remarkable change: just before the ligature was applied, it seemed ready to burst from distention; but, as soon as the direct circulation was stopped, its distention ceased, and its surface became shrivelled. The pulsatory movement, previously perceptible in it, now could not be detected. A daily improvement in the expression of the countenance followed. The swelling entirely disappeared, and the cheek-bone and zygoma, which had been quite concealed by it, again became evident. At the end of two years and a half from the operation, there had been no return of the disease, and the disfigurement was so trifling, that it was scarcely perceptible. (See *A. Burns's Surgical Anatomy of the Head and Neck, p.* 463, *Ed.* 2, *with additions by G. S. Pattison, Glasgow* 1824.) In the same edition, the efficacy of tying the carotid for the cure of fungous diseases of the antrum, is proved by several very interesting cases. This is a subject which seems to me to demand the earnest attention of surgical practitioners.

HOSPITAL GANGRENE.—In addition to what has been previously mentioned, with regard to this terrible disease, under the head of *Amputation*, the following remark, made by Delpech, deserves notice:—"When it is unnecessary to follow the disorder very deeply into the intermuscular, or subaponeurotic cellular substance; when the morbid surface is not very irregular; and, especially, when a large vessel lies in the vicinity of the parts affected; the application of muriatic acid should be preferred to that of the actual cautery." (*Chirurgie Clinique, T.* 1, *p.* 78.)

LIGATURE.—The evils of reserve-ligatures are so well known in this country, that no chance exists of their being ever resorted to again by any well-educated British surgeon. On the Continent, however, sound ideas respecting the process, by which punctured, or divided arteries heal, are far from being generally established; and hence, ligatures of reserve still retain there many advocates of high name and great influence. It is gratifying to find, however, that Delpech is an exception to this remark: the disastrous consequences of these superfluous ligatures he has been taught by fatal experience, and he has now completely abandoned them. Some of the cases, which he has recently published, exemplify in a convincing manner, that nothing is so likely as reserve-ligatures to cause ulceration of the artery and secondary hemorrhage. The same practitioner is also a zealous advocate for the principles and practice inculcated by the late Dr. Jones, and strongly insists upon the propriety of letting ligatures cut through the inner and middle coats of the tied vessels. (See *Chir. Clinique, T.* 1. *Obs. èt Réflexions sur la Ligature des principales Artères.)*

OSTEOSARCOMA.—Dr. Cumin, of Glasgow, proposes, that this term should be limited to a degeneration and morbid growth of the lining membranes of the longitudinal canals, or cancelli of bones, accompanied with absorption of the solid osseous substance. (See *Edinb. Med. and Surgical Journ. No.* 82, *p.* 13, *&c.*) Whether this limitation of the meaning of the word "osteosarcoma," the strict etymological import of which is far more extensive, will tend to dispel the obscurity and confusion, supposed to prevail concerning the nature of this disease, the judgment of the profession must determine. The case of exostosis of the clavicle, and that of a fungous disease of the antrum, referred to by me in the article *Osteosarcoma* of this Dictionary, are thought by Dr. Cumin to imply undefined ideas on the subject. In answer to this criticism, it may be proper to state, that my views of osteosarcoma would lead me to arrange, under this head, every tumor partly of a sarcomatous, and partly of a bony nature, without any theory concerning its origin. On this principle, these particular instances of exostosis of the clavicle, and fungus of the antrum, seemed to me to deserve notice in the consideration of a subject, which, I admit, to be at present obscure, and very imperfectly explained.

PAROTID GLAND.—This organ has been successfully removed by Dr. Prieger, on account of a carcinomatous affection of it. The mass, taken out, weighed two pounds and three quarters. The patient, a woman 35 years of age, completely recovered. The operation was finished in seven minutes. About sixteen or eighteen ounces of blood were lost. The large arteries were tied as soon as divided; viz. the auricular, the external maxillary, and the branches of the external carotid sent into the gland itself. (See *Journ. für Chir. &c. herausgegeben von D. L. Gräfe und D. P. F. Walther, B.* 2, *St.* 3.)

July 1st, 1825.

A

DICTIONARY

OF

PRACTICAL SURGERY.

ABAPTISTON (from ἀ, priv. and ϐάπτιζω, *immergo*, to sink under). Galen, Fabricius ab Aquapendente, and especially Scultetus, in his *Armamentarium Chirurgicum*, so denominate the crown of the trepan, because it formerly had a conical shape, which kept it from penetrating the cranium too rapidly, and plunging its teeth in the dura mater and brain. While, however, it is admitted by modern surgeons, that mischief may be done by letting the saw penetrate too deeply, they do not find it necessary to obviate the possibility of such an accident, by using a conical trepan, with which it would be difficult to make any perforation at all; but they guard against the danger, by observing particular rules and cautions, laid down in another part of this book. (See *Trephine.*)

In confirmation of this statement, consult *Sharp's Operations*, *p.* 151. *Ed.* 3. and *L'Encyclopédie Méthodique*, *Partie Chir. art. Abaptiston.*

ABDOMEN. The BELLY. When a surgeon speaks of the cavity of the abdomen, he confines his meaning to the space included within the bag of the peritoneum. Hence, neither the kidneys, nor the pelvic viscera, are, strictly speaking, parts of the abdomen.

Anatomists have divided this large cavity into different regions, the terms allotted to which are so very frequent in the language of surgical books, that some account of them in this Dictionary seems indispensable.

The middle of the upper part of the abdomen, from the ensiform cartilage as low down as a line drawn directly across the greatest convexity of the cartilages of the ribs, is called the *epigastric region.*

The spaces at the sides of the epigastric region are termed, the *right* and *left hypochondria*, or *hypochondriac regions.*

The *umbilical region* extends from the navel upwards to the line, forming the lower boundary of the epigastric region, and downwards to a line drawn across from one anterior superior spinous process of the ilium to the other.

The middle space, below the last line, down to the os pubis, is named the *hypogastric region.*

The parts of the abdomen, situated on the outside of the umbilical region to the right and left, or externally with respect to two perpendicular lines drawn from the greatest convexities of the cartilages of the seventh true ribs, are named the *ilia*, or *flanks.* On each side of the hypogastric region is situated the *inguinal region*, or *groin.* The whole of the back part of the abdomen has only one technical appellation, viz. the *lumbar region* or *loins.*

The abdomen claims the particular attention of every practical surgeon; for, it is the frequent situation of several of the most important surgical diseases. It is also very much exposed to wounds, and various operations on different parts of it are often indispensable. One of the most common afflictions, to which mankind are subject, is that in which some of the bowels protrude, pushing out before them a portion of the peritoneum. This disease is called *hernia*, and ought to be well understood by every practitioner, who, however, can never acquire the necessary knowledge, without being perfectly and minutely acquainted with the anatomy of the abdomen. In dropsical cases, it is frequently proper to tap the abdomen, and this operation, named *paracentesis*, simple as it may seem, requires more consideration, and attention to anatomy, than many surgeons bestow upon it. See *Hernia*, *Paracentesis*, and *Wounds.*

Abdomen, *Abscesses of the*, may take place, either within the cavity of the belly, or at some point of its circumference, and may be either of an acute, or chronic nature. Women are generally considered more liable, than men, to abscesses in and about the abdomen; the abscesses named *lumbar* being elsewhere treated of, are here excluded from consideration. Collections of purulent matter, resembling turbid whey, and containing whitish or yellowish flakes, are not unfrequently formed in the cavity of the peritoneum, as one of the effects of inflammation accompanying puerperal fever.—(*Stoll*, *Rat. Med.* 4. *p.* 103; *Lassus*, *Pathologie*, *Chir. T.* 1. *p.* 137, *Nouvelle Edit.* 8*vo. Paris*, 1809.)

In lying-in-women, abscesses frequently form between the abdominal muscles and the peritoneum, especially just above the groin. They are cases, which have been very correctly described by Conradi. Before the integuments project, the diagnosis is often attended with difficulty, and sometimes an obscurity prevails several weeks; for, the patients seem as if affected with slight colic pains, which yield to common treatment, particularly external applications, but soon return. Thus, unless the vicinity of Poupart's ligament be carefully examined, where some painful point, hardness, or elevation can be detected, the abscess may remain concealed until a large prominence, or the extension of the matter down the thigh, lameness, &c. make the nature of the case completely manifest. As the peritoneum, adjoining the abscess, is always thickened by the preceding inflammation, Conradi assures us, that there is no danger of the collection of matter bursting inwards. Some abscesses, indeed, have been so enormous, that the matter actually pushed the viscera out of their places, yet all this happened without any inward bursting of the disease. The whole danger depends upon the duration of the complaint, and the extent to which the matter spreads. A timely detection of the nature of the case, the use of emollient applications, and the making of an early opening, generally bring the disease to a speedy and favourable termination.—(See *Arnemann's Magazin für die Wundarzneiwissenschaft*, 1 *B. p.* 175. *8vo. Gött.* 1797.)

Chronic tumors of the mesentery, which, in scrophulous children, sometimes terminate slowly in suppuration, and diseases of the ovary, and other abdominal viscera, bringing on the formation of matter, are often the cause of purulent extravasation, great emaciation, hectic symptoms, and death. However, sometimes salutary adhesions are produced between the viscera, by which means an outlet is obtained for the matter through the bladder, anus, or vagina. Thus (says Lassus) in the case of a woman who had had for a long while pains in the right lumbar region, supposed to proceed from suppuration of the kidney, because pus was voided with the urine, the right kidney was found after death in the natural state; but there was an abscess in the right ovary, which was adherent to the bladder, into which the pus had passed through an ulcerated communication. In another patient, who had voided pus by the anus, the right kidney suppurated, and adhered to the colon, with which it communicated by a preternatural aperture. For many years, a woman had a hard tumor of considerable size in the abdomen: at length, the pain of it became intolerable; and just at the moment when her death was apprehended, an immense quantity of pus was suddenly discharged from the vagina. The pain abated; the swelling of the belly subsided; merely the remains of the induration were now perceptible; and the woman's health was perfectly re-established. (*Lassus, Pathologie Chir. T.* 1, *p.* 138.)

The abscesses, which sometimes form between the peritoneum and abdominal muscles, or between the layers of these muscles, or under the integuments of the abdomen, are attended with considerable variety, according as they happen to be chronic, or acute; circumscribed, or diffused; small, or extensive. Those of the acute or phlegmonous kind sometimes follow stabs, and contusions, and are particularly noticed in the article *Wounds*. They are cases, which demand especial care, because, if not checked, they may prove fatal, many examples of which are upon record. (See *Commerc. Literar. Noric.* 1741, *P.* 100; *Eller, Medic. and Chir. Anmerkungen, P.* 108, *&c.*) As for chronic external abscesses of the abdomen, they should be opened early, and treated on the principles explained in the article *Lumbar Abscess.*

Hard indigestible substances, after being swallowed, are not unfrequently discharged from abscesses in some of the abdominal regions. (See *De La Grange, in Museum der Heilkunde*, 4 *B. P.* 154*: a fish-bone, which had been swallowed, found in the abscess; Petit, Traité des Mal. Chir. T.* 2, *p.* 226*: an awl, without a handle, extracted from an abscess of the abdomen; and many other analogous cases.*)

Encysted tumors are sometimes formed between the peritoneum and abdominal muscles, and attain an immense size, before they burst; a remarkable specimen of which is detailed by Gooch. (*Chirurgical Works, Vol.* 2, *p.* 144, *&c. 8vo. Lond.* 1792.) In this case, the spontaneous opening in the navel was enlarged with caustic, and the cyst extracted; but, before a cure could be effected, it became necessary to make a depending opening, and introduce a seton. Swellings of this nature, however, are only noticed here, on account of their resemblance to circumscribed chronic abscesses of the parietes of the abdomen.

Abdomen, Pulsations in the. From the article *Aneurism*, the reader will understand, that, though it be the common nature of this disease to be attended with throbbing, it is not every pulsating tumor that is an aneurism. The cases, usually called *abdominal* or *epigastric pulsations*, often furnish a proof of the correctness of the preceding remark. The authors, who have treated of the latter affection with the greatest discrimination, are Dr. Albers, of Bremen, and Mr. Allan Burns, of Glasgow, two gentlemen, whose high reputations and useful labours will long survive the recent termination of their meritorious lives. Some of the pulsations, here referred to, are the consequence of organic disease, and capable of demonstration by dissection; while the rest are not attended with any such appearance, and have therefore been regarded as nervous. The pulsation is not always produced by the impulse communicated to some solid tumor, or substance between the hand and the artery, but was conceived by Mr. Burns to be sometimes dependent on a nervous affection of the vessel itself. (*On Diseases of the Heart, p.* 263.) Hippocrates, in his book "De Morbis Popularibus," makes mention of three patients, affected with extraordinary pulsations in the abdomen. As one of these cases seemed to depend upon obstructed menses, it was probably not the result of any organic disease. (*Hippocratis Opera Omnia, ex edit. Fœsii. Francof.* 1621. *lib.* 5. *sect.* 7. *p.* 1144.) In order to remove a difficulty in believing, how an artery, not affected with aneurismal enlargement, can communicate to the superincumbent parts such movements as are frequently remarked in cases of abdominal pulsations, a fact pointed out by Mr. Hunter should be remembered: in speaking of the actual dilatation of an artery, he says, that when the vessel is "covered by the integuments, the apparent effect is much greater, than it really is in the artery itself; for, in laying such an artery bare, the nearer we come to it, the less visible is its pulsation; and when laid bare, its motion is hardly to be either felt or seen." (*Treatise on the Blood, &c. p.* 175. *4to. Lond.* 1794.) And this observation will apply to all tumors and indurations situated over a large artery. In the epigastric region of a certain patient, Taberranus felt not only a pulsation, but a tumor as large as the fist, with all the other usual symptoms of an aneurism. On opening the body after death, he was therefore surprised to find, instead of this disease, a considerable scirrhous tumor in the middle of the mesentery, so closely connected to the large vessels, as to compress the aorta, by the pulsations of which it had been lifted up. (*Obs. Anat. ed.* 2. *No.* 9.)

Dr. Albers quotes an extraordinary case from Tulpius: the patient, a laborious man, but subject to bilious attacks, was sometimes affected with violent throbbings of the spleen. These were not only very painful, but could be heard at a distance, and their number distinctly counted, when the hand was applied to the part. What seems almost incredible, it is alleged, that Tulpius could hear them at the distance of thirty feet! Their violence increased, or diminished, according as the patient was more or less bilious, and sometimes they entirely ceased, when his health improved; but always recurred, as soon as the chylopoietic organs became disordered again. After the patient's death, permission could not be obtained to open his body. (*Tulpii Obs. Medicæ. Amst.* 1652. *lib.* 2. *cap.* 28.)

According to Bonetus, pulsations in the left hypochondrium are not unfrequent, and it was his belief, that they were produced by the cœliac artery. He cites several cases of this disorder from other writers, the tenor of which is to prove, that the cœliac artery and mesenteric vessels must have been affected, as they were found after death dilated and filled with black blood. (*Sepulchretum Anatomicum*, *lib.* 1. *sect.* 9. *Obs.* 9, 25, 27, 30, 38, 42, 44, 45, and 46.) The conjecture of Bonetus and others, however, respecting the frequency of abdominal pulsations from dilatation of the cœliac and mesenteric arteries, by no means coincides with the results of modern observations. Mr. Wilson, whose dissections were numerous, met with only one instance of true aneurism, affecting any of the branches of the aorta, distributed to the abdominal viscera. This case was an aneurism of the left branch of the hepatic artery. (*Lectures on the Blood*, *and on the Anatomy*, *Physiology*, *and Surgical Pathology of the Vascular System*, *&c. p.* 379. *8vo. Lond.* 1819.) Bontius was present at the opening of an inhabitant of Batavia, who had been afflicted three years with a disease, the exact nature of which could never be made out during life. When the hand was applied above, or below the navel, a pulsation was felt like that of the heart, or an artery, and as forcible as the motion of a child in the womb. It was synchronous to the pulsation of the heart and arteries. Hence, Bontius concluded, that the case was owing to some affection of the heart. The vena cava, instead of containing blood, was filled with a medullary substance, which, pressing against the aorta, is supposed to have excited the extraordinary pulsations in that vessel. The heart was unusually dilated, and flabby. The two ventricles were very large, and filled with dark coloured blood. The liver was of nearly twice its natural size. The gall-bladder resembled that of a bullock, and was filled with viscid bile, nearly as thick as an extract. (*Jacobi Bontii de Medicina Indorum*, *libri* 4. *Lugd.* 1718. *Obs.* 8. *p.* 101.)

Lewenhoek met with an instance of a similar pulsation, which he imputed to irregular action of the diaphragm, the pulse at the wrist not being affected. The disorder lasted three days, during which the functions of the alimentary canal were so much disordered, that the patient was expected to die. (*Philosoph. Trans. from* 1719 *to* 1733, *abr. by J. Eames*, *&c. Lond.* 1734. *vol.* 7. *p.* 683.)

Dr. Albers has described the particulars of a case, recorded by Burggraf, and entitled, "Diuturna, magna, et valde molesta pulsatio in epigastrio." (*Vid. Acta Natur. Cur. Norimb.* 1740, *Vol.* 6, *Obs.* 131.) Burggraf gives his reasons for believing, that, in this instance, the pulsation arose neither from the aorta nor from the cœliac artery; and suspects that it was caused by a dilatation of that considerable branch of the inferior mesenteric artery, which inosculates with the branch of the superior mesenteric. This idea, however, which was merely surmise, could not be correct, as the patient was cured by taking in the form of pills, every morning and evening, half a dram of a mass composed of equal parts of Gum Ammoniac, extr. Centaur. Minor, and Venice soap.

In the valuable essay of Albertinus, on diseases of the heart, as a cause of difficult respiration, there is a passage where he is speaking of the diagnosis of enlargements of the heart, aneurism of the curvature of the aortæ, &c., which Dr. Albers cites, as deserving attention in the present subject. "Verumtamen extra pectus ubi deficiente solido arcu costarum, tantum difficultatis in hac indagine non ostenditur, me satis scio pluries indicavisse ex eo, quod vasis diametrum non auctum perceperim validas, assiduasque arteriæ cœliacæ, vel aortæ in abdomine pulsationes fuisse sine dilatatione, nec judicium meum eventus fefellit." (*De Bononiensi Scientiarum et Artium Instituto*, *atque Academia Comment. Bononiæ*, 1748, *T.* 1. *p.* 387.)

An example follows from the writings of the celebrated Störk. After death, the symptoms were found to have arisen from disease of the pancreas, which weighed thirteen pounds, and contained a large cyst filled with lamellated blood. (*Annus Medicus*, *Vindob.* 1760, *p.* 245.)

The subsequent case, somewhat analogous to the former, is from a different author.

A man, aged 60, complained of pain in the left side of the abdomen, midway between the umbilicus and crista of the ilium. Emaciation, weakness, distress of countenance, anorexia, constipation succeeded. At length, a large pulsating tumor was discovered in the epigastric region. The case was now pronounced aneurism of the abdominal aorta. There was *no nausea*, *nor vomiting*, except that some days before death, a quantity of fetid, blackish fluid was twice or thrice voided. *No fever*. The swelling caused a sense of constriction rather than pain, and the throbbings became more perceptible. The pulse was feeble, but *slow and regular*. After death, the stomach was found *adhering* to the liver, pancreas, and abdomen; and a *cancerous tumor* occupying its internal surface from the duodenum to the insertion of the œsophagus, the coats of the stomach being an inch thick. The surface of the pancreas was also diseased, and the pylorus, situated in the midst of the cancerous mass, was contracted by the thickening of the parietes of the stomach, and obstructed by numerous fungi. The liver was large, but apparently sound; the spleen small. *The aorta, the cœliac trunk, and its branches were quite natural.* (See *Journ. de Med. per Leroux, Oct.* 1815, *and Medico-Chir. Journ. Vol. I. p.* 289.)

Morgagni describes the case of a woman, 44 years of age, who, after a suppression of the menses for some months, was attacked with palpitations in the epigastrium. Morgagni, on applying his hand to the part, felt a large hard body moving forcibly. At first, it was regarded as an aneurism in the abdomen; but, as there were no similar throbbings in the chest, and there was nothing extraordinary in the pulse at the wrists, Morgagni concluded, that the movements in question could not depend upon the heart. Neither did he take the disease for an aneurism, because the throbbings did not correspond to the pulse. As for the large indurated mass, it appeared to him more easy to say what it was not, than what it was: it could not be merely a *globus hystericus*, which never beats like an aneurism. Morgagni considered the case as an hysterical spasmodic complaint, ordered the patient to be bled, and the following day the pulsations ceased. (*Morgagni, de Sedibus et Causis Morborum, T.* 2, *Epist.* 39. 18.)

Aaskow relates a case, in which, after the subsidence of a hard painful swelling under the upper false ribs of the right side, a peculiar throbbing movèment presented itself in the same part. The phenomenon was imputed to the diaphragm: " et in loco dolente singularis motus palpitationis instar, evidenter enim conspiciebatur, quasi musculus diaphragmatis se constringendo partes vicinas comprimeret et extrorsum protruderet." (*Acta Societatis Medicæ Havniensis. Havniæ,* 1777, *Vol.* 1, *p.* 208, *&c.*)

Senac has spoken of these abdominal pulsations, as sometimes occurring in hypochondriacal and chlorotic patients; and, as they frequently subside, without leaving any vestige behind, he sets them down as nervous affections. (*Traité des Mal. du Cœur.*)

De Haen had under his care a hypochondriacal patient, affected with pulsations in the abdomen; which, with other complaints, were dispelled by means of brisk opening medicines. (*Heilung's Methode Ubersetzt von Plattner. Leipz.* 1782. 2 *B.S.* 29.)

Thilenius observed a flatulence of the stomach, which he represents as having been epidemic, and attended, in some patients, with pulsations at the scrobiculus cordis. (*Med. Chir. Bemerk. Frankf.* 1789. *S.* 211—217.)

My friend, Mr. Hodgson, also, in speaking of pulsations in the epigastrium, which are not the consequence of organic disease, and occur in irritable hypochondriac subjects, states his opinion, that, in some instances, these pulsations were a consequence of distention of the stomach with air, which was thrown against the abdominal muscles by the pulsation of the great blood vessels; and in such cases, the throbbing was diminished by the eructations. (*On the Diseases of Arteries and Veins, p.* 96.)

Abdominal pulsations are also described by Zuliani, as a symptom of hypochondriasis and hysteria. (*De Apoplexia, Lips.* 1790, *p.* 79.) They also happen in certain febrile diseases. (*Versuch über den Pemphygus und das Blasenfieber von C. G. C. Braune, Leipz.* 1795, *S.* 23; and *Dr. R. Jackson on the Fevers of Jamaica, 8vo. Lond.* 1791.)

In a dissertation on cramp in the stomach, Haü remarks, " Quin immo, ubi diutius vexavit gastrodynia, continuos ægrotans persentit spasmos, ut et haud raro pulsationem quandam plane singularem, in cardia et ventriculo, pulsui autem cordis minime synchrone." (*Diss. de Gastrodynia, Upsal.* 1797.) In the same essay there is an account of a man, who had violent palpitations in the epigastric region, apparently first excited by the larva of the musca pendula, many of which were vomited up.

Pinel is another writer who describes these abdominal pulsations, as an occasional symptom of hypochondriasis. " Palpitations du cœur, et quelquefois une sorte de pulsation irregulière, dans quelque partie de l'abdomen." (*Nosographie Philosophique, T.* 2, *p.* 25, *Paris, an.* 6.)

Dr. Albers details some cases which fell under his own notice. A young woman, whose menses were upon her, and who had been for some days constipated, was seized with frequent fainting fits and febrile symptoms, occasionally voiding from the bowels a quantity of dark matter, each evacuation of which was followed by a swoon. One morning at five o'clock Dr. Albers was sent for, as it was feared the patient was about to die. She was extremely exhausted, and the fainting fits followed each other with hardly any intervals. She could just say, " I feel a throbbing in the belly;" and, when Dr. Albers applied his hand to the part, he felt a violent pulsation, extending from the ensiform cartilage down to about the bifurcation of the aorta. The action of the heart was weaker than natural; the pulse at the wrist very small, but not quicker than it had been on the preceding day, and not synchronous to the throbbing in the abdomen. Dr. Albers confesses, that, at first, he took the case for an aneurism. Dr. Meyerhoff was of the same opinion. Another physician, however, Dr. Weinholt, entertained doubts of the complaint being aneurismal, saying, that he recollected having read some similar cases in Morgagni. These gentlemen decided to persevere in the employment of opening medicines and clysters, combining opium with the former. Under this plan, the pulsations in the abdomen and tightness of the chest diminished in a few days. The stools were at first of the colour of chocolate, but afterwards resumed their natural appearance. The throbbings, in a weakened form, however, were perceptible for six weeks longer. The patient at length got quite well, and was remaining so four years afterwards.

A man, about 40, severely afflicted with hypochondriasis, great oppression of the chest, constipation, and tension of the abdomen, tendency to fainting, &c., complained to Dr. Albers, that he felt as if his heart had fallen down into his belly, where he was annoyed with an incessant throbbing. Indeed when Dr. Albers examined the abdominal parietes, he could feel a very strong pulsation, and, what is curious, could trace it not only along the track of the aorta, but in the course of the left iliac artery. The pulse at the wrist, which was small, frequent, and hard, did not correspond with the abdominal pulsations. For several days, the evacuations from the bowels had been as black as pitch. After the employment of gentle purgatives, all the complaints quickly abated, though the throbbings were feebly perceptible for nine months afterwards.

The next case, which Dr. Albers met with, is very interesting. A robust sailor, whose bowels were so constipated, that hardly the strongest purgative could affect them, was seized with constant pain in the left hypochondrium. With this complaint were soon joined great pain in the back and a sensation as if something alive moved about in the belly from one side to the other, and thence extended up to the neck, followed by the vomiting of a greenish matter. At the same time, he felt in the left side a pulsation, which he took for that of the heart, and which continued the whole of his illness. The pulse at the wrist was natural, and synchronous with that in the abdomen. In the beginning of the disorder, the patient was obliged to sit with his body very much inclined forward, as no other posture could be endured. For the first week, opening medicines afforded so much relief, that he was sometimes quite free from pain for six or eight hours. After a time, a round swelling formed in the left hypochondrium, reached to the navel, and attained with incredible quickness the size of a child's head. Indeed, it could now be traced beyond the umbilicus to the right side. The motions were quite of a dark colour, or else red blood and a puriform matter were discharged. Sometimes the blood voided was of a bright red colour, sometimes it was dark, coagulated, and mixed with bile. The patient was at length worn out with febrile symptoms, and died. On opening the body, Dr. Albers found a swelling in the middle of the mesentery, the texture of which cannot be easily described, and the circumference of which was 16 French inches. The stomach was filled with coagulated blood. The spleen, pancreas, and liver were sound; but the gall-bladder was of prodigious size, and contained thick viscid bile. The arteria cœliaca, arteria coronaria ventriculi, and the arteria mesenterica, were preternaturally dilated, and full of dark coloured blood. He speaks of them, however, only as being in an enlarged, not an aneurismal state. Dr. Albers thinks it highly probable, that it was one of these vessels, by which the pulsations had been occasioned.

Dr. Albers has also seen these abdominal pulsations in a paralytic female; and in a lunatic, who was afterwards seized with apoplexy. He likewise met with a married woman, the mother of several children, in whom these throbbings took place invariably at the commencement of pregnancy, and were a surer sign of this state, than other common effects, as stoppage of the menses, &c. After the third month, however, they used to cease altogether.

Many valuable practical observations on cases attended with hemorrhages from the intestinal canal, my limits here oblige me to pass over. According to Dr. Albers, hemorrhoidal patients, especially when put to inconvenience by compression of the tumors, often complain of throbbings about the spleen, which are plain even to the hand. (*J. F. Albers, über Pulsationen im Unterleibe, 8vo. Bremen*, 1803.)

Dr. Parry makes a few interesting remarks on such abdominal pulsations as excite suspicion of aneurism. In any persons, not very fat and lying upon their backs, he says, the pulse of the aorta can easily be felt, if strong pressure be made a little to the left of the median line, about half way between the navel and scrobiculus cordis. In certain instances, the pulsation is painfully felt by the patient himself. In many cases of this kind, particularly in nervous individuals, the sense of pulsation is merely the effect of preternatural action of the heart. While, in other examples, it is the effect of the pressure of some hard substance upon the descending aorta, determining a disproportionate quantity of blood to the head, "and giving to the hand placed on the abdomen, and sometimes even to the eye, the appearance of a beating so near the surface, as to lead inexperienced observers to conclude, that the aorta is morbidly dilated." According to Dr. Parry, the most common causes are collections of fœces in the colon, requiring repeated and active purgatives, which must bring away almost incredible discharges of stercoraceous matter before the aortal pulsation subsides. (See *Parry's Elements of Pathology, &c.* and the *Medico-Chir. Journ. & Review, Vol.* 1, *p.* 157.)

Another cause of a temporary appearance of pulsation or movement in the abdomen, not mentioned by any of the preceding authors, is the power which some persons have of putting portions of the recti muscles separately into strong convulsive action. I have seen a large abscess of the loins, attended with distinct and forcible pulsations, corresponding to those of the aorta.

According to Mr. Allan Burns, a beating is generally felt about the pit of the stomach, in the advanced stage of chronic inflammation of the heart: in this case, when the pericardium is closely adherent to the latter organ, it is corrugated at every contraction of the ventricles, and the diaphragm and liver are elevated. The ventricle, however, having completely emptied itself, is again distended, and, in proportion to the degree of dilatation, the liver and diaphragm descend, whereby an impulse is communicated in the epigastric region. (*On Diseases of the Heart, p.* 263.) This valuable writer cites the remark of Morgagni (*Epist.* 17, *art.* 28), that sometimes in dilatation of the heart, this organ descends so far as to push the diaphragm into the hypochondrium, and pulsate in that situation, so that the disease is mistaken for an aneurism of the cœliac artery. In Mr. Burns's work, a memorable case of this description is related. An erroneous judgment is the more likely to be formed in such examples, because the pulsations of the heart and tumor are not exactly simultaneous; for, it is not the heart which is felt directly beating, but the liver, which, by the action of the heart, is thrown forwards. Hence, the palpable interval between the stroke of the heart, and the movement of the liver.

The following fact shows how circumspect a practitioner should be in the prognosis. An anonymous writer informs us that he attended a gentleman, in consultation with an eminent surgeon and lecturer on anatomy, where the most distressing palpitations of the heart, and loud pulsations below the epigastrium, were awful symptoms. The pulsations could be both seen and heard at a distance on entering the room in which the patient sat. Several physicians were inclined to suspect some organic lesion of the arterial system; but their opinion was given with becoming diffidence:—not so the surgeon's; his impression was, that there existed *an aneurism of the descending aorta*; and such was the firm persuasion he had acquired of the reality of his impression, that he could grasp the aneurismal sac through the abdominal coverings, though nobody else could, and trace its magnitude and position. After death, the heart was found enlarged, and its left ventricle of enormous size. The inner surface of the stomach also exhibited traces of long existing disease; but the aorta was quite sound. (See *Med. Intelligencer*, 1821, *p.* 71.)

Preternatural pulsation about the epigastrium is also stated by Mr. A. Burns, to be sometimes occasioned by encysted tumors, attached either to the lower surface of the diaphragm, or formed between the layers of the pericardium towards the diaphragm, as happened in an instance recorded by Lancisi.

Another cause specified by Mr. A. Burns, is enlargement of the vena cava, or of the right auricle of the heart. Senac describes a case, in which the vena cava was as large as the arm, and there had been a violent pulsation in the epigastrium.

The next cause, enumerated by the same gentleman, is increased solidity of the lungs, more especially of their lower acute margins, where they overlap the pericardium. In this case, the pulsation is about the scrobiculus cordis.

Mr. A. Burns likewise notices several other causes of epigastric or abdominal pulsations, already illustrated in the foregoing part of this article, indurations of the pancreas, scirrhus of the pylorus, tumors in the mesentery, or any solid increase of substance about the abdominal aorta, or its principal branches; and, lastly, a peculiar affection of the vascular system itself.

The following observations, on the criteria between various abdominal pulsations and those of aneurism, appear interesting.

According to Dr. Albers, an internal aneurism originates gradually, and the pulsations increase in strength by degrees. Other abdominal pulsations, on the contrary, begin suddenly, and are most violent in the beginning, abating after they have lasted some time.

In an aneurism, the pulsation is synchronous with the stroke of the artery at the wrist; but this is not regularly the case with other pulsations.

Should the patient be affected with melancholia, hypochondriasis, hysteria, or other nervous complaints, void blood from the stomach, or a black matter from the bowels; should there be any hardness or swelling of any of the abdominal viscera discoverable by the touch, the probability is, that the pulsations are not owing to an internal aneurism.

With the exception of cases, in which these pulsations are owing to mechanical impediments to the circulation, Dr. Albers believes, that they are mostly a symptom of some nervous affection. He also thinks, that the surprise, excited by these throbbings, arises only from their strength and situation, other analogous, strong pulsations, as for instance, those of the heart, or of the carotids, being common enough in hypochondriacal and hysterical persons. The same gentleman adverts to the increased action, which, in inflammation and fevers, is often more conspicuous in some parts of the sanguiferous system, than in others. (*Über Pulsationen im Unterleibe, p.* 36, &c. *Bremen*, 8*vo.* 1803.) Much important additional information on this subject may be found in *Observations on some of the most frequent and important Diseases of the Heart; on Aneurism of the Thoracic Aorta; on Preternatural Pulsation in the Epigastric Region, &c. By Allan Burns, p.* 262, *&c.* 8*vo. Edinb.* 1809.

ABSCESS. A tumor containing pus, or a collection of purulent matter.

Abscesses are divided into two principal kinds, viz. *acute* and *chronic*. For information relative to the former, see *Suppuration*; and, for that concerning the latter, refer to *Lumbar Abscess*. See also *Abdomen*, *Antrum*, *Anus Abscesses of*, *Bubo*, *Empyema*, *Hypopium*, *Mammary Abscess*, *Whitlow*, *&c.*

ACETIC ACID. *Vinegar. Distilled Vinegar.* Vinegar is of considerable use in surgery; mixed with farinaceous substances, it is frequently applied to sprained joints, and, in conjunction with alcohol and water, it makes an eligible lotion for many cases, in which it is desirable to keep up an evaporation from the surface of inflamed parts. Vinegar was once considered useful in quickening exfoliations, which effect was ascribed to its property of dissolving phosphate of lime. Its application to this purpose, however, seems hardly admissible, for reasons, which will be well understood, from a perusal of what is said on the subject of *Necrosis*. The good effects of vinegar, when immediately applied to burns and scalds, were taken particular notice of by Mr. Cleghorn, a brewer in Edinburgh, whose sentiments were deemed by Mr. Hunter, worthy of publication. (See *Med. Facts and Obs. Vol. II. and the Art. Burns.*)

In chronic inflammations of the eyes, and eyelids, and in certain instances, in which the eyes are weak and watery, vinegar is sometimes recommended as an useful ingredient in the collyrium. After general and topical bleeding, it is said to be an efficacious remedy even in cases of acute ophthalmy. Whenever vinegar is applied to the eye, it is in a diluted state, as may be seen in another part of this work. (See *Collyrium Acidi Acetici.*) In the form of a collyrium, it is alleged to be the best lotion for clearing the eye of any small particles of lime which happen to have fallen into, and become adherent to it, or the inside of the eyelids. (See *A. T. Thomson's Dispensatory, p.* 8. *Ed.* 2.)

Concentrated vinegar is sometimes employed for stopping violent hemorrhage from the nose. With this view, it may be used either as an injection, or a lotion, in which lint is to be dipped, and introduced up the nostril.

Vinegar is sometimes employed for obviating the smell of sick rooms. The strongest acetic acid which can be made, is found also to be one of the most certain and convenient applications for the destruction of warts and corns, care being taken not to injure the surrounding skin with it.

ACHILLES, *Tendon of.* See *Tendons.*

ACIDS. See *Acetic Acid; Muriatic Acid;* and *Nitrous* and *Nitric Acids.*

ACTUAL CAUTERY. A heated iron, formerly much used in surgery for the extirpation and cure of diseases. The instrument was made in various shapes, adapted to different cases, and it was often applied through a cannula, in order that no injury might be done to the surrounding parts. *Actual* cauteries were so called in opposition to other applications, which, though they were not really hot, produced the same effect as fire, and consequently were named *virtual* or *potential cauteries.* The actual cautery is still in use upon the continent; and by foreign surgeons, we are not unfrequently criticised for our general aversion to what they distinguish by the appellation of an *heroic* remedy. Pouteau, Percy, Dupuytren, Larrey, Roux, and Maunoir, are all advocates for the practice; and the latter gentleman, when he was lately in England, took the opportunity of reminding British surgeons of their error, in totally abandoning, as they now do, the employment of heated irons in the business of their profession. (See *Obs. on the Use of the Actual Cautery*, *Med. Chir. Trans. Vol. IX. p.* 364. *&c.*)

ACUPUNCTURE (from *acus*, a needle, and *pungo*, to prick). The operation of making small punctures in certain parts of the body with a needle, for the purpose of relieving diseases, as is practised in Siam, Japan, and other oriental countries, for the cure of headachs, lethargies, convulsions, colics, &c. (See *Phil. Trans. No.* 148; and *Wilh. Ten. Rhyne, de Arthritide, Mantissa Schematica, &c. 8vo. Lond.* 1683.) The practice of acupuncture is not followed in England. In a modern French work, it has been highly commended; but, the author sets so rash an example, and is so wild in his expectations of what may be done by the thrust of a needle, that the tenor of his observations will not meet with many approvers. For instance, in one case, he ventured to pierce the epigastric region so deeply, that *the coats of the stomach were supposed to have been perforated: this was done for the cure of an obstinate cough, and is alleged to have effected a cure!* But, if this be not enough to excite wonder, I am sure, the author's suggestion *to run a long needle into the right ventricle of the heart*, in cases of asphyxia, must create that sensation. (See *Berlioz, Mém. sur les Maladies Chroniques, et sur l'Acupuncture, p.* 305-309, *8vo. Paris,* 1816.)

ADHESIVE INFLAMMATION. That kind of inflammation, which makes parts of the body adhere, or grow together. The process, by which recent incised wounds are united, without any suppuration, and frequently synonymous with union by the first intention. (See *Union by the First Intention.*)

ÆGYLOPS (from αιξ, a goat, and ωψ, an eye.) A disease so named from the supposition that goats were very subject to it. The term means a sore just under the inner angle of the eye.

The best modern surgeons seem to consider the ægylops, only as a stage of the fistula lachrymalis. Mr. Pott remarks, when the skin covering the lacrymal sac has been for some time inflamed, or subject to frequently returning inflammations, it most commonly happens, that the puncta lachrymalia are affected by it, and the fluid, not having an opportunity of passing off by them, distends the inflamed skin, so that, at last, it becomes sloughy, and bursts externally. This is the state of the disease, which is called perfect *aigylops*, or *ægylops.* (*Pott on Fistula Lachrymalis.*)

Ægylops was a very common term with the old surgical writers, who certainly did not suspect, that obstruction in the lachrymal parts of the eye, is so frequently the cause of the sore, as it really is. The skin over the lachrymal sac must undoubtedly be, like that in every other situation, subject to inflammation and abscesses; but, we do not find, that sores, unconnected with disease of the lachrymal sac, are here so frequent, as to merit a distinct appellation.

AGARIC. A species of fungus, growing on the oak, and formerly much celebrated for its efficacy in stopping bleeding. (See *Hemorrhage.*)

ALBUGO (from *albus*, white). A white opacity of the cornea, not of a superficial kind, but affecting the very substance of this membrane. The disease is similar to the leucoma, with which it will be considered. (See *Leucoma.*)

ALPHONSIN. The name of an instrument for extracting balls. It is so called from the name of its inventor Alphonso Ferrier, a Neapolitan physician. It consists of three branches, which separate from each other by their elasticity, but are capable of being closed by means of a tube, in which they are included.

ALUM (An Arabic word). Alum, either in its simple state, or deprived of its water of crystallization, by being burnt, has long been used in surgery. The ingenious author of the Pharmacopœia Chirurgica remarks, that except for external use, as a dry powder, the virtues of alum are not improved by exposure to fire. Ten grains of alum, made into a bolus with conserve of roses, are given thrice a day at Guy's Hospital, in such cases, as demand powerful astringent remedies. In a relaxed state of the urinary passages, or want of power of the sphincter vesicæ, small doses of alum have been found of service. Alum is employed as an ingredient in several astringent lotions, gargles, injections, and collyria.

It was recommended by Dr. Perceval, as a remedy for counteracting the poison of lead. Burnt alum is a mild caustic, and is a principal ingredient in most styptic powders.

ALVINE CONCRETIONS. Comprehending under this head both gall-stones and intestinal concretions, an interesting subject presents itself, certain parts of which have been chiefly elucidated in modern times, as will be hereafter explained. When the concretions voided are very numerous, they are generally gall-stones. Thus, Dr. Coe relates an instance, in which seventy were discharged in one day. In the same short time Petermann knew of seventy-two being voided from one individual; Birch, one hundred; Barbette, Sloane, and Vogel, two hundred; and Russell, four hundred. A patient, under the care of Van Swieten, had voided two hundred, and was still continuing to expel others. Riverius speaks of another patient, who had voided calculi from the bowels for several years whenever he went to stool. (*Observ. Commun.*) Fernelius likewise adverts to cases, in which the concretions evacuated were innumerable. (*Pathol. lib.* 6. *cap.* 9.) If we take a view of alvine concretions generally, and include all their different kinds, we shall find that they are of various sizes. Most of them are not larger than a pea or nut; but others are as large as an orange, and weigh four pounds. (See *Monro's Morbid Anat. of the Human Gullet, &c. and Medico-Chir. Journ. vol.* 4. *p.* 188.) Morgagni saw one, which equalled in size a moderate finger, and Gooch, Guettard, Heuermann, Maréschal, (*Mem. de l'Acad. Royale de Chir. t.* 3. *p.* 55.) and others, have seen concretions of this nature, which were too bulky to pass out of the rectum without surgical aid. In certain examples, recorded by Heuermann and Maréschal, the passage of the concretion outward lacerated the sphincter ani. Horstius speaks of one concretion, which was as large as an apple, (*Epist. l.* 2. *sect.* 2. *Opp.* 2. *p.* 237.) and Marcellus Donatus, Schwind, (*Schmucker's Verm. Schriften*, 2 *b. p.* 129.) Hooke, Venette, and Hecquet, give the particulars of other examples, in which the concretions discharged were as large as a hen's egg. Mr. C. White extracted two from the rectum which were nearly as big as the fist; (*Cases in Surgery, p.* 18.) and in a boy, who had died in an emaciated state, after continued pain in the abdomen, attended with frequent attacks of ileus, Mr. Hey found in the transverse arch of the colon so large a concretion, that it could not pass any further along the bowel, and appeared to have been the sole cause of the boy's death. (*Practical Obs. in Surgery, p.* 509. *ed.* 2.) An analogous case is also reported by White (*p.* 28.) It is stated, in the *Mém. de l'Acad. de Chir.* that Duhamel saw a concretion that had been discharged, which was two inches and a half in length, one inch and a half in diameter, three inches and a half in circumference, and the weight of which was three drams and a half. But, judging by their weight, how much larger those must have been, which were seen by Scroekius and Lettsom, and weighed ten drams; that reported by Dolœus, which weighed two ounces; that recorded by Orteschi, which, besides weighing two ounces, two drams, and a half, is said to have been eight inches in circumference, and to have been taken out by force; that recorded by Schaarschmidt, which weighed four ounces; and lastly, the specimen cited by Plouquet, (*Literatura Med. Dig. vol.* 1. *p.* 171.) the weight of which is alleged to have been half a pound. (*Samml. Med. Wahrnehm*, 9 *b. p.* 231.) It is observed by Rubini, that, although examples of alvine concretions being discharged by vomiting are not so frequent as the foregoing cases, yet they are tolerably numerous. Many of them have been collected by Schenck, and others are collected by Breyn (*Phil. Trans. No.* 479.); by Orteschi in his Journal; by Moreali, (*Dell' Uscita di una Pietra, per la Via del Esophago, Modena*, 1781.); by Borsieri; and by a long list of other writers, whose names and publications are specified by Plouquet. (*Lit. Med. Dig. art. Calculus, Vomitus, &c.*) With this class of substances, says Rubini, may also be arranged those concretions, which are found upon dissection, either in the intestines or stomach, whence, probably, in time they might have been expelled. Facts of this description are recorded by Portal, Vicq d'Azyr, Jacquinelle, Chandron, &c. The cases, recited by White and Hey, in which the colon was completely obstructed, I have already mentioned; and to these may be added the instance quoted by Rubini, in which Meckel found the jejunum entirely blocked up by a similar substance. (See *Pensieri sulla varia origine e natura de corpi calcolosi, che vengono talvolta espulsi dal tubo gastrico, Memoria, p.* 5 *and* 6. 4*to. Verona*, 1808.)

Rubini observes, that, with respect to the origin of alvine concretions, whether discharged from the alimentary canal upwards or downwards, some of them appear to be formed in that canal itself, while others pass into it from other situations: and they all admit of being distinguished according to the place of their origin and formation into three kinds; 1. *hepatic*, or *biliary*; 2. *gastric*, or *intestinal*; and 3. (what this author terms) *mixed*, or *hepatico gastric. Hepatic alvine concretions*, as the name implies, are derived from some point of the hepatic system; the *gastric*, or *intestinal*, are formed within the alimentary canal; and the *mixed* commence in the hepatic organs, but afterwards get into the bowels, where they acquire an increased size.

On the subject of hepatic concretions, or biliary calculi, or gall-stones (as they are usually named), there is no point of this system, where they do not occasionally form. Riedlin found them in the surface of the liver. Sorbait met with a biliary calculus, as large as a goose's egg, adhering to the peritoneal covering of the liver, and a similar case is recorded by Benivenio. Tallon, Pomme, Saurau, and Heberden have seen calculi within the substance of the liver; while Blasius, Fallopius, Columbus, Ruysch, Henricus ab Heers, and Morgagni, record examples, in which the concretions were in the parenchyma of that organ. Plater, Reverhorst, Glisson, Morgagni, and Walther, have seen them in the biliary ducts, as probably were those, which Columbus and Camenicus say they found in the vena portæ. Walther and Dietrick found calculi in the ductus hepaticus; Ruysch and Soemmering in the ductus cysticus; and Dietrick, Galeazzi, and Richter in the ductus choledocus. Greisel, Benivenio, Eller, Morgagni, Dargeat, and D'Hervillay, have seen calculi included in morbid cysts, attached either to the liver or the gall-bladder. The place, however, where calculi are found in the greatest number, and with most frequency, is the cavity of the gall-bladder itself. Here they are sometimes single, their size varying up to a magnitude completely filling that cavity, as Saye, (*Journ. de Savans, Sept.* 1697.) Halle, and Isenflamm, have noticed: while sometimes their number amounts to a hundred, or even a thousand, of different sizes. Rubini possesses a gall-bladder, which contains above a hundred small calculi, and formerly I had a similar number, which I found in the body of a female. Van Swieten met with a hundred; Haller, a hundred and forty; Stieber, two hundred; F. Plater, three hundred; Walther, five hundred; Mentzki, seven hundred; Baillie, a thousand; Hunter, eleven hundred; Paré, sixteen hundred; Stork, two thousand; and Meckel several thousands. (*Handb. der Pathol. Anat. b.* 2. *p.* 460.)

All hepatic concretions, however, are not calculated to pass from the place of their origin into the intestines, but only such as are situated in the ductus hepaticus, or its main branches, in the gall-bladder, the ductus cysticus, or the ductus choledocus. When their size is not disproportionate to the diameter of the ducts, they pass with facility; but, when their dimensions are larger than those ducts can naturally admit, the latter become stretched and dilated, whence arise the sharp pains and colic which attend the disorder, analogous to the sufferings produced by the descent of large calculi from the kidneys to the bladder. The reality of these dilatations of the hepatic ducts is proved by dissection. Heister found the orifice of the ductus choledocus, which is usually very small, so much enlarged that it could receive a finger; and Vicq d'Azyr saw this duct enlarged through its whole extent in a similar degree. (*Hist. de la Société Royale de Médecine, an.* 1779, *p.* 220.) Galeazzi, in dissecting a body, found the ductus choledocus so dilated, that it resembled a kind of bag, in which several calculi were included. Mr. Thomas has likewise seen two cases, in which the point of the forefinger readily passed from the duodenum into the gall bladder. (See *Med. Chir. Trans. Vol.* 6. *p.* 105.) Morgagni saw this duct in one instance large enough to hold a couple of fingers, and he quotes many similar instances from Bezold, Trew, Verney, and others. We may conceive how dilated this tube must have been in a case recorded by Richter, where, though it was not completely obstructed, a calculus weighing three ounces and a half was lodged within it. (*Rubini, op. cit. p.* 7—10.)

With regard to those concretions which are distinguished by the epithet *gastric*, or *intestinal*, some are formed in the cavity of the stomach; the rest in one or other of the intestines. They remain for a greater or lesser period in the place of their formation, according as they happen to be lighter, or heavier, smoother, or rougher, more or less adherent, or as local, or general circumstances are more or less favourable to their retention or expulsion. Sometimes, they continue undischarged, until they have attained a very considerable size. In particular instances, instead of remaining constantly in one place, they successively pass through the whole intestinal tube, lodging at different points for a greater or lesser time. In the works of Haller and Conradi may be seen representations of the points of the intestinal canal, where these concretions have been found. The alvine concretion, of which Maréschal has given an account, was some years in traversing all the convolutions of the bowels. These gastric, or alvine concretions, which are very common in animals, are less frequent in the human subject, as is proved by the observations of Fourcroy and Vauquelin, inserted in their valuable essay on this subject in the *Annales du Museum Nationale d'Histoire Naturelle de Paris.* In the horse, they are sometimes of an enormous size, as we may learn from an instance on record, in which the concretion weighed thirteen pounds. (*Voigt, Magazin fur das Neueste der Naturkunde,* 3 *B. p.* 578.)

As for the third species, which Rubini names *mixed*, or *hepatico-gastric*, they have their beginning in the hepatic organs, and augment in the intestinal tube. Here if the extraneous body be detained, and the contents of the bowels have a disposition to become thickened and condensed round it, as a nucleus, it may be rendered larger by additional strata of matter, and would increase *sine fine*, if a stop were not put to the augmentation by the narrowness of the canal, or an effort made for the expulsion of the concretion. Morgagni cites two instances of this sort of concretion: one, from Gemma; the other from Bezold; and he gives his opinion that another alvine calculus spoken of by Vater must have been of the same nature. Dr. Coe describes another interesting specimen; and others are referred to by Vandermonde, Moreali, Portal, &c. Perhaps, says Rubini, the instances of this kind would have been more numerous, if all the concretions discharged from the bowels had been noted with greater attention, and the hepatico-gastric substances not confounded with the hepatic. The lodgment of these concretions in the intestinal canal is of uncertain duration, and depends upon a variety of circumstances: Vandermonde gives the history of a calculus, which, as far as could be judged of by the pain in the right hypochondrium, and the change of symptoms, must have passed into the duodenum in the month of January, and then continued in the bowels until August, when it was discharged from the rectum.

The crystallized appearance of alvine concretions is generally so conspicuous that it has not escaped the attention of several of the old writers, as we may convince ourselves of by referring to the works of Corn. Gemma, Greisel, Baglivi, Scultetus, &c. It was noticed by Haller in his Elementa Physiologiæ, vol. 6, and by Morgagni in his Epist. 37, de Sedibus et Causis, &c. If, says Rubini, these crystallizations are not always plainly visible, distinct, and regular, this depends either upon their imperfection; the heterogeneous nature of the accumulated matter; or particular unfavourable circumstances, which would equally affect the process of crystallization out of the body.

Now, as all crystallizations depend upon the fluids, in which they form, and from which they receive their crystallizing elements, it must be evident that, inasmuch as the fluids of the hepatic organs differ in their constituent principles from the fluids contained in the intestinal canal, the concretions, produced in the first system, must differ from those originating in the second; whilst the hepatico-gastric calculi will combine the nature and properties of both together.

The fluid from which hepatic concretions are formed is unquestionably the bile, either some or all its ingredients entering into their composition. Indeed, previously to the new chemical doctrines, hepatic calculi were generally considered as being simply condensed indurated bile.

From investigations made, in more modern times, however, when the art of analysis has attained a precision, of which the old chemistry was not susceptible, it appears, that, although human biliary calculi yield the same products as the bile, there is contained in them more or less of a peculiar substance, which was named by the celebrated Fourcroy, *adipocere.* (*Mém. de l' Acad. des Sciences,* 1789, *p.* 323.) The presence of this substance in the concretion is of such importance, that, when it is abundant and in large proportion, the calculus is regular and the crystallization well finished; and, when it is in small quantity, the crystallization is confused and disordered, the calculus only exhibiting an irregular misshapen concretion, more like a clot, than true crystals. The kind of adipocire, constituting the base of all human biliary calculi, has some resemblance to spermaceti. Both Fourcroy and Dr. Bostock, who analysed it, found it composed entirely of carbon, hydrogen, and oxygen. It melts, but requires a heat superior to that of boiling water: in fusion it has a smell like wax, and on cooling, forms a substance, which breaks into crystalline laminæ. It is not soluble in alcohol in the cold; but, when the alcohol is boiled on it, it is dissolved in a proportion, according to Fourcroy, of one part in nineteen—according to Dr. Bostock, one in thirty. (*Nicholson's Journ.* 8*vo. vol.* 4. *p.* 137.) The solution, when it cools, deposits light brilliant scales. It is soluble in ether in the cold, and more abundantly if the ether be heated. Oil of turpentine generally dissolves biliary calculi; and, according to Gren, it dissolves those, which consist almost entirely of this peculiar matter; yet, Dr. Bostock has remarked, that oil of turpentine acts on it with difficulty, and even when digested with it, at a boiling heat, dissolves it only in a small degree. Pure soda and potassa dissolve it completely, and reduce it to a saponaceous state. Ammonia, as Dr. Bostock has remarked, exerts little action on it, except when boiling. Nitric acid dissolves it, and, according to Fourcroy, converts it into a species of liquid similar to the oil of camphor. This, as Dr. Bostock has remarked, becomes concrete, but without any crystalline structure, and is more soluble in ether and the alkalis, than the original matter.

" This substance, (Fourcroy has observed,) is contained in greater or less quantity in nearly all human biliary calculi, more or less intermixed with other matter, but still so far predominant as to form their basis. Hence, they partake of its properties; are fusible, inflammable, and more or less soluble, in the agents, which dissolve it." (See *Murray's Syst. of Chemistry, vol.* 4, *p.* 594, *Ed.* 2.) Fourcroy, on exposing the above peculiar substance to the action of oxygenated muriatic acid, saw it whitened, and afterwards resume its former silvery hue. However, Rubini repeated this experiment, and found, that the whiteness, which was contracted, remained permanent.

While the hepatic system contains a fluid which is always nearly of the same quality, viz. the bile, the alimentary canal, as Rubini observes, contains a hundred different fluids, and is continually occupied by substances, of various natures, kinds, and properties, consisting of food, drink, and several secretions. All the principles, which are to serve for the formation and renewal of the different species of living solids, and of the many kinds of fluids, at first remain more or less time in the alimentary canal, and there undergo peculiar changes. All the principles, which, under different circumstances, may contribute to the production of morbid concretions, either in the gall-bladder, the urinary bladder, the kidneys, or in any other part of the body, where they ever occur, pass at first into the intestinal canal, where they continue for some time. Such a multiplicity of principles, disposed to crystallize, and be converted into calculi, would very often, almost daily, produce these concretions in the bowels, were there not many circumstances, which counteract this tendency, as, for instance, exercise, the incessant motion of the matter itself along the intestinal tube, the variety of these elements, whereby their requisite tendency to unite is disturbed, and the decomposing and recomposing influence of the gastric secretions, whereby parts are united, disposed of, dissolved, and analogous matter kept divided, &c. But, whenever these circumstances are not actively operating, as may be the case in a noose, or fold of the bowels, or in some preternatural cyst belonging to them; whenever the intestinal fluids undergo such an alteration, that the production of these concretions cannot be prevented; or, lastly, whenever some favourable circumstance, such as an extraneous nucleus, forms a centre of reunion for particular elements; then the saline matter, which is most disposed to crystallize, and the earthy and mucilaginous substances, &c. are attracted together, and produce more or less perfect crystallizations. A chemical analysis of some intestinal calculi, first made by Konig, and afterwards by Slare, (*Philosophical Transactions*) proves that when they are exposed to a strong heat in distillation, they yield water, ammonia, and a lixivious salt, a caput mortuum remaining behind. Cadet, in analysing a similar concretion, found in addition to the above products, phosphorus. The muriate of ammonia was afterwards discovered; and Gioberti, Fourcroy, and Vauquelin, in their histories of the intestinal concretions met with in animals, describe them as composed of the acidulous phosphate of lime, phosphate of magnesia, and of the ammoniacal-magnesian phosphate.

Some specimens, contained in the Edinburgh museum, were very carefully examined by Dr. T. Thomson: they at first swam in water, but afterwards sunk; the specific gravity varying from 1·376 to 1·540. Cold water acquired from them a brownish tinge, and took up albumen, which separated in white flakes by boiling. There was also a peculiar brown substance, at first dissolving in water, but rendered nearly insoluble by slow evaporation; soluble in alcohol; and most nearly resembling vegetable extract. The specimens likewise contained muriate of soda, crystallizing on spontaneous evaporation of the water: phosphate of lime, precipitated by ammonia; sulphate of soda in minute proportion; and, perhaps, sulphate of lime. Alcohol dissolved the peculiar brown matter and some of the salts; caustic potash, the albumen, brown matter, and perhaps some of the salts; and muriatic acid a proportion of phosphate of lime. After all, there remained a peculiar substance, having the colour and texture of the calculus; in very short threads, light, resembling cork, or rather agaric; tasteless, insoluble in water, alcohol, ether, potash-ley, and muriatic acid; being blackened, and partly reduced to charcoal by sulphuric acid; slowly dissolving by heat, without effervescence, in nitric acid; and leaving on evaporation a whitish residue, of bitter taste, and imperfectly soluble in water; burning with a bright flame; but differing from all other animal and vegetable substances hitherto examined, and distinguishable from wood, by its insolubility in potash-ley. The calculi consisted of alternate layers, or intimate mixtures of this substance and phospate of lime, to which the albumen and brown matter served as a cement, the other substances being in small proportions. Phosphate of lime, mixed with a brown animal matter, formed the external crust of some of the specimens. On the surface of a few were noticed crystals of phosphate of ammonia and magnesia. The presence of neither potash, ammonia, carbonate of lime, uric acid, nor urea, could be detected.

Varieties have also been found by Dr. Henry and Mr. Brande, exclusively composed of magnesia, of which the patients had been in the habit of taking vast quantities. (See *Thomson's Obs. in Monro's morbid Anatomy of the human Gullet, &c. p.* 36, *or in Medico-Chir. Journ. vol.* 4, *p.* 188, 189.)

From observations, made by Dr. Wollaston, it appears probable, that the above fibrous, light, thready substance is derived from oats, which are so commonly taken as food in Scotland.

"If the oat-seed be divested of its husk, minute needles or beards, forming a small brush, are seen planted at one of its ends. Dr. Wollaston, on examining these needles, and comparing them with similar ones detached from the calculi, and forming the velvet substance in question, satisfied himself, beyond all doubt, of their perfect identity." (*Marcet on calculous Disorders, p.* 130, 8*vo. London*, 1817.)

The specimen, analysed by Dr. Ure, he inferred to be a modification of ambergris. (*Dict. of Chemistry, art. Intestinal Concretions.*)

As for the mixed, or hepatico-gastric calculi, they have for their nucleus a biliary concretion, round which other substances contained in the bowels adhere: hence, it is evident, that as they are formed at two distinct periods in two different situations, and amongst various fluids, two distinct compositions must be the result. Although, says Rubini, there has hitherto been no scientific analysis of this species of calculus, excepting the very imperfect one by Moreali, reason shows clearly enough, that, if two separate analyses were made, one of the nucleus, the other of the surrounding matter, there would be obtained from the nucleus the same elements, as those of an hepatic calculus, and from the rest those of an intestinal concretion. (See *Pensieri sulla Varia Origine, &c. de' Corpi calcolosi che vengono espulsi dal tubo gastrico, p.* 15—17.)

As the same author remarks, the foregoing principles will enable us to determine with greater precision, than formerly, the characters, which appertain to the several classes of calculi, liable to be voided from the intestinal canal; characters, by means of which there can be no difficulty in deciding, from the appearance of one of these concretions, the place of its origin, and its peculiar nature. The hepatic calculus, being composed of bile, and also of *adipocire*, its characters will be such as indicate the predominance of an uniform, oleaginous, and (what Rubini terms) a well *animalized* principle. The gastric, or intestinal calculus, arising from the union of various salts, earths, and other principles, which happen to be in the alimentary canal, will have very different characters, generally indicating its earthy, saline composition. Lastly: the hepatico-gastric calculus will present an union of the different characters; viz. in the centre, the characters of the hepatic calculus; more externally, those of the gastric.

The criteria for distinguishing the several kinds of calculi from each other, may be divided into such as may be termed *external*, being derived from accidental circumstances attending the foreign body; and others, which may be called *internal*, being deduced from the inherent characters, belonging to the composition and nature of these concretions.

The first of these external criteria, is the age of the patient. C. Stephanus, Hoffmann, Durande, and Morgagni all agree, that biliary calculi seldom occur, except in subjects of advanced age, and never in youth. And Haller writes, "*Juniores et pueros, quantum novi, numquam adfligit morbus.*" Morgagni met with sixty-one old persons who had alvine concretions, but with only eight young persons, not one of whom was a child, the youngest being twelve years of age, and the eldest twenty-nine. To these I may add the instance reported by Saye, in which a stone as large as a hen's egg was found in the gall-bladder of a young female aged only twelve. (See *Journ. des Savans, Sept.* 1697.) The cause of this difference is attempted to be explained by Morgagni; but, probably, a more rational explanation, than that suggested by him, will be found in the analysis of the bile of old and young subjects, as made by Fourcroy and other modern chemists. From these and other observations, collected by Rubini, it is rational to conclude, that, when an alvine concretion is discharged from a young subject, the chances are, that it is not a biliary one; though, if the patient be of advanced age, it is not to be inferred, that the foreign substance expelled must certainly be hepatic, because gastric or intestinal concretions are common to individuals of every age. (*Rubini, op. cit. p.* 18.) Indeed, with the latter kind of calculi, men of advanced age and women are said to be most frequently afflicted; children and young persons rarely suffering, unless the formation of such bodies has been produced by the presence of fruit-stones, or other indigestible substances, which serve as nuclei. (*Richerand, Nosographie Chir. T.* 3, *p.* 433. *Ed.* 4.) These concretions are also sometimes formed in patients, who have been confined by disease a long while in a recumbent posture.

The second criterion is drawn from the symptoms, which precede, or accompany the expulsion of the calculus. Sense of heaviness, irritation, and pain in the region of the liver, pain about the ensiform cartilage and navel, bilious vomiting, jaundice, and either looseness of the bowels or constipation, are the symptoms, which (especially when they frequently occur) indicate the hepatic origin of the calculus, and proceed from its passing through the narrow ducts of the liver or gall-bladder towards the intestines. The most careful observations have proved, however, that these symptoms are only to be depended upon when taken collectively, and that no single one gives any certain information. Also, if their presence be sufficient to prove the hepatic origin of the calculus, their absence can by no means be regarded as a proof of the concretion being of the intestinal kind. (*Rubini, p.* 19.)

Third criterion. A calculus voided may be set down as undoubtedly hepatic, if accompanied by others unequivocally of this nature. In a case recorded by Brunner, and in another by Vater, the absence of certain symptoms in the first, and the magnitude of the calculus in the second, created doubts whether the concretions were not more likely to be of the intestinal kind, than of the hepatic. At length, the bodies having been opened, the presence of other similar calculi in the gall-bladders afforded an adequate criterion.

Morgagni lays down a fourth criterion, deduced from the number of the calculi voided; which, if very numerous, are to be considered as biliary. Rubini points out, however, the fallacy of this test; both hepatic and gastric concretions being sometimes single, sometimes in various numbers even up to a thousand; and he refers to a case where a very large number of concretions of the gastric description were voided, as reported by Konig. The test, here suggested, however, may be considered as generally valid; for, the number of intestinal concretions is rarely more than two, though sometimes very considerable. (*T. Thomson. See Med. Chir. Journ. Vol.* 4, *p.* 189.)

I shall now follow Rubini, and notice those characters of alvine concretions, which he calls *internal*, and are deduced from their quality and composition, beginning with the criterion furnished by the size of the extraneous substance voided. As the biliary ducts are narrow, it is obvious that, if the calculus be above a certain size, it cannot have passed in this state suddenly through those narrow tubes, and consequently must be either of the gastric description, or mixed, having quitted the hepatic system while small, and afterwards increased within the alimentary canal. Unquestionably, as Rubini admits, this criterion has considerable weight, especially when the discharge of the calculus has not been preceded by pain, or other symptoms indicating such violent distention, as the above ducts must have suffered from the passage of the foreign body. These are certainly capable of being dilated in a remarkable degree, as some facts, already noticed in this article, sufficiently prove; but, such dilatation can never happen without pain, irritation, and a serious train of sympathetic effects. Rubini remarks, this criterion will only apply to large, and not to diminutive concretions. A biliary calculus, of prodigious size, was found by Mr. Brayne, of Banbury, to have passed by ulceration directly from the cavity of the gall-bladder, into that of the duodenum, whence it made its way through the rest of the bowels, and was voided from the anus. (See *Med. Chir. Trans. Vol.* 12.)

A second criterion is the colour of the calculus; a test, admitted by Moreau, who asserts, that biliary calculi are yellow, or green, and intestinal ones grayish brown, or black. But, says Rubini, one need only look at various specimens of alvine concretions, and read the statements of authors, who have seen a great many of them, particularly Morgagni and Soemmering, to comprehend, that any criterion deduced from their colour, is most fallacious, every species of them presenting great variety in this particular. And it is to be remembered, that the bile and the intestinal fluids, whence these concretions are formed, differ in colour in different individuals, according to a variety of circumstances, in health and disease. One species of hepatic calculus has a white colour, but is sometimes yellow or greenish. Another is of a round or polygonal shape, and often of a gray colour externally, and brown within. A third is of a deep brown, or green colour. (See *Ure's Dict. of Chemistry, art. Gall-stones.*) The smaller intestinal concretions, examined by Dr. T. Thomson, destitute of coating, resembled bad yellow ochre; the larger were encrusted with an earthy matter, of a coffee colour, and purple, or sometimes white. (See *Monro on the Human Gullet, &c. and Med. Chir. Journ. Vol.* 4, *p.* 188.)

Third criterion. The presence or absence of a nucleus will enable one to judge, whether a calculus be gastric, or hepatic. A biliary concretion has no nucleus, properly so called; that is to say, it has no foreign body in its centre. When a transverse section is made of such a calculus, one either finds a cavity in its middle, or else nothing by which this part of its substance can be distinguished from the rest; or, if a nucleus, different from the other part of the concretion, be apparent there, it consists merely of bile, either grumous, differently coloured, or more or less fluid, than the rest of the calculus, but which is nevertheless invariably bile. On the contrary, every gastric concretion has, as it were, an extraneous nucleus, as Fourcroy and Vauquelin have explained in their essay upon the intestinal calculi met with in animals. Ruysch in the Phil. Trans. gives an account of some alvine concretions, which were formed round grains of seed. Birch records an example of a crystallized calculus, formed round a leaden bullet. Haller met with a calculus, in the centre of which was an iron nail. Concretions, formed upon fruit stones, are recorded by Clarke, White, and Hey, and also in the Edinb. Med. Essays. Instances, in which the nucleus was a small portion of bone, are related in the latter work, and also by Hooke and Coe. Homberg and others describe alvine concretions, formed round indurated excrementitious matter: and many similar cases are specified by Vallisnieri, Van Swieten, and others. In the hepatico-gastric calculus, the biliary concretions serve as a nucleus for the gastric. According to Dr. T. Thomson, the nucleus is commonly a cherry-stone, a small piece of bone, or a biliary calculus. (See *Med. Chir. Journ. Vol.* 4, *p.* 188.)

A fourth criterion is deduced from a certain unctuosity, which belongs to biliary calculi, but not to those of the gastric class. This character is more palpable, when the calculus has been recently voided, or when it is handled with warm fingers. The unctuosity is still more evident, when the concretion is cut, or sawn, as then the knife, saw, or fingers, become smeared with saponaceous particles, which adhere to them. In order to denote an hepatic calculus, however, the unctuosity must pervade its whole substance, and not merely appear towards its outside; for, a gastric, earthy, saline concretion may by accident become coated, as it passes through the bowels, with a stratum of bile, or saponaceous matter. When the unctuosity is deficient externally, or in the outer laminæ of a calculus, but is found in its interior, it is a clear indication of the hepatico-gastric formation of the concretion.

Fifth criterion. The specific gravity of a calculus, the property, which it has of floating or sinking in water, has been long considered as a test of its species. The hepatic calculus is generally specifically lighter than water, as most oily substances are: on the contrary, gastric calculi are specifically heavier than water, like all earthy saline matter, and of course sink in that fluid. This criterion was often employed by Reverhorst, Fernelius, and others, for distinguishing various concretions. But it is by no means regular, as many biliary calculi swim only a little while and then sink. The specific gravity of that analyzed by Dr. Ure of Glasgow, was 1·0135. (See *Med. Chir. Journ. Vol. IV. p.* 179.) As Rubini observes, this test will not answer for hepatico-gastric calculi, which are subject to great anomalies. (*Pensieri, &c. p.* 22.) Nevertheless, the most correct modern examinations prove, that gastric concretions have a specific gravity, varying from 1·376 to 1·540, (*Dr. T. Thomson* in *Monro's Morb. Anat. &c.*) and, consequently, their general character is to be heavier, than biliary calculi.

A sixth criterion is that proposed by Vicq d'Azyr, in the *Mém. de l'Acad. Royale de Med.* and deduced from the figure of the crystallization. According to this writer, intestinal concretions crystallize in concentric laminæ, shaped like a cock's comb, while the crystallizations of biliary calculi are radiated and needle-shaped. Although this criterion is ingeniously founded upon the known laws, by which every crystallized substance assumes a peculiar and determinate shape, yet it may be generally observed, with respect to the mark of distinction here proposed, that the concretions, of which we are now speaking, are usually too compound, and too much disturbed in their crystallization, to exhibit a regularity, for which simplicity and quietude are indispensable. Hence, many of these concretions do not present the slightest vestige of crystallization, while others scarcely show a trace of it, in the midst of a large misshapen mass. The white coloured hepatic calculus, when broken, is said to present crystalline plates, or striæ, brilliant and white like mica. The round, or polygonal one, which is often of a gray colour externally, and brown within, is described as consisting of concentric layers of inspissated bile, usually with a nucleus of the white crystalline matter in the centre. Lastly, the hepatic calculi, of a deep brown, or green colour, when broken, are said to exhibit a number of crystals of the substance resembling spermaceti, mixed with inspissated bile. (See *Ure's Dict. art. Gall-stones.*) With respect to the special shape, assigned by Vicq d'Azyr to the two classes of alvine concretions, it may be observed, that his specimens were taken from animals, and that consequently, the inferences made from them are not applicable to substances of an analogous nature, discharged from the human body; because, as the bile varies in different animals, so must the formative principles of the calculous crystallizations. It is further remarked by Rubini, that the substance termed *adipocire*, which is the basis of biliary concretions, was not found by Poulletier in hepatic calculi taken from horned cattle.

A seventh criterion is founded upon the inflammability of an alvine calculus. A biliary concretion being commonly made up altogether of unctuous matter, liquefies when subjected to heat, smokes, emits a flame, and burns. When this experiment is made in close vessels, the products are hydrogen, carbonic acid gas, oil, and ammonia: some carbon and earth remaining behind. An intestinal concretion, on the other hand, decrepitates, or turns black, but generally does not burn. One specimen, examined by Dr. Ure, when heated to the temperature of 400 F. fused into a black mass, and exhaled a copious white smoke, in the odour of which was recognized that of ambergris, mixed with the smell of burning fat. Exposed in a platina capsule to a dull red heat, it burnt with much flame, and smoke, leaving no appreciable residuum. (See *Ure's Dict. of Chemistry, art. Intestinal Concretions.*)

The eighth criterion depends upon the solubility of calculi in an oily menstruum. Haller dissolved biliary calculi in oil of turpentine; Dietrick found them soluble in oil of sweet almonds; and Gren in oils in general. But, intestinal calculi are not so readily dissolved by any of these menstrua.

The ninth criterion is founded upon the solubility of the calculus in alcohol. In biliary calculi, this solubility is not always the same; but as this point has been already spoken of, it is unnecessary to dwell upon it; and I shall merely add, that, while hepatic concretions are almost always more or less dissolved by alcohol, those of the gastric kind resist this menstruum.

Though the above criteria are interesting, as tending to establish distinctions betwixt the different species of alvine concretions, it merits attention, that not one of them, taken separately, is at all certain and pathognomonic. It may happen, says Rubini, that some peculiarity in the biliary secretion, and an irregularity in the crystallization and accumulation of the matter, may cause salts and earths to predominate in hepatic concretions, in which circumstance, their usual oily quality will be defective. On the other hand, in the formation of an intestinal concretion, oily adipose matter may accidentally adhere to it, so as to disguise its wonted character. If uniformity of characters and physical properties depend upon uniformity of elementary constituent principles, it can hardly happen even in the natural healthy state of the secretions, because age, sex, and other particular circumstances of the individual, will always make a difference in the proportions of those principles. How then can identity of results be expected in a diseased state of the process of secretion?—Such reflections may explain, how Morgagni, amongst others, met with many biliary calculi, which were not inflammable; with others, which did not give a yellow tinge to water; and with some which floated, or sunk in water, according as they had been recently, or long discharged; while Gren found some of these calculi insoluble in alcohol, &c. (*Rubini, p.* 24, 25.)

Moreali put a piece of the outer part of an alvine concretion into nitrous acid, when a considerable effervescence took place, and the substance afterwards completely dissolved. Now, as this calculus had a nucleus, it must have been of the hepatico-gastric kind, and the experiment was therefore made only with the intestinal part of it. Should the experiment be often repeated with the same result, says Rubini, it would furnish another criterion for distinguishing the two species of calculi; those being intestinal, which effervesce, and others being hepatic, which do not effervesce, but yield globules of wax-like oily matter. (P. 28.)

For additional chemical observations on biliary and other alvine concretions, the reader is particularly referred to Rubini's interesting memoir, Vicq d'Azyr's essay in the Hist. de la Societé Royale de Médecine, an. 1779; the writings of Fourcroy, Vauquelin, and Thenard; Thomson's account of the subject in Monro's Morbid Anatomy of the Human Gullet, &c.; Marcet on calculous Disorders; and some interesting experiments by Dr. Ure, related in a paper by Mr. Kennedy, in Medico-Chir. Journ. Vol. 4, p. 177, &c. Also Ure's valuable Dict. of Chemistry.

With respect to the treatment of cases of biliary calculi, the subject not being generally one, for which any surgical proceeding is advisable, I may be very brief. The medicine, which is alleged by Durande, a physician at Dijon, to be the best solvent for them, consists of three parts of sulphuric æther, and two parts of oil of turpentine. It is to be given in the dose of ℈ij every morning; purgatives being previously exhibited for a few days. The efficacy of this medicine is also corroborated by Soemmering and Richter. To these statements, however, some doubts must be attached, because what symptoms and circumstances will ever unequivocally prove, that there were biliary calculi in the bowels; and that they have been dissolved by this medicine? And how can the product of such solution be got at and examined? But, admitting the authenticity of the cases, doubts must exist of the solvent action of the remedy, since at a temperature, below that of the human body, the æther separates from the turpentine and is volatilized. (See *Dict. des Sciences Med. T.* 3, *p.* 464, 465.)

A calculus in the gall-bladder, or one of the biliary ducts, sometimes produces so much irritation, that inflammation and suppuration take place, and if the abscess point outwardly, the stone may escape externally, and a termination be put to the patient's sufferings. Heberden records a case of this description; and another is given by Mr. Blagden. (See *Med. Trans. of the College of Physicians, Vol.* 5. *and Thomas in Med. Chir. Trans. Vol.* 6. *p.* 106. *And for other instances, the following works referred to by Plouquet: Acrel. Diss. de Cholelithis, Upsal.* 1788, *p.* 204; *Act. Natur. Cur. Vol.* 6, *Obs.* 69; *Bartholinus, Act. Hafn.* 4, *Obs.* 46; *Block, Med. Bemerk, p.* 27; *Gooch's Works, Vol.* 2, 157—161; *Johnston in Phil. Trans. Vol.* 50, *p.* 2, 548; *Petit, Mém. de l'Acad. de Chir.* 1, *p.* 182—185; *Sandifort, Tab. Anat. Fasc.* 3; *Schlichting in Bald. N. Magas,* 9 *b. p.* 210; *Vogler in Museum der Heilkunde,* 4 *b. p.* 91; *Haller, Collect. Diss. Pract.* 3, *No.* 107.)

It was J. L. Petit who first suggested the bold practice of making, under certain circumstances, an incision into the gall-bladder, in order to extract biliary calculi. This proceeding, however, is liable to serious objections, arising not only from the usual difficulty of knowing positively, whether there is a calculus in the gall-bladder, but also from the difficulty of ascertaining whether this viscus is adherent to the peritoneum, without which state of things, the operation would cause an extravasation of bile, enteritis, and death. Petit himself, indeed, mentions three cases, in which distention of the gall-bladder was mistaken for an abscess and punctured. In two of these examples, the consequences were fatal, there having been no adhesion between that organ and the peritoneum to prevent the bile from getting amongst the bowels: the other patient was saved by this fortunate circumstance. (See *Traité des Mal. Chir. T.* 1, 262, *&c.*) However, if a case were to present itself, in which an abscess had formed, and broken, leaving an aperture, in which the calculus could be plainly felt, the surgeon would be justified in attempting to make a sufficient opening for its extraction.

The symptoms, induced by the lodgment of large concretions in the bowels, are of a formidable description: severe pains in the stomach and bowels, diarrhœa, violent vomitings of blood and mucus, a discharge of thin fetid matter from the rectum, a difficulty of voiding the excrement, an afflicting tenesmus, extreme emaciation, and debility.

That the foregoing account is not exaggerated may be seen by a perusal of the cases, and remarks published by Mr. C. White, and the late Mr. Hey.

In cases like that reported by Mr. Hey, (*Pract. Obs. P.* 509. *Ed.* 2.) where the colon was entirely obstructed, surgeons have been advised to cut into that bowel, and extract the foreign body. Let the inexperienced admirer of curious feats with the scalpel, however, pause a little, before he ventures to make up his mind upon this matter; and, at all events, let him know, that some serious mistakes have nearly been made: "upon the very bold operation of cutting out these concretions, when lodged in the colon, proposed by Dr. Monro senior, (See *Monro's Morbid Anatomy of the Human Gullet, &c. P.* 63.) we think it our duty to state, that the diagnosis is so difficult, that, in one case, where the operation was strongly advised, it turned out upon dissection, that the disease was a *scirrhous pylorus.*" (See *Edinb. Med. and Surg. Journ. No.* 33, *P.* 112.)

Sometimes, patients ultimately get well by voiding the concretions either by vomiting or stool. Mr. C. White gives us an account of some instances of this kind; in one, fourteen concretions on plum-stones were discharged from the anus; in another, twenty-one similar bodies were ejected from the stomach.

When such concretions are not particularly large and indurated, they sometimes admit of expulsion by doses of castor oil, oleaginous clysters, &c. But, in other instances, their extraction must be attempted, if their situation in the rectum will permit. It may be done with a pair of lithotomy forceps, or with the sort of scoop used for taking fragments of stone out of the bladder. In this manner Mr. C. White succeeded in removing two alvine concretions from the rectum, nearly as big as his fist. When the sphincter ani will not allow the concretion to be taken out, the muscle should be divided at its posterior angle. According to Richerand, such a division does not permanently weaken its fibres in a perceptible degree, and its paralysis never originates from this cause. (*Nosogr. Chir. T.* 3, *p.* 434. *Edit.* 4.) Maréschal, after a proper dilatation with a scalpel, extracted from the rectum an alvine concretion, which weighed two ounces and a half, and was of an oval form, its greatest diameter being two inches eight lines, and its smaller one inch seven lines. (See *Mém. de l'Acad. de Chir.*)

A. Petermann, Scrutinium Icteri ex calculis vesiculæ Fellis, occasione casus cujusdam singularis. Lips. 1696. *Alb. Haller, De Calculis Felleis frequentioribus Observationes,* 4to. *Gott.* 1749. *T. Coe, A Treatise on Biliary Concretions,* 8vo. *Lond.* 1757. *Imbert, De Variis Calculorum biliarium Speciebus, &c.* 4to. *Monsp.* 1758. *De Vries, Diss. de Calculo biliario, et sectione felleæ vesiculæ,* 4to. *Traj. ad Rhen.* 1759. *Walther de Concrementis Terrestribus in variis partibus corporis humani repertis. Fol. Acrol.* 1775: *the most valuable work on the subject at this period. Hochstetter, De Cholelithis Humanis,*4to. *Tub.* 1763. *Vicq d'Azyr, Hist. de la Société royale de Méd.* 1779. *A valuable production, particularly with reference to the kinds of crystallization, observable in hepatic and intestinal calculi. Durande, Mémoire sur les pièrres biliaires, et sur l'efficacité du mélange d'éther vitriolique et d'esprit de térébinthine dans le colique hépatique produite par ces concrétions, vol.* 1 *des Mém. de l'Acad. de Dijon,* 8vo. *p.* 199, *an.* 1783. *S. T. Soemmering, De Concrementis biliariis Corporis humani,* 8vo. *Traj. ad Rhen.* 1795. *B. Brunie, Essai sur les Calculs biliaires,* 4to. *Paris,* 1803. *Fourcroy, Mém. de l'Acad. des Sciences,* 1789. *et Syst. des Connoissances Chim. T.* 10, *p.* 53—60. *Dr. Bostock, in Nicholson's Journal, Vol.* 4. *p.* 137. *Marcet's Chemical History and Medical Treatment of Calculous Disorders,* 8vo. *Lond.* 1817. *J. F. Meckel, Handbuch der Pathol. Anat. B.* 2, *p.* 455, *&c. Leipz.* 1818. *P. Rubini, Pensieri sulla varia Origine e Natura de Corpi calcolosi che vengono talvolta espulsi dal Tubo Gastrico Memoria,* 4to. *Verona,* 1808. *James Kennedy, An Account of a Morbid Concretion discharged from the Rectum of the Human Female, and in its Chemical Characters closely resembling Ambergris; with Historical Remarks: see Medico-Chir. Journal, Vol.* 4, *p.* 177, *&c.* 1817. *This paper contains a good deal of useful matter, deserving the notice of every body wishing to investigate the history and nature of alvine concretions. Monro's Morbid Anatomy of the Human Gullet, Stomach, and Intestines,* 8vo. *Edinb.* 1811. *The account of alvine concretions in this work is one of the best and most comprehensive. Dict. des Sciences Med. art. Bezoard, et Calculs Biliaires. Nothing of much consequence in either of these articles. Moscovius, Diss. de Calculorum Animalium eorumque imprimis biliosorum origine et natura. Berol.* 1812. *Cases in Surgery, by C. White,* 8vo. *Lond.* 1770, *p.* 17. *Philos. Trans. abridged, vol.* 5. *p.* 256, *et seq. Edinb. Med. Essays and Obs. vol.* 1. *p.* 301. *Ibid. vol* 5. *p.* 431. *Essays Phys. and Literary, vol.* 2. *p.* 345. *Leigh's Natural History of Lancashire, plate* 1. *fig.* 4. *W. Hey's Practical Obs. in Surgery, p.* 507. *ed.* 2. *Richerand, Nosographie Chirurgicale, t.* 3. *p.* 433. *ed.* 4. *Thomas, in Med. Chir. Transactions, vol.* 6. *p.* 98. *T. Brayne, An Account of Two Cases of Biliary Calculi of extraordinary dimensions: Med. Chir. Trans. vol.* 12. *Ure's Chemical Dict. articles, Intestinal Concretions, and Gall-stones.*

AMAUROSIS (from αμαυροω, to obscure). *Gutta serena. Suffusio nigra.* Fr. *L'Amaurose;* Germ. *Schwarzer Staar.* According to Beer, the term *amaurosis* properly means that diminution or total loss of sight, which immediately depends upon a morbid state of the retina and optic nerve, whether this morbid state exist as the only defect, or be complicated with other mischief; whether it be a primary affection, or a secondary one, induced by previous disease of other parts of the eye. Or, we may say with a critical writer, that the term *amaurosis* designates *all affections of the nerves of vision, which produce either complete or partial loss of sight,* whether this arise from obvious or inferred organic disease, or from a diminution, or loss of sensibility in the eye, which cannot be traced to change of structure, or any other evident cause. (See *Journ. of Foreign Med. and Surgery, vol.* 4. *p.* 166.)

From these definitions, which comprehend every form of amaurosis, it is evident, that this affection does not uniformly take place as a single independent disorder; but, not unfrequently, presents itself as a symptomatic effect of some other disease of the eye: a fact, exemplified in cases of hydrophthalmia, cirsophthalmia, glaucoma, &c. And, as Mr. Wardrop observes, amaurosis, in its usual acceptation, signifies a symptom of disease, as well as a distinct affection. (*Essays on the Morbid Anatomy of the Human Eye, vol.* 2. *p.* 165. *8vo. Lond.* 1818.) With respect to the mere name of the kind of disease, here implied by amaurosis, its correctness will remain the same, whether the iris be moveable or immoveable; whether the pupil be preternaturally enlarged, or contracted; and whether it be perfectly clear and transparent, or more or less turbid; for the name only refers to the morbid state of the retina and optic nerve, and not to the condition of the sight in general. When the long established name of *amaurosis* is received with this precise meaning, there will not be the slightest danger of confounding this disease with other affections of the eye. However, when it is wished to make out the very different forms and kinds of amaurosis, the foregoing appearances of the iris and pupil are considerations of great importance. (See *Beer's Lehre von den Augenkrankheiten, b.* 2. *p.* 420. *&c. Wien,* 1817.)

I think it also of importance, that surgeons should well understand, what Mr. Travers has particularly mentioned, that the term "amaurosis" comprehends all those imperfections of vision, which depend upon a morbid condition, *whether affecting structure, or function,* of the sentient apparatus proper to the organ. (See his *Synopsis of the Diseases of the Eye, p.* 293.)

Amaurosis does not constantly attack both eyes at the same time; frequently one is attacked some time after the other, and it is not unusual even for one eye to remain sound during life, while the other is completely blind. This depends, in part, upon the disposition to the disease in one eye being quite local, and in part upon the causes giving rise to the complaint extending their operation only to the eye affected. Where, also, the origin of amaurosis seems to depend altogether are nothing more than cases of periodical amaurosis. But, sometimes, the frequently recurring form of the disease confines itself to no determinate type; and, on account of its irregularity, it is then termed by Beer, *Amaurosis Vaga*, which, he says, is often of spasmodic origin, and therefore principally met with in persons liable to hysteria, hypochondriasis, convulsions, or epilepsy. Periodical amaurosis, after remaining uncured a certain time, often becomes *permanent*. (*Beer, Lehre, &c. B.* 2, *p.* 429.)

In amaurosis in general, but particularly when no material knowledge can be acquired of causes, and the treatment must of necessity be conducted on empirical principles, it is of the highest importance to recollect what Richter has pointed out, namely, that amaurosis sometimes commences with several symptoms, betraying an increase of sensibility in the eye, or some irritation affecting this organ. In moderately light places, the patient can discern things very well; but, in a great light, he is not able to see at all. The eye is sometimes so sensible, that a strong light will make it weep and become painful. Patients of this description ought always to wear a shade, however bad their sight may be. Sometimes amaurosis originates with symptoms of weakness and diminished irritability. The sight is cloudy, and the patient finds that he can see better in a light, than a dark situation. He feels as if some dirt, or dust, were upon his eyes, and is in the habit of frequently wiping them. His power of vision is greater after meals than at the time of fasting. His sight is always plainer for a short time, after the external use of tonic remedies, such as hartshorn, cold water, &c. Richter informs us of a person, who was nearly quite blind, but was constantly able to see very well, for the space of an hour, after drinking champagne wine. He also mentions a woman entirely bereft of sight, who was in the habit of having it restored again, for half an hour, whenever she walked a quick pace up and down her garden. He likewise acquaints us with the case of a lady, who had been blind for years; but, experienced a short recovery of her sight, on having a tooth extracted. (*Anfangsgr. &c. B.* 3, *Kap.* 14.)

Whether the benefit arose from the stimulus of the operation, as Richter seems to imply, or from the removal of an irritating cause, doubts may rationally be entertained. A similar fact is recorded by Mr. Travers, who says, that he has seen an incipient functional amaurosis distinctly arrested by the extraction of a diseased tooth, when the delay of a similar operation had occasioned gutta serena on the opposite side, two years before. (*Synopsis, p.* 299.)

When the disorder is accompanied with diminished sensibility in the eye in general, Beer joins Richter, with respect to the temporary improvement of the sight after a nourishing meal, or drinking spirituous liquors; or when the patient's mind is elated with joy, or anger, though such melioration of sight, it is true, is but of very short duration. (*See also Vetch's Treatise on the Diseases of the Eye, p.* 137.)

On the other hand, it may be remarked, that every thing, which tends to depress the passions and spirits, augments the imperfection of sight. Where marks of increased sensibility prevail, the abovementioned circumstances exercise a transient disadvantageous operation; the patient carefully retires from every strong light, and frequently shelters his eye with his hand, &c. (*Lehre von den Augenkr. B.* 2, *p.* 430.)

Mr. Travers also knows patients, whose vision is benefited, in a high degree, and others, in whom it is much deteriorated, by the quickened circulation of a full meal, and a few glasses of wine. The former, he says, are persons of spare and meagre habits; the latter, plethoric. (*Synopsis of the Diseases of the Eye, p.* 157.)

Amaurosis either presents itself as a genuine uncomplicated affection, or, at least, with the appearance of such a form of disease of the eye, depending solely upon a morbid state of the optic nerve, and cognizable by a diminution, or complete abolition, of the power of vision; or the disease is co-existent with other diseased appearances either in the eye, its vicinity, or some other organs at a distance from the eye, or in the general constitution. These appearances merit the most earnest consideration, because they are for the most part connected with the cause of amaurosis. According to this statement, then, there is a *genuine local amaurosis*, and a *complicated amaurosis*, which last may be either *local*, or *general*, or of both descriptions together, and therefore named by Beer, *perfectly complicated*. (*Vol. cit. p.* 431.)

Mr. Travers divides amaurotic affections into two classes, the *organic* and the *functional*. The first comprehends alterations, however induced, in the texture, or position of the retina, optic nerve, or thalamus. The second includes suspension, or loss of function of the retina and optic organ, depending upon a change, either in the action of the vessels, or in the tone of the sentient apparatus.

As causes of organic amaurosis, Mr. Travers enumerates: 1. Lesion, extravasation of blood, inflammatory deposition upon either of its surfaces, and loss of transparency of the retina. 2. Morbid growths within the eyeball, dropsy, atrophy, and all such disorganizations as directly oppress or derange the texture of the retina. 3. Apoplexy, hydrocephalus, tumors or abscesses in the brain, or in or upon the optic nerve or its sheath, and thickening, extenuation, absorption, or ossification of the latter. As causes of functional amaurosis, Mr. Travers specifies: 1. Temporary determination; vascular congestion, or vacuity, as from visceral or cerebral irritation; suppressed, or deranged, or excessive secretions, as of the liver, kidneys, uterus, mammæ, and testes; various forms of injury and disease; and hidden translations of remote morbid actions. 2. Paralysis idiopathica, suspension, or exhaustion of sensorial power from various constitutional and local causes; from undue excitement or exertion of the visual faculty; and from the deleterious action of poisons on the nervous system, as lead, mercury, &c.

From this description, says Mr. Travers, it will be understood, that organic, and many forms of functional amaurosis are incurable; and the functional, by continuance, lapses into the organic disease.

Functional amaurosis is subdivided by Mr. Travers, into 1st, the *Symptomatic*, or that which is only a symptom of some general disease, or disorder of the system; as for example general plethora, general debility; 2dly, the *Metastatic*, or that produced by the sudden translation of the morbid action from another organ of the body; as, for example, from the skin, the testicle, &c. 3dly, the *Proper*, or that which depends upon a peculiar condition of the retina; as, for example, the visus nebulosus, muscæ volitantes. (*Synopsis*, *p.* 139–155.)

On the whole, genuine local amaurosis, that is to say, a diminution or total loss of the eyesight, unattended with any other apparent local or constitutional defect, may be said to be a very rare case, the disorder being usually more or less complicated.

To the local complications, says Beer, belong the cataract; glaucoma; a general varicose state of the eyeball (*cirsophthalmia*;) exophthalmia; atrophy of the eye; spasms in the organ and surrounding parts; paralysis of one or more muscles of the eye (*ophthalmoplegia*;) paralysis of the eyelids; ophthalmia in general, and internal ophthalmia in particular; a scorbutic bloodshot appearance of the eye; (*Hypoema Scorbuticum*;) and, finally, wounds or contusions of the eye, or adjacent parts. With these cases should also be mentioned that important case, fungus hæmatodes of the eye. From this simple enumeration of local complications, one may see how frequently amaurosis is only a symptomatic effect of another disorder of the eye, with which it is conjoined, and how often it is connected with the same common causes, which pertain to another or several other diseases of the eye.

Amongst the general complications, Beer enumerates those which are purely nervous; impairment of the health in various forms by infection, contagion, or miasmata; a bad habit of body; typhoid fevers; asthma; internal and external hydrocephalus; organic defects of the abdominal viscera: worms; chlorosis; consumption; old ulcers of the legs; organic disease of the brain and skull; complaints arising from pregnancy; hemorrhage, &c. In these general complications, Beer remarks, that the casual connexion between amaurosis and some remote disease of another organ, or of the whole constitution, cannot be mistaken; and, in these cases, we often see the disease of some other distant part from the eye, suddenly or gradually diminish, and immediately appear again as a sympathetic action in the form of amaurosis, of which the most remarkable instance is seen after the sudden healing of old ulcers of the legs. (*Beer*, *Lehre*, *von den Augenkr. B.* 2, *p.* 433.)

From the above general remarks upon amaurosis, it is quite manifest, that the objective and subjective symptoms of the disease vary considerably according to the violence of its causes, and of the local and general complications, though the seat of the disease, and what is particularly the proximate cause of the loss of vision, be in the optic nerve; and it depends especially on the nature of the causes, whether this or that morbid appearance take place in the eye.

One may consider as the only real inseparable subjective symptom of amaurosis, that weakness of sight (*Amblyopia*) or that complete blindness, in which neither with the unassisted nor assisted eye the least defect can be perceived in the structure and shape of the affected organ. Hence, Beer names such impairment of vision, or blindness, *amaurotic*. But how rarely this subjective symptom of amaurosis exists alone, and how frequently it is obscured by some other defect in the structure and form of the eye, is proved by daily experience.

The objective symptoms of amaurosis have hitherto been set down as merely consisting of a considerable dilatation of the pupil, and immobility of the iris, because these appearances are indeed the most frequent; but, as Beer observes, this is another proof what ignorance has prevailed respecting the true nature of that disease of the eye, and its modifications, which are usually termed amaurosis; the objective symptoms of the complaint being, according to the nature of the causes, as numerous as the subjective.

First; the objective symptoms of amaurosis may consist in the faulty size and shape of the pupil. In many cases, the pupil is very much dilated, immoveable, and possesses its natural black colour, and usual transparency. It cannot be denied, that this is the state of numerous cases, but, it is equally true, that there are many exceptions. Sometimes, according to Richter, in the most complete and incurable cases, the pupil is of its proper size, and even capable of very free motion (*Tarbés*, *RécueilPeriodique*, *&c. T.* 2, *p.* 319.); and, occasionally, it is actually smaller, and more contracted, than natural. This aperture often continues extraordinarily large in the strongest light; but, in some instances, it is unusually small in every kind of light. (*Arrachard*, *Récueil Period. &c. T.* 1, *p.* 273.—*Richter*, *Anfangsgr. &c. B.* 3, *p.* 424. *Beer*, *Lehre*, *&c. B.* 2, *p.* 435.) According to the latter writer, the pupillary edge of the iris rarely has its primitive shape, being generally more or less angular; either at some indeterminate point; or above and below, so as to resemble in some measure the pupil of the cat-race; or towards the nose, or temple, so as to have some similitude in its form to the pupil of ruminating animals. These appearances are highly important, having great influence over the diagnosis.

Frequently not only the size and shape of the pupil are faulty, but the position of that opening is quite unnatural, being inclined either upwards or downwards, or outwards or inwards; but, most commonly, in a diagonal line between inwards and upwards, and, in these cases, the pupillary margin of the iris never describes a regular circle, but is always more or less angular. (*Beer*, *Vol. cit. p.* 436.)

The pupil of an eye affected with amaurosis (as Richter remarks) frequently does not exhibit the clear shining blackness, which is seen in a healthy eye. In general, it is of a dull, glassy, hornlike blackness, which symptom alone is frequently enough to apprize a well-informed practitioner of the nature of the disease. It is in the words of Mr. Travers, "little more, than the healthy appearance of the humors in the eye of a horse." (*Synopsis*, *p.* 146.) Sometimes the colour of the pupil has an inclination to green; while, in other examples, this aperture seems to be dense, white, and cloudy, so that the complaint might easily be mistaken for the beginning of a cataract. This error, into which inexperienced surgeons are liable to fall, may generally be avoided by attention to the following circumstances. The misty appearance is are nothing more than cases of periodical amaurosis. But, sometimes, the frequently recurring form of the disease confines itself to no determinate type; and, on account of its irregularity, it is then termed by Beer, *Amaurosis Vaga*, which, he says, is often of spasmodic origin, and therefore principally met with in persons liable to hysteria, hypochondriasis, convulsions, or epilepsy. Periodical amaurosis, after remaining uncured a certain time, often becomes *permanent*. (*Beer, Lehre, &c. B.* 2, *p.* 429.)

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As causes of organic amaurosis, Mr. Travers enumerates: 1. Lesion, extravasation of blood, inflammatory deposition upon either of its surfaces, and loss of transparency of the retina. 2. Morbid growths within the eyeball, dropsy, atrophy, and all such disorganizations as directly oppress or derange the texture of the retina. 3. Apoplexy, hydrocephalus, tumors or abscesses in the brain, or in or upon the optic nerve or its sheath, and thickening, extenuation, absorption, or ossification of the latter. As causes of functional amaurosis, Mr. Travers specifies: 1. Temporary determination; vascular congestion, or vacuity, as from visceral or cerebral irritation; suppressed, or deranged, or excessive secretions, as of the liver, kidneys, uterus, mammæ, and testes; various forms of injury and disease; and hidden translations of remote morbid actions. 2. Paralysis idiopathica, suspension, or exhaustion of sensorial power from various constitutional and local causes; from undue excitement or exertion of the visual faculty; and from the deleterious action of poisons on the nervous system, as lead, mercury, &c.

From this description, says Mr. Travers, it will be understood, that organic, and many forms of functional amaurosis are incurable; and the functional, by continuance, lapses into the organic disease.

Functional amaurosis is subdivided by Mr. Travers, into 1st, the *Symptomatic*, or that which is only a symptom of some general disease, or disorder of the system; as for example general plethora, general debility; 2dly, the *Metastatic*, or that produced by the sudden translation of the morbid action from another organ of the body; as, for example, from the skin, the testicle, &c. 3dly, the *Proper*, or that which depends upon a peculiar condition of the retina; as, for example, the visus nebulosus, muscæ volitantes. (*Synopsis*, *p.* 139–155.)

On the whole, genuine local amaurosis, that is to say, a diminution or total loss of the eyesight, unattended with any other apparent local or constitutional defect, may be said to be a very rare case, the disorder being usually more or less complicated.

To the local complications, says Beer, belong the cataract; glaucoma; a general varicose state of the eyeball (*cirsophthalmia*;) exophthalmia; atrophy of the eye; spasms in the organ and surrounding parts; paralysis of one or more muscles of the eye (*ophthalmoplegia*;) paralysis of the eyelids; ophthalmia in general, and internal ophthalmia in particular; a scorbutic bloodshot appearance of the eye; (*Hypoema Scorbuticum*;) and, finally, wounds or contusions of the eye, or adjacent parts. With these cases should also be mentioned that important case, fungus hæmatodes of the eye. From this simple enumeration of local complications, one may see how frequently amaurosis is only a symptomatic effect of another disorder of the eye, with which it is conjoined, and how often it is connected with the same common causes, which pertain to another or several other diseases of the eye.

Amongst the general complications, Beer enumerates those which are purely nervous; impairment of the health in various forms by infection, contagion, or miasmata; a bad habit of body; typhoid fevers; asthma; internal and external hydrocephalus; organic defects of the abdominal viscera: worms; chlorosis; consumption; old ulcers of the legs; organic disease of the brain and skull; complaints arising from pregnancy; hemorrhage, &c. In these general complications, Beer remarks, that the casual connexion between amaurosis and some remote disease of another organ, or of the whole constitution, cannot be mistaken; and, in these cases, we often see the disease of some other distant part from the eye, suddenly or gradually diminish, and immediately appear again as a sympathetic action in the form of amaurosis, of which the most remarkable instance is seen after the sudden healing of old ulcers of the legs. (*Beer*, *Lehre*, *von den Augenkr.* *B.* 2, *p.* 433.)

From the above general remarks upon amaurosis, it is quite manifest, that the objective and subjective symptoms of the disease vary considerably according to the violence of its causes, and of the local and general complications, though the seat of the disease, and what is particularly the proximate cause of the loss of vision, be in the optic nerve; and it depends especially on the nature of the causes, whether this or that morbid appearance take place in the eye.

One may consider as the only real inseparable subjective symptom of amaurosis, that weakness of sight (*Amblyopia*) or that complete blindness, in which neither with the unassisted nor assisted eye the least defect can be perceived in the structure and shape of the affected organ. Hence, Beer names such impairment of vision, or blindness, *amaurotic*. But how rarely this subjective symptom of amaurosis exists alone, and how frequently it is obscured by some other defect in the structure and form of the eye, is proved by daily experience.

The objective symptoms of amaurosis have hitherto been set down as merely consisting of a considerable dilatation of the pupil, and immobility of the iris, because these appearances are indeed the most frequent; but, as Beer observes, this is another proof what ignorance has prevailed respecting the true nature of that disease of the eye, and its modifications, which are usually termed amaurosis; the objective symptoms of the complaint being, according to the nature of the causes, as numerous as the subjective.

First; the objective symptoms of amaurosis may consist in the faulty size and shape of the pupil. In many cases, the pupil is very much dilated, immoveable, and possesses its natural black colour, and usual transparency. It cannot be denied, that this is the state of numerous cases, but, it is equally true, that there are many exceptions. Sometimes, according to Richter, in the most complete and incurable cases, the pupil is of its proper size, and even capable of very free motion (*Tarbés*, *Récueil Periodique*, *&c.* *T.* 2, *p.* 319.); and, occasionally, it is actually smaller, and more contracted, than natural. This aperture often continues extraordinarily large in the strongest light; but, in some instances, it is unusually small in every kind of light. (*Arrachard*, *Récueil Period.* *&c.* *T.* 1, *p.* 273.—*Richter*, *Anfangsgr.* *&c.* *B.* 3, *p.* 424. *Beer*, *Lehre*, *&c.* *B.* 2, *p.* 435.) According to the latter writer, the pupillary edge of the iris rarely has its primitive shape, being generally more or less angular; either at some indeterminate point; or above and below, so as to resemble in some measure the pupil of the cat-race; or towards the nose, or temple, so as to have some similitude in its form to the pupil of ruminating animals. These appearances are highly important, having great influence over the diagnosis.

Frequently not only the size and shape of the pupil are faulty, but the position of that opening is quite unnatural, being inclined either upwards or downwards, or outwards or inwards; but, most commonly, in a diagonal line between inwards and upwards, and, in these cases, the pupillary margin of the iris never describes a regular circle, but is always more or less angular. (*Beer*, *Vol. cit.* *p.* 436.)

The pupil of an eye affected with amaurosis (as Richter remarks) frequently does not exhibit the clear shining blackness, which is seen in a healthy eye. In general, it is of a dull, glassy, hornlike blackness, which symptom alone is frequently enough to apprize a well-informed practitioner of the nature of the disease. It is in the words of Mr. Travers, "little more, than the healthy appearance of the humors in the eye of a horse." (*Synopsis*, *p.* 146.) Sometimes the colour of the pupil has an inclination to green; while, in other examples, this aperture seems to be dense, white, and cloudy, so that the complaint might easily be mistaken for the beginning of a cataract. This error, into which inexperienced surgeons are liable to fall, may generally be avoided by attention to the following circumstances. The misty appearance is not situated close behind the pupil, in the place of the crystalline lens; but, more deeply in the eye. Nor is it in proportion to the impairment of sight, the patient being quite blind, while the misty appearance is so trivial, that, if it arose from the opacity of the crystalline lens, it could at most only occasion a slight weakness and obscurity of vision; at the same time, Richter acknowledges, that it must be more difficult to avoid mistake, when a beginning amaurosis is accompanied with this cloudiness in the eye, and, consequently, when the degree of blindness seems to bear some proportion to the degree of mistiness in the pupil. However, in this case, he maintains that the true nature of the disease may generally be known by comparing the ordinary symptoms of the two diseases. (*Anfangsgr. B.* 3, *p.* 14.) And, according to Beer, when the pupil is of a true dark gray, or greenish gray colour, a lateral inspection of the eye will show plainly enough, that the cloudiness is in the vitreous humour, or behind it. Sometimes, the pupil appears reddish, quite red, or of a yellowish white colour; (*Lehre von den Augenkr. B.* 2, *p.* 436.) while, in other cases, the interior of the eye, a good way behind the pupil, seems quite white, and a concave light coloured surface may be observed, upon which the ramifications of blood-vessels can be plainly seen. In particular instances, this white surface extends over the whole back part of the eye; while, in other cases, it only occupies a half or a small portion of it. This peculiar appearance has been ascribed to a loss of transparency in the retina itself, and a consequent reflection of the rays of light. (*Haller, Element. Physiol. Tom.* 5. *p.* 409.) Mr. Travers inclines to the opinion, that it arises from a deficient secretion of the choroid pigment, a preternatural adhesion betwixt the choroid coat and the retina, and a discoloration, or resplendent appearance of the latter from this cause. (*Synopsis, p.* 148.)

One of the strongest characteristics of amaurosis and an incipient cataract, and one most to be depended upon in practice, is reported by Mr. Stevenson to be the difference, which the flame of a candle exhibits in the two affections. In incipient cataract, it appears, as if it were involved in a generally diffused, thin mist, or white cloud, which increases with the distance of the light; but, in amaurosis, a halo, or iris appears to encircle, or emanate from the mist, the flame seeming to be split, when at a distance. (*On the Nature, &c. of Amaurosis. Lond.* 1821.)

There can now be no doubt, that the whiteness behind the pupil must sometimes have originated from the diseased mass, which, in cases of fungus hæmatodes of the eye, grows from the deeper part of this organ, and gradually makes its way forward to the iris, being always attended with total loss of sight. Putting out of present consideration the change of colour within the eye, produced by fungus hæmatodes, the other palish changes behind the pupil are not confined, as Kieser supposes, to very old cases of amaurosis, because the alteration is described by Schmucker as taking place especially in examples the formation of which was quite sudden. (*Vermischte Chir. Schrift. B.* 2.) and Langenbeck has recorded cases, in which the same appearance happened in the early stage of the disease. (*Neue Bibl. B.* 1, *p.* 64, *&c.*

Besides the above appearances in the pupil itself, and in the pupillary margin of the iris, Beer adverts to several important phenomena, with respect to the motion of the iris. Sometimes the iris moves but very inertly, and frequently not at all, though the light be strong, and the upper eye-lid be rubbed over the eye-ball. While, in other examples, a very moderate light will bring on such a rapid contraction of the iris and closure of the pupil, as are never witnessed in a healthy eye.

We have also the authority of Richter for asserting, that, in particular instances, the iris not only possesses the power of motion, but is capable of moving with uncommon activity, so that, in a very moderate light, it will contract in an unusual degree, and nearly close the pupil. (*Anfangsgr. der Wundarzn. B.* 3, *p.* 424, *Edit.* 1795.)

Two or three remarkable instances of the active state of the iris, in cases of amaurosis, were some years ago shown to me by Dr. Albert, then staff surgeon at the York Hospital, Chelsea, and I have seen some other similar cases in St. Bartholomew's Hospital. Most of the patients in question had not the least power of distinguishing the difference, between total darkness and the vivid light of the sun, or a candle placed just before their eyes. Janin sometimes found the pupil capable of motion in this disease, and Schmucker twice noticed the same fact.

Such cases, Mr. Travers thinks, can only be explained by concluding the organ to be sound, and the cause of the amaurosis remote, or external to it. Thus, says he, in a case of circumscribed tumor, compressing the left optic nerve, immediately behind the ganglion opticum, although the blindness was complete, the iris was active. In two young ladies, in whom the eyes, as in the former case, were perfect, and the blindness complete, the iris was even vivacious; and there was the strongest presumptive evidence, from the symptoms, that the amaurosis was in the cerebral portion of the nerve. (*Synopsis, p.* 188.)

In some anomalous cases, when the strength of the light is suddenly increased, the pupil expands with more or less celerity.

I have already adverted to the occasional moveableness of the iris, notwithstanding the insensible state of the retina. Let me next take notice of a case, which sometimes presents itself, and is quite the reverse of this last. The nerves of the iris may be paralytic, while those of sight continue unimpaired. Schmucker was acquainted with a woman, whose pupil was uncommonly distended, and totally incapable of motion. Her sight was very weak, and spectacles were of no use to her. She could scarcely discern any thing by day, or in a strong light; but she could see rather better at night and in dark places. This infirmity of sight depended upon the dilated, paralytic state of the pupil, by which too many rays of light were admitted into the eye; and the reason why the patient could see better at night was, because the pupil, in its natural state, always becomes widened in a dark situation. (See *Vermischte Chirurgische Schriften, Von J. L. Schmucker, Band* 2, *p.* 13, 14.)

On this curious part of the subject, it is remarked by Mr. Travers, that, if the retina be opaque, compressed, or unsupported, the iris mechanically disordered, or the ciliary nerves palsied, the pupil is inactive, independently of the state of vision. In the first of these cases, it is evident, vision will be lost; but, we continually see useful vision, combined with the second and third, as after operations, in which the iris has been half destroyed, or has become preternaturally adherent, or in malformations, where it is half wanting; and in paralysis of the ciliary nerves, accompanying ptosis. (*Synopsis, p.* 188.)

Frequently, in amaurosis, when the sight of only one eye is lost, and the other retains its full power of vision, not the slightest defect can be discovered, as long as the patient keeps both of them open; but, the instant the sound eye is completely covered, the iris becomes perfectly motionless, its pupillary margin assumes an angular shape, and the pupil expands, being sometimes evidently drawn towards the edge of the cornea. (*Beer, Lehre von den Augenkrank. B.* 2, *p.* 438.)

Besides the above appearances of the pupil and iris, amaurosis is attended with other characteristic phenomena, which occur under certain circumstances, in the form, texture, and state of other parts of the eye, and adjoining organs. Thus, the patient often complains of a peculiar troublesome dryness of the eye, or of a sensation as if the eye-ball were about to be pressed out of its socket; and, indeed, says Beer, one may sometimes hear a grating noise, and distinguish a fluctuation in the orbit behind the eye-ball, when this organ is pressed upon by the finger, or moved in various directions, though neither its circumference be enlarged, nor any tendency to exophthalmia be really present. Nor is it very uncommon to find the affected eye preternaturally hard, soft, or even quite flaccid; but it is less common to find the dimensions of the globe of the eye increased, or the organ affected with atrophy. (*Beer, vol. cit. p.* 438.)

However, in organic amaurosis, as Mr. Travers notices, a peculiar bluish, gray tint of the sclerotic coat is frequently remarkable; and sometimes even a degree of bulging on one or more sides of the eye, or simply a loss of sphericity, its tides appearing flattened.

A turgescence of the superficial vessels, especially of the long fasciculi of conjunctival veins, is likewise another symptom frequently observed in cases of organic amaurosis. (*See Travers's Synopsis, p.* 146.)

The same gentleman also gives the particulars of a dissection, in which a case of amaurosis was attended with a collapse of the retina from absorption of the vitreous humour. (*Op. cit. p.* 150.)

The principal subjective morbid effects, which appertain to amaurosis, have been already described in speaking of the several defects of vision, which accompany an amaurotic weakness of sight. Besides these, however, there are others, which merit attention. For instance, the patient feels in the eye and surrounding parts an irksome sensation, without any actual pain, and complains of a remarkable sense of fulness, or weight in the organ. Amaurotic patients are also frequently attacked with sudden violent giddiness, usually ending in a considerable diminution of the eyesight, and sometimes in severe general headach. Occasionally, they fancy that small atoms of dust are lodged under the eyelids, and are fearful of moving these parts, or the eye. It is also well known, that many persons become amaurotic, while labouring under severe hemicrania, extending from, or to, the diseased eye; while, on other occasions, the most violent pains are confined, particularly to the region of the eyebrow, and have the appearance of being strictly periodical. In certain other cases, the pain is wandering, and shoots in every direction about the eyebrow. These painful feelings often precede the amaurotic blindness a considerable time, and often first take place when one or both eyes are already blind; but, the pains and loss of sight are not unfrequently produced together. Lastly, some patients are met with, in whom the worst pains only last until the amaurosis is perfectly formed, when they gradually and permanently cease. In all these painful cases of amaurosis, the pain and the blindness chiefly depend upon the same cause, and one is seldom the occasion of the other. Sometimes amaurotic patients experience such violent pain, that they lose their senses, and grow delirious; but, in these cases, if we can credit the assertion of Beer, important morbid changes in the bones of the skull, or the brain itself, are invariably noticed after death. (See *Lehre von den Augenkr. B.* 2, *p.* 439.) In some amaurotic patients, lethargic symptoms may be remarked; in others, restlessness; and, more rarely, delirium in all its degrees, either as a transient, or permanent affection.

According to the observations of Mr. Travers, pain, affecting the forehead and temples, is a precursory symptom of amaurosis, diminishing in proportion as the dimness increases. When the amaurosis is perfect, it usually ceases altogether, *if the* disease *has its seat in the eyeball.* But, when the pain is severe, remits imperfectly, and is quickly rendered worse by exercise, it is usually connected with organic disease of the brain. In this case, derangement and torpor of the primæ viæ, loss of strength and flesh, disposition to stupor, occasional confusion of intellect, inaptitude to exertion, and paralysis of one or more muscles, will be concomitant symptoms. (*Synopsis, &c. p.* 167.)

Paralytic appearances may precede amaurosis, either in the vicinity of the eye, or in the muscles of the face, or, in a distant situation, as the extremities. Sometimes they accompany the disease, and sometimes closely follow the weakness of sight, being not unfrequently the forerunners of a fatal attack of apoplexy.

In the same way, convulsive symptoms may be conjoined with amaurosis, and when they first occur in the complete stage of the latter disease, Beer pronounces them a very unfavourable omen for the patient's life.

But, according to the same experienced oculist, when, in a case of perfect amaurosis, several of the other external senses are affected; and lastly, when the internal senses begin to suffer, when, for instance, the hearing, and then the smell, and taste are lost, and afterwards the memory and other intellectual powers fail, the patient's speedy dissolution may be expected. (See *Lehre von den Augenkrankh. B.* 2, *p.* 441, *Wien.* 1817.)

As Professor Beer correctly observes, age cannot be considered a predisposing cause of amaurosis, as it is of cataract; for, there are many more blind persons, who have been deprived of their sight by amaurosis in their best days, than old persons thus attacked. Amaurosis spares no age—not even the newborn infant.

Four forms of *congenital* organic amaurosis are noticed by Mr. Travers. One, in which the eye is preternaturally small, soft, and even flaccid; the iris tremulous, and not influenced by belladonna; and the globe affected with tremor, and not subject to the control of the will. A second, depending on a deficiency of the pigmentum nigrum; the organ is tremulous, strong light produces uneasiness, and vision is dazzled and confused. The vessels of the choroid give the interior of the eye a deep red tinge. A third case is that, in which the sclerotica so encroaches upon the cornea, that the latter is scarcely wider than the pupil. In the fourth kind of congenital amaurosis, described by Mr. Travers, the eyes move in concert, as if attracted by a faint perception of light; but, the infant is blind: no marks of organic derangement can be seen; but, Mr. Travers apprehends, that the disease must be connected with a morbid state of the thalami, or optic nerve. (*Synopsis, p.* 153-154.)

Neither does sex nor race appear to have any influence over the origin of the complaint; but, it would seem, that dark eyes, especially those which are called black, are more disposed to amaurotic blindness, than such as are light coloured. According to Beer's experience, for every gray or blue eye affected with amaurosis, there are five-and-twenty or thirty brown or black ones, thus diseased. In the peculiar constitution of the eye, then, as well as in a sanguineous and choleric temperament, there exists a tendency to the disorder.

More frequently, than cataract, amaurosis is found to be a true hereditary disease:—this is so much the case, that most of the members of a family, for more than one generation, may lose their sight from amaurosis at a certain period of life. Beer says, that he is acquainted with more than one family, in which this has happened, and, what merits attention, the women of one of these families, down to the third generation, became completely and permanently blind from amaurosis on the cessation of the menses, while all the others, who had had children, were unaffected. But, the males of this unfortunate family, who, as well as the females, have very dark brown eyes, all seem to be weak-sighted, though none of them are yet blind. (*Lehre von den Augenkrankheiten, B.* 2, *p.* 445.)

In women, especially those with black eyes, the time when the menses stop is a dangerous period for the commencement of amaurosis.

According to the same writer, patients, whose piles used to bleed periodically for a long time, but are now suddenly stopped, and whose eyes are dark, are very liable to amaurosis.

One of the less common causes of amaurosis is an idiosyncrasy, in relation to this or that sort of nutriment or medicine, or this or that particular state of the body. Here is to be reckoned the amaurotic weakness of sight, or the perfect amaurosis, which comes on at the very commencement of pregnancy, and subsides after delivery, but always attended with dyspepsia and insuperable vomiting. This species of amaurosis, however, should be carefully distinguished from that which sometimes first originates in the final months of pregnancy, and chiefly from strong and long continued determination of blood to the head and eyes, particularly when the bowels are at the same time loaded, and the patient constipated. This latter case usually continues till after delivery; or, if the labour be tedious, difficult, and attended with considerable efforts, the blindness may first attain its complete form at the time of delivery, and not afterwards subside.

Beer saw a young Jewess, who, at the very beginning of her first three pregnancies, which followed each other quickly, regularly used to lose her sight, becoming completely amaurotic between the third and fourth months, and, on the two first occasions, she continued blind till after delivery; but, in the third instance, the power of vision never returned at all. Beer twice had under his care another woman, who was attacked with amaurosis whenever she drank chocolate; but, upon leaving off that drink, she never afterwards had any complaint in her eyes.

If we are to believe the generality of writers on this subject, the abuse of bitter substances, as of chicory in coffee, bitter malt liquors, and bitter medicines, especially quassia, is unquestionably a predisposing cause of amaurosis.

The abuse of narcotic poisonous substances may induce amaurosis; immoderate doses of opium; hyoscyamus; belladonna, &c. Lead will do the same thing. Beer mentions a case, in which the only assignable cause was the exhibition of pills, containing the extractum cynoglossi.

One not unfrequent, and very important, cause of amaurosis is hysteria and hypochondriasis, with which must be mentioned infarction generally, and induration of one or more of the abdominal viscera, especially the liver. (*Beer, Lehre, &c. B.* 2, *p.* 444-46.)

According to Richter, the remote causes of amaurosis may be properly divided into three principal classes, the differences of which indicate three general methods of treatment.

The first class of causes depends upon an extraordinary plethora and turgidity of the bloodvessels of the brain, or of those of the optic nerves and retinæ, upon which last parts a degree of pressure is thereby supposed to be occasioned. A considerable plethora, especially when the patient heats himself, or lets his head hang down, will frequently excite the appearance of black specks before the eyes, and sometimes complete blindness. A plethoric person (says Richter), who held his breath, and looked at a white wall, was conscious of discerning a kind of network, which alternately appeared and disappeared with the diastole and systole of the arteries.

Richter thinks it likely, that the disease is thus produced, when it proceeds from the suppression of some habitual discharge of blood, not being bled according to custom, the stoppage of the menses, and the cessation of hemorrhage from piles. In the same manner, the complaint may be brought on by great bodily exertions, which must determine a more rapid current of blood to the head. Richter informs us of a man, who became blind all on a sudden, while carrying a heavy burden up stairs. He tells us of another man, who laboured excessively hard for three days in succession, and became blind at the end of the third day. Pregnant women, in like manner, are sometimes bereft of their sight during the time of labour. Schmucker has recorded a remarkable instance of this in a strong young woman, thirty years old, and of a full habit. Whenever she was pregnant, she was troubled with violent sickness, till the time of delivery, so that nothing would stop in her stomach. She was bled, three or four times, without effect. Towards the ninth month, her sight grew weak, and for eight or ten days before parturition, she was quite blind. The pupil of the eye was greatly enlarged, but retained its shining black appearance. She recovered her sight immediately after delivery, and did not suffer any particular complaints. Schmucker assures us, that he has been three times a witness of this extraordinary circumstance. (*Vermischte Chir. Schriften, Band* 2, *p.* 6, *edit.* 1786.) Richter speaks of a person, who lost his sight, during a violent fit of vomiting. Schmucker acquaints us, that it is not uncommon for soldiers, who are performing forced marches in hot weather, to become blind all on a sudden.

Beer also coincides with Schmucker, Richter, and others, in regarding as a frequent cause of amaurosis, repeated and long continued determinations of blood to the head and eyes, produced by various circumstances, viz. by pregnancy; a tedious and difficult labour; lifting and carrying heavy burdens, especially with the arms raised up; all kinds of work, in which the eyesight and intellectual faculties are intensely exerted, with the head bent forwards, and the abdomen compressed, as is the case with shoemakers, tailors, &c., every sudden stoppage of natural, or preternatural long established discharges of blood, as that of the menses, lochia, or hemorrhoids; the omission of habitual venesection at some particular season of the year; severe and obstinate vomiting; forced marches in hot, dry weather; scrofulous and other swellings of considerable size in the neck, pressing upon the jugular veins, and obstructing the return of blood from the head; the use of a pediluvium, or warm bath, the water of which is of high temperature; hard drinking; violent gusts of passion; frequent and obstinate constipation; and hard straining at stool. These causes are more likely to occasion amaurosis, in proportion as the individual is young and plethoric. (*Beer, Lehre von den Augenkr. B.* 2. *p.* 446.)

The second class of causes are supposed to operate, by weakening either the whole body, or the eye alone, and they indicate the general or topical use of tonic remedies. In the first case, the blindness appears as a symptom of considerable universal debility of the whole system; in the second case, it is altogether local. Every great general weakness of body, let it proceed from any cause whatsoever, may be followed by a loss of sight. Amaurosis, if we can give credit to the statement of Richter, is sometimes the consequence of a tedious diarrhœa, a violent cholera morbus, profuse hemorrhage, and immoderate salivations. (*Also Travers's Synopsis, p.* 144.) Richter informs us of a dropsical woman, who became blind, on the water being let out of her abdomen. According to the same author, no general weakening causes operate upon the eyes, and occasion total blindness, so powerfully and often, as premature and excessive indulgence in venereal pleasures.

The causes which operate locally in weakening the eyes, are various. Nothing has a greater tendency to debilitate these organs, than keeping them long and attentively fixed upon minute objects. But, however long and assiduously objects are viewed, if they are diversified, the eye suffers much less, than when they are all of the same kind. A frequent change in the objects which are looked at, has a material effect in strengthening and refreshing the eye. The sight is particularly injured by looking at objects with only one eye at a time, as is done with telescopes and magnifying glasses; for, when one eye remains shut, the pupil of that which is open, always becomes dilated beyond its natural diameter, and lets an extraordinary quantity of light into the organ. The eye is generally very much hurt, by being employed in the close inspection of brilliant, light-coloured, shining objects. Amongst the occupations, enumerated by Mr. Travers as particularly exposing persons to amaurosis, are those of needleworkers, writers, draughtsmen, inspectors of linen and scarlet cloths, and of new banknotes; money-counters; smiths, stokers in iron-furnaces and glass-houses; tavern-cooks; watchmakers, engravers, philosophical instrument makers, sea-officers, &c. (*Synopsis, p.* 144.) They are greatly mistaken, says Richter, who think, that they save their eyes, when they illuminate the object, which they wish to see, in the evening, with more lights, or with a lamp, that intercepts and collects all the rays of light, and reflects them upon the body which is to be looked at. Richter mentions a man, who in the middle of winter, went a journey on horseback, through a snowy country, while the sun was shining quite bright, and who was attacked with amaurosis. He speaks of another person, who lost his sight, in consequence of the chamber, in which he lay, being suddenly illuminated by a vivid flash of lightning. A man was one night seized with blindness, while his eyes were fixed on the moon in a fit of contemplation. Richter also expresses his belief, that a concussion of the head, from external violence, may sometimes operate directly on the nerves, so as to weaken and render them completely paralytic.

Beer corroborates the foregoing statement; for, he says, amongst the most frequent causes is to be considered every abuse of the eyesight, especially in dark-eyed persons, as a long and close inspection of one object, particularly with a microscope, when the thing examined is very brilliant, or reflects back much light into the eye. Hence, the view of jewels at night, and long journeys through snowy countries, &c. are conducive to the disease. In this respect, every kind of employment which strains the eyes much, and requires a strong reflected light, must be considered injurious. (*See also Travers's Synopsis, p.* 144.) Thus reverberating lamps, like Argand's; the view of a white wall illuminated with the sun's rays; and looking a long while at the moon, or more especially the sun, with the unassisted eye, are circumstances likely to bring on the disease. That a flash of lightning, especially when it suddenly wakes a person in the night-time out of a sound sleep, may produce an amaurotic amblyopia, in an irritable eye, or even perfect blindness, is a well known fact, and, it is on the same principle, that going suddenly out of a dark bedroom, immediately after waking in the morning, into an apartment that commands an open extensive prospect must be hurtful to an irritable eye, though the bad effects may only be very slow. Here is also to be included every kind of over irritation of the eye by light, as happens to typhoid patients, when they lie with their eyes open all the day in a large sunny chamber.

Very often the cause of amaurosis consists in local or constitutional debility, proceeding from impairment of the nerves in general, or of the nerves of the head, especially those of the forehead and eyebrow; either from a concussion of the spinal marrow, falls from a considerable height with the weight of the whole body upon the heels; concussions of the eye-ball, sometimes caused by violent sneezing, but more generally by contusions of the eye with blunt weapons, &c. Some of the cases of amaurosis from blows on the temple, or the eye, observed by Mr. Travers, were attended with signs of disorganization; some were superficially inflamed; and others presented no external appearance of injury. We learn also from the same authority, that it is not always the eye on the struck side of the head that is affected. (*Synopsis, &c. p.* 152.) If we are to believe Beer, and other foreign practitioners, considerable direct weakness may arise from cholera, long continued diarrhœa, salivation, and the incessant spitting of tobacco smokers; bleedings; injudicious tapping of the abdomen; excessive indulgence in venery, and the misemployment of issues. A general debility, which has the worst effect on the eyes, may also arise from long trouble, especially when the diet is poor and bad; also from a deficiency of proper food; long watching; violent and sudden fright; imprudently washing the eyes with very cold water, especially when they are already weakish and irritable; and keeping them long in a dark place, particularly, when they are also exerted a good deal in some particular kinds of labour, a case which, Beer says, is very frequent in Vienna. The amaurosis, following typhus, without any unusual irritation of the eye by light, Beer also refers to general debility. (*Lehre von den Augenkr. B.* 2. *p.* 449.)

Like nervous deafness (says Mr. Travers) amaurosis sometimes follows typhus and scarlet fever, and the various forms of acute constitutional disease. He has several times met with it as a consequence of infantile fevers. He observes, that it is also sometimes a consequence of chronic wasting diseases, in which organic changes interrupt the nutrition of the system. He has seen a rapid and severe salivation, instituted for a remote affection, and where no disease had previously affected the eyes, terminate in gutta serena of both. (*Synopsis, p.* 155.)

The third class of causes consists of irritations, most of which are asserted to lie in the abdominal viscera, whence they sympathetically operate upon the eyes. The observations of Richter, Scarpa, and Schmucker, all tend to support this doctrine. Many amaurotic patients are found to have suffered much trouble, and long grief, or been agitated by repeated vexations, anger, and other passions, which have great effect in disordering the bilious secretion, and the digestive functions in general. Richter tells us of a man, who lost his sight, a few hours after being in a violent passion, and recovered it again the next day, upon taking an emetic, by which a considerable quantity of bile was evacuated. A woman is also cited, who became blind, whenever she was troubled with what are termed acidities in the stomach. (See *Anfangs. der Wundarzn. B.* 3. *Kap.* 14.) However, according to Beer, imperfect amaurosis seldom depends upon disorder of the gastric organs, excepting the case from worms: (*Lehre von den Augenkr. B.* 2. *p.* 456:) a very important difference from the sentiments entertained by Schmucker, Richter, and Scarpa.

Amaurosis sometimes proceeds from mechanical irritation. A small shot pierced the upper eyelid, and lodged at the upper part of the right orbit between the eye-lid and eye-ball, so that it could be felt externally. The patient shortly afterwards became blind in the left eye; but recovered his sight after the excision of the shot. (*Anfangsgr. der Wundarzn. Band* 3, *p.* 439.)

According to Beer, several constitutional disorders, but more especially gout, are frequently concerned in the production of amaurosis.

Respecting the causes of amaurosis, the following remarks by Beer claim attention. Various swellings in the orbit, as, for instance, encysted tumours, tophi, hydatids in the sheath of the optic nerve, may, and must gradually produce complete amaurosis by their pressure upon the optic nerves and retina. These cases are usually characterized by a protrusion of the eye from its socket. (See *Exophthalmia.*)

In the same manner, different morbid changes in the brain itself, and in the bones of the cranium in particular, may be the direct cause of amaurosis: for example, hydrocephalus internus, caries, and exostoses at the basis of the skull.

Just as amaurosis is frequently a pure symptomatic effect of various disordered states of the constitution, so may different morbid changes, occasioned in the eye by those states of the health, become the proximate cause of amaurosis, as hydrophthalmia, cirsophthalmia, fungus hæmatodes, dissolution of the vitreous humour, glaucoma, &c.

From a contagious atmosphere, which is generally injurious to the eyes, an amaurotic blindness may originate, though but very rarely, and, as it would seem, only through the powerful influence of such state of the air over the whole sanguiferous and nervous system. Debilitated, nervous, weak-sighted persons, by remaining long in the atmosphere of a privy (*Chomel, Mém. de Paris,* 1711, *Obs. Anat.* 5. *and Ramazzini, De Morbis Artificum, c.* 13.), that of a deep cellar, or exposed to coal-smoke, may be suddenly attacked with amaurosis; and Beer assures us, that his experience confirms the truth of these reports. (*Lehre, &c. b.* 2. *p.* 452.) A sympathetic affection of the nerves of the eye, with a carious grinder in the upper jawbone, is one of the most uncommon causes of amaurotic blindness.

A case, not yet duly considered, and very like the amblyopia senilis, consists of an incessantly diminishing secretion of the pigmentum nigrum upon the tunica Ruyschiana, choroidea, and uvea, which secretion indeed, in some individuals, earlier and more considerably; in others, later and in a slighter degree, recedes with other secretions of a different nature. (See *Beer's Lehre von den Augenkr. B.* 2. *p.* 451, *&c.*)

As Mr. Travers has correctly explained, the history and concomitant appearances of amaurosis, usually denote whether the case is *organic*, or *func-*

tional. "For example, diseased changes in the situation or texture of the eye-ball, or, in the brain, a hemiplegia, or partial paralysis, with other signs of apoplectic or hydrocephalic pressure, whether resulting from an injury of the head, or otherwise; or, an acute deep-seated inflammation, whether accompanied by a visible opacity, or not, point out the organic nature of the affection. I have seen (continues Mr. Travers) such an amaurosis produced by abscess in the cerebral substance, and by the medullary fungus of the cerebrum. On the other hand, I have known the following distinct sources of irritation operating to produce functional amaurosis, viz. a wound of the scalp, caries of the scull, abscess and caries of the antrum maxillare, with excessive œdema of the integuments of the lids and cheek, a large abscess under the masseter and muscles of the cheek, and an abscess at the extremity of a molar tooth, while the crown of the tooth was sound. In all these cases, it is to be understood, that the eye was sound, and the orbit was untouched by the disease of the parts in the vicinity, to which the amaurosis was clearly attributable. In like manner, an excessive use, or rather abuse of the visual faculty, the disordered functions of the stomach, liver, uterus, &c.; sudden and alarming depletion; excessive, or obstinately suppressed secretions; difficult dentition, the presence of worms in the intestinal canal, and the deleterious effects of noxious agents upon the organ, or the system, are sufficiently obvious causes of the functional amaurosis." (*Synopsis, &c. p.* 142.) For a variety of additional facts and observations respecting the causes of amaurosis, I would advise the reader to consult *Wardrop's Essays on the Morbid Anatomy of the Human Eye, vol. 2. chap.* 45; and *Travers's Synopsis,* works replete with valuable information.

It is remarked by Beer that amaurosis, when completely formed, has, hitherto, been but rarely cured. This (says he) may depend, in the first place, upon our far too imperfect knowledge of the nerves, and of their genuine and complicated disorders. Secondly, it may equally depend upon the present very defective etiology of amaurosis. Thirdly, the frequent incurability of amaurosis also very materially proceeds from the causes of the disease being in most instances, not only obscure, but exceedingly complicated, and even when detected, many of them will not admit of removal, because they have their foundation either in the constitution of the eye, long existing defects of physical and moral education, protracted bad habits of youth, or the unmanageable behaviour of the patient. Fourthly, we must take into the account the unconscientious indolence of the practitioner, who so often positively declines rendering the patient any assistance at all; or if, for the sake of lucre, he attempt any thing, it is only an empirical mode of treatment, by which means every chance of benefit is annihilated, while an active and intelligent surgeon might perhaps preserve vision, and bring it to perfection again.

In amaurosis, the difficulty of cure is naturally in proportion to the variety and number of causes of the complaint; and the more readily the surgeon makes himself acquainted with them, and the more certainly he obviates them, the more surely and quickly does the cure follow.

It may be considered as generally true, that every amaurotic weakness of sight, and every completely formed amaurosis, are attended with the greatest probability of cure, where they began suddenly, and were quickly developed; for experience proves, that, in these cases, the whole of the causes of the disease are much more frequently and earlier comprehended, than when the complaint has been several years in forming.—(*Beer, Lehre von den Augenkr. b.* 2. *p.* 454—56.) This observation perfectly coincides with the account given by Schmucker, who says that many of these suddenly formed cases fell under his notice, and were more easy of cure, than when the disorder had come on in a more gradual way. (*See Vermischte Chir. Scriften, b.* 2.)

It also agrees with what Mr. Travers has stated, namely, that slow and steadily progressive cases of amaurosis, are more to be apprehended in the result, that is, are less tractable, than either the sudden, or the rapidly advancing disease, supposing all to be alike free from unequivocal signs of organic change. (*Synopsis, p.* 298.)

A case may happen, nay, it happens not unfrequently, says Beer (which, considering the imperfect etiology of amaurosis, cannot be wondered at), that the surgeon, after the most careful investigation, can absolutely detect no particular cause of the existing amaurotic blindness, in which event, the prognosis must in every respect be very uncertain and unfavourable, since only empirical treatment can be tried, which rarely answers; and, even when a cure in this manner does follow, it is frequently quite accidental.

As will be seen in the account of each particular species of amaurosis, the affected eye is sometimes so conditioned, that the complete incurability, sooner or later, may be prognosticated with entire certainty, and this even though a degree of vision may now be enjoyed.

There are amaurotic patients, to whom every treatment does harm, the disease making uninterrupted advances to perpetual blindness. This observation especially refers to local remedies, of the danger of which, under certain circumstances, the patient should be carefully warned.

In general, the more complete the amaurosis is, and the longer the patient has been deprived not only of vision, but of all sensibility to light, the less hope is there of sight being ever reestablished.

When one eye has been completely bereft of sight by amaurosis, and the surgeon can find out little or no cause for the infirmity, there is strong reason for apprehending, that the other eye will, sooner or later, become blind. This is a fact amply proved by experience, and the exceptions are very rare.

According to Beer, the idea entertained by some writers is not built upon experience, that amaurotic patients, in whom the iris is still moveable, and the pupil not very much dilated, are more easily and frequently cured than others, in whom the iris is perfectly motionless, and the pupil exceedingly dilated. For sometimes, during the treatment, or even spontaneously, the iris, after being quite immoveable, recovers its power of motion, yet the patient may not, at the same time, regain the slightest degree of vision; and, on the other hand, many cases of perfect amaurosis are cured, without the iris recovering any of its mobility, and the pupil remains dilated during the remainder of the patient's life. (*Lehre von den Augenkr. b.* 2. *p.* 458.) Richter also thinks, that the moveable or immoveable state of the pupil can neither be considered as a favourable nor unfavourable circumstance. Sometimes, says he, an amaurosis may be cured, which is attended with a pupil extraordinarily dilated, and entirely motionless; and sometimes the disorder proves incurable, notwithstanding the pupil be of its proper size, and capable of motion. There are likewise examples, in which the pupil recovers its moveableness, in the course of the treatment, although nothing will succeed in restoring the eyesight. (*Anfangsgr. der Wundarzn. b.* 3. *p.* 424. 8*vo. Gott.* 1795.)

In some very rare instances, says Beer, amaurotic blindness has been cured by some apparently accidental, or indeed morbid effect, without any assistance from art; by hemorrhage from the nose, an intermittent fever, a blow on the head, &c. The same experienced writer operated successfully upon both eyes of a patient with cataracts, which had been previously depressed too far against the retina, so that their pressure gave rise to amaurosis, which, after continuing eight years, had been suddenly removed by the patient's accidentally falling out of bed, and pitching upon the top of his head. (*Lehre von den Augenkr. b.* 2. *p.* 458.)

The following observations, made by Beer, respecting the prognosis, cannot fail to prove interesting. There is a species of amaurosis, which gradually diminishes of itself; for instance, that which arises from hard drinking, or the effect of narcotic poisons, belladonna, opium, hyoscyamus, &c.

Sometimes imperfect amaurosis goes away, without any assistance from art, in consequence of the accession of some other disease, as an eruption, a discharge of matter from the ear, bleeding from piles, the menses, &c.

Also, in most cases, when the surgeon is so fortunate as to cure amaurosis, either by scientific or empirical methods, there still continues, for life, a considerable degree of amblyopia, more especially if the amaurosis has been complete.

Sometimes, by successful treatment, vision is in a great measure, or even entirely, restored in one eye; yet the other remains completely blind; or one eye sees again much sooner than its fellow, although they were both affected together with an equal degree of blindness.

It often happens that, though a material degree of vision returns in the course of the treatment, the faculty is restricted to a circumscribed point of the retina, so that the patient is enabled to see objects plainly only when they are held in a particular direction before him; while, in other directions, they are either quite invisible, or very indistinct. (*Beer, Lehre von den Augenkr. b.* 2. *p.* 459, 60.)

Amaurosis, following an injury of the supra-orbitary nerve, frequently resists every endeavour made to relieve it, and this, whether it come on directly after the blow, or some weeks subsequently to the healing of the wound of the eyebrow; but, it is not always absolutely incurable. Scarpa only knows of one such cure, viz. the example recorded by Valsalva. (*Dissert.* 2. § 11.) But additional instances are reported by Hey (*Med. Obs. and Inq. vol.* 5.), by Larrey (*Mém. de Chir. Militaire, t.* 4. *p.* 181.), and Dr. Hennen. (*Principles of Military Surgery, p.* 346. *ed.* 2.). According to Mr. Wardrop, it is only when this nerve is wounded, or injured, and not divided, that amaurosis takes place; for the blindness may sometimes be cured by making a complete division of the trunk nearest its origin. (*Essays on the Morbid Anatomy of the Human Eye, vol.* 2. *p.* 180.)

Perfect, inveterate amaurosis, attended with organic injury of the substance, constituting the immediate organ of sight, says Scarpa, is a disease absolutely incurable. *Imperfect, recent amaurosis*, particularly that which is *periodical*, is usually curable; for, it is mostly dependent upon causes which, though they affect the immediate organ of sight, are capable of being dispersed, without leaving any vestige of impaired organization in the optic nerve or retina.

When amaurosis has prevailed several years, in persons of advanced age, whose eyesight has been weak from their youth; when it has come on slowly, at first with a morbid irritability of the retina, and then with a gradual diminution of sense in this part, till total blindness was the consequence; when the pupil is motionless, not circular and not much dilated; when it is widened in such a degree, that the iris seems as if it were wanting, and the margin of this opening is irregular and jagged; and, when the bottom of the eye, independently of any opacity of the crystalline lens, presents an unusual paleness, like that of horn, sometimes partaking of green, and reflected from the thickened retina, the disease may be generally set down as incurable. Kieser joins Scarpa in representing this alteration as an unfavourable omen, adding, that it only takes place in examples of long standing, and, that when it is considerable, the disease is incurable. Langenbeck differs, however, from both these authors, and particularly from Kieser, assuring us, not only that he has often seen this discoloration of the bottom of the eye in the early stage of amaurosis, but seen patients in this state soon cured. The cases which he has published, in proof of this statement, I have read with care, and find them completely satisfactory. Langenbeck agrees with other writers in imputing the appearance to a morbid change of the retina, and the treatment, which he prescribes, consists in the internal exhibition of the oxymuriate of mercury in small doses, and friction with mercurial ointment on the eyebrow and temple. (See *Langenbeck's Neue Bibl. für de Chirurgie,* 1 *b. p.* 64 —69, *&c. Göttingen,* 1815.)

Cases, says Scarpa, attended with pain all over the head, and a continual sensation of tightness in the eye-ball; or preceded by a violent, protracted excitement of the nervous system, and then by general debility, and languor of the constitution, as after masturbation, premature venery, and hard drinking; or connected with epileptic fits, or frequent spasmodic hemicrania; or which are the consequence of violent, long-continued, internal ophthalmia, may be set down as incurable. Nor can any cure be expected, when amaurosis proceeds from a direct blow on the eye; foreign bodies in the eye-ball; lues venerea, or exostoses about the orbit; or when it is conjoined with a manifest change in the figure and dimensions of the eye-ball.

Recent, sudden cases, in which the pupil is not excessively dilated, and its circle remains regular, while the bottom of the eye is of a deep black colour; cases unaccompanied with any acute, continual pain in the head and eye-brow, or any sense of constriction in the globe of the eye itself; cases, which originate from violent anger, deep sorrow, fright, gastric disorder, general plethora, or the same partial affection of the head, suppression of the menses, habitual bleedings from the nose, piles, &c. great loss of blood, nervous debility, not too inveterate, and in young subjects, are all, generally speaking, curable. Amaurosis is also mostly remediable, when produced by convulsions, or the efforts of difficult parturition; when it arises during the course, or towards the termination of acute, or intermittent fevers; and when it is periodical. (*Scarpa, Osservazioni sulle Malattie degli Occhi, cap.* 20. *Venez.* 1802.)

According to Mr. Travers, it is rather the degree, than the nature and origin of the symptomatic functional amaurosis, that should in most cases influence our prognosis; yet, the latter circumstances, it is equally clear, afford more or less encouragement, in proportion as the pre-existing states of disease ordinarily admit of relief, or not. Thus, says he, the amaurosis from gastric diseases, from plethora, from irritation, are all of them relievable, and if treated at an early period, remediable. Whereas paralysis, the sequel of fever, or of epilepsy, or severe constitutional diseases, whether acute, or chronic, or depending upon habitual cerebral congestions combined with organic visceral disease, or induced by the operation of noxious agents on the system, is a hopeless form of the malady. (*Synopsis, p.* 296.)

In general, when the treatment proves successful, the return of the power of vision is accompanied with a regression of the same characteristic effects, which were disclosed in the gradual advance of the disorder, viz. appearances as if there were before the eyes flashes of light, a cobweb, network, mist, or flaky substances. (*Beer, Lehre von den Augenkr. b.* 2. *p.* 460. *Wien.* 1817.)

Upon the commencement of the cure, there is also a return of the obliquity of sight; one of the most constant symptoms of imperfect amaurosis. This is a circumstance, which Hey took particular notice of in some cases, which fell under his observation many years ago: he says, that it was most remarkable in those persons who had totally lost the sight in either eye; for, in them, the most oblique rays of light seemed to make the first perceptible impression upon the retina; and, in proportion as that nervous coat regained its sensibility, the sight became more direct and natural. (See *Med. Obs. and Inq. vol.* 5.)

TREATMENT OF AMAUROSIS.

When amaurosis is to be fundamentally cured, not upon empirical, but scientific principles, all the causes of the disorder must be ascertained, and, if possible, removed, as in the treatment of every other complaint. How often, however, it is impossible to accomplish either the one or the other of these objects, must be clear enough from the preceding observations, particularly those concerning the etiology of the disease; and hence, it is not surprising, that amaurosis should so frequently resist every endeavour to cure it.

The plan of treatment is to be regulated, first by the number and kinds of circumstances, which determine the form of the disorder; secondly, by its presence, degree, and duration. When only the chief causes can be ascertained, a scientific mode of treatment may always be instituted; though here it is very necessary to pay the utmost attention to those morbid effects in the constitution, and in the eye in particular, which appear to have no connexion with the causes of amaurosis, and merely exist as accidental contemporary defects.

If no particular circumstances can be assigned as the cause of amaurosis, the surgeon has no alternative but the adoption of some empirical method of treatment; but, exclaims Beer, woe to the patient whose surgeon, under these circumstances, draws from a heap of what are considered remedies for amaurosis, as from a lottery, the first as the best!

In order to avoid this erroneous method, and not render a half-blind person completely blind, instead of improving, or at least preserving, whatever remnant of vision there may be, the surgeon should act with great caution, and constantly bear in his mind, first, the constitution, sex, and age of the patient; secondly, his ordinary employments, and general mode of living; and thirdly, the principal morbid appearances, under which the amaurosis originated and was developed. (*Beer, Lehre von den Augenkr. b.* 2. *p.* 462.) But, what will be of the greatest assistance, is a correct acquaintance with the remedies for amaurosis in general, and the circumstances, under which the use of this or that particular means is likely to be useful or detrimental. I know of no writer who has been so minute on this part of the subject as Beer, whose sentiments (be it also remarked) are here in many respects different from those of Richter and Scarpa; for, like the surgeons of this metropolis, he rarely employs the emetic plan of treatment, which, according to his principles, is not only ineffectual, but hurtful, whenever the blindness is attended with determination of blood to the head and eyes, plethora, an accelerated circulation, or (what is understood by) a phlogistic diathesis. Beer's opinions, respecting the employment of emetics, and other means for the cure of amaurosis, may be partly collected from the sequel of this article, but, more especially, from the fuller statement which will be made at a future opportunity. See *Gutta Serena.* In the mean time, I shall endeavour to offer a general account of the practice recommended by Schmucker, Richter, Scarpa, and Travers, according to the arrangement of causes adopted by the second of these valuable writers; for I need not repeat that, whenever the method of cure can be directed against the causes of the disease, it is the most proper and scientific. The present article will, then, close with a description of the four forms, into which professor Beer divides amaurosis, and a history of their varieties, symptoms, and treatment, according to the doctrines and experience of this eminent oculist.

In that species of amaurosis, which arises from the first class of causes, or those which induce the disease, by means of a preternatural fulness and dilatation of the blood vessels of the brain, or eye, the indication is to lessen the quantity of blood, and the determination of it to the head. For this purpose, the patient may be bled in the arm, temporal artery, or, as is often preferred by foreign surgeons, in the foot. This evacuation is to be repeated as often as seems necessary, and it will be better to begin with taking away from twelve to sixteen ounces. The efficacy of bleeding, in the cure of particular cases of gutta serena, is strikingly exemplified by numerous well authenticated observations. Richter informs us of a woman who, on leaving off having children, lost her sight; but, recovered it again by being only once bled in the foot. A spontaneous hemorrhage from the nose also cured a young woman, who had been blind for several weeks. (*Anfangsgr. der Wundarzn. b.* 3. *p.* 442.)

That bleeding is sometimes hurtfully and wrongly practised in amaurotic cases, is a fact, which admits of no doubt. Mr. Travers particularly refers to one description of cases, where the lancet does harm: these are cases of undue determination of blood to the organ, which are especially common after deep seated chronic inflammation or distress from over excitement, by which its vessels have lost their tone; an effect decidedly increased by depletion.—In one interesting case of this kind, a gradual, but perfect recovery followed a regulated diet, and a course of the blue pill, with saline aperients. (*Synopsis, p.* 159.) All cases of direct debility and proper paralysis of the retina (says Mr. Travers) are aggravated by loss of blood, and the great prevailing mistake in the treatment of amaurosis, is the indiscriminate detraction of blood. (*Synopsis, p.* 303.)

When in addition to general bleeding, topical is also necessary, leeches may be applied to the temples, or cupping glasses to the back of the neck. Besides bleeding, purgatives, blisters, bathing the feet in warm water, &c. are frequently proper.

In some cases, the foregoing means fail in producing the desired benefit, even when followed up, as far as the pulse and strength will allow. Here the continuance of the disease may depend, either upon the stoppage of some wonted evacuation of blood, or else upon some other cause of the first class. In the first of these cases (says Richter) experience proves, that the disease will sometimes not give way, before the accustomed discharge is re-established. A woman, who (as this author acquaints us) had lost her sight, in consequence of a sudden suppression of the menses, did not recover it again till three months after the return of the menstrual discharge, notwithstanding the trial of every sort of evacuation. He also tells us of another woman, who had been blind half a year, and did not menstruate, and to whose external parts of generation leeches were several times applied. As often as the leeches were put on (says Richter) the menses in part recommenced; and, as long as they made their appearance, which was seldom above two hours, the woman always enjoyed a degree of vision. (*Anfangsgr. der Wundarzn. B.* 3, *p.* 443.)

For the amaurosis, arising from suppression of the menses, Scarpa recommends leeches to the pudenda, bathing the feet in warm water, and afterwards exhibiting an emetic, and laxative pills, made of rhubarb and tartrite of antimony, combined with gummy and saponaceous substances. If these means fail in establishing the menstrual discharge, he says, great confidence may be placed in a stream of electricity, conducted from the loins across the pelvis, in every direction, and thence repeatedly to the thighs and feet. He enjoins us not to despair at want of success at first, as the plan frequently succeeds, after a trial of several weeks.

For the amaurosis, proceeding from the stoppage of an habitual copious bleeding from piles, Scarpa recommends leeches and fomentations to the hemorrhoidal veins, then an emetic, and afterwards the same opening pills. (*Osservazioni sulle principali malattie degli occhi, cap.* 19.)

When the disease does not originate from the stoppage of any natural or habitual discharge of blood, and does not yield to the evacuating plan, Richter thinks, the surgeon justified in concluding, that the preternaturally dilated vessels have not regained their proper tone and diameter, and that topical corroborant remedies, particularly cold water, ought to be employed. In this kind of case, he is an advocate for washing and bathing the whole head with cold water, especially the part about the eyes: a method, he says, which may often be practised after evacuations, with singular and remarkable efficacy.

When the return of sight cannot be brought about in this manner, Richter advises us to try such means, as seem calculated to stimulate the nerves, and remove the torpid affection of the optic nerves in particular. Of these last remedies, says he, emetics are the principal and most effectual.

We come now to the consideration of that species of the gutta serena, which is regarded as the effect of some unnatural irritation. Here, according to the precepts delivered by Richter, we should endeavour to discover what the particular irritation is, and then endeavour to effect its removal. When it cannot be exactly detected, we are recommended generally to employ such remedies, as will lessen the sensibility of the nerves, and render them less apt to be affected by any kind of irritation.

Sometimes the irritation is both discoverable and removable, and still the effect, that is to say, the blindness, continues. In this circumstance, Richter thinks, that the surgeon should endeavour to obviate the impression, which the irritation has left upon the nerves, by the use of anodynes; or, else, try to remove the torpor of the nerves by stimulants.

But, according to Schmucker, Richter, and Scarpa, the curable imperfect amaurosis commonly depends on some disease, or irritation, existing in the gastric system, occasionally complicated with general nervous debility, in which the eyes participate. Hence, in the majority of cases, we are assured, that the chief indications are, to free the alimentary canal from all irritating matter, improve the state of the chylopoietic viscera, and invigorate the nervous system in general, and the nerves of the eye in particular.

For an adult, dissolve three grains of antimonium tartarizatum in four ounces of water, and give a spoonful of this solution, every half hour, until nausea and copious vomiting are produced. The next day some opening powders are to be exhibited, consisting of an ounce of the supertartrate of potash, and one grain of antimonium tartarizatum, divided into six equal parts. The patient must take one of these in the morning, another four hours afterwards, and a third in the evening, for eight or ten days in succession. They will create a little nausea, rather more evacuations from the bowels than usual, and perhaps, in the course of a few days, vomiting. If the patient, during their use, should make vain efforts to vomit, complain of bitterness in his mouth, loss of appetite, and no renovation of sight, the emetic, as at first directed, is to be prescribed again. This is to be repeated a third and fourth time, should the morbid state of the gastric system, the bitter taste in the mouth, the tension of the hypochondria, the acid eructations, and the inclination to vomit, make it necessary. The first emetic often produces only an evacuation of an aqueous fluid, blended with a little mucus, but, if it be repeated, a few days after the resolvent powders have been administered, it then occasions a discharge of a considerable quantity of a yellow, greenish matter, to the infinite relief of the stomach, head, and eyes.

The stomach having been thus emptied, the following aperient pills are to be ordered.

℞ Gum. Sagapen.
Galban. } an. ʒj
Sap. Venet.
Rhei optim. ʒiss
Tart. Emet. gr. xvi
Suc. liquerit. ʒj fiant pilulæ gran. quinque.

Three are to be taken every morning and evening for a month, or six weeks.

When the state of the stomach has been improved, and the restoration of sight partly effected, such remedies must be employed, as strengthen the digestive organs, and excite the vigour of the nervous system in general, and of the nerves of the eye in particular. With this intention, Scarpa prescribes bark and valerian in powder, and recommends a diet of tender succulent meat, and wholesome broths, with a moderate quantity of wine, and proper exercise in a salubrious air. For exciting the action of the nerves of the eye, the vapour of liquor ammoniæ, properly directed against the eye, he says, is of the greatest service. This remedy is applied by holding a small vessel, containing it, sufficiently near the eye to make this organ feel a smarting, occasioned by the very penetrating vapours, with which it is enveloped, and which cause a copious secretion of tears, and a redness, in less than half an hour after the beginning of the application. It is now proper to stop, and repeat the application three or four hours afterwards. The plan must be thus followed up till the incomplete amaurosis is quite cured.

The operation of these vapours may be promoted by other external stimulants, applied to such other parts of the body as have a great deal of sympathy with the eyes. Of this kind are blisters to the nape of the neck; friction on the eye-brow with the anodyne liquor; the irritation of the nerves of the nostrils by sternutative powders, like that composed of two grains of turbith mineral, and a scruple of powdered betony leaves; and, lastly, a stream of electricity. See *Gutta Serena.*

Bark, which is efficacious in intermittent fevers, and other periodical diseases, far from curing periodical amaurosis, seems to aggravate it, rendering its return more frequent, and of longer duration. On the other hand, this disease is most commonly cured, in a very short time, by exhibiting first emetics, then the above laxative pills, and lastly, corroborants, and even bark, which was before useless and hurtful.

Such is Scarpa's statement, which agrees with that of Richter, respecting the effect of bark in periodical amaurosis. As if, however, practitioners were doomed always to differ, and learners to be puzzled, Beer tells us, that he has seen only two cases of periodical intermittent amaurosis, both of which were soon perfectly cured by large doses of bark. Other periodical amaurotic affections he has seen, however, attendant on intermittent fever, but they spontaneously subsided with the febrile paroxysms, without any particular treatment being applied to the eyes. Sometimes, when the paroxysms recurred frequently, a considerable weakness of sight remained after them; but, this always went off of itself, except in a single instance, in which the functions of the eyes were perfectly re-established by the exhibition of arnica, joined with bitters. (*Lehre von der Augenkr. B. 2, p. 585.*)

In the two cases, which were unaccompanied with fever, the vitreous humour had the appearance of being turbid during the attacks, but regained its natural clearness on each return of vision, the loss of which used to be complete. Here we see another instance, in which a cloudiness behind the pupil in amaurosis did not impede the cure, and went away in the most ready manner. Possibly, the opacity, which, in speaking of the prognosis, I said that Langenbeck had not found to prevent the cure of certain cases, might also have had its seat in the vitreous humour, and not depended upon disease of the retina.

Scarpa finds the above plan successful in the majority of cases, where the disease is only sympathetic, or dependent on the morbid state of the gastric system. But, there are cases, in the formation of which many other causes operate, besides the most frequent one already stated. These demand the employment of particular curative means, in addition to those which have been already described. Such is, for example, the imperfect amaurosis, which occurs suddenly in consequence of the body being excessively heated, or exposure to the sun, or violent anger, in plethoric subjects. This case requires, in particular, general and topical evacuations of blood, and the application of cold washes to the eyes and whole head. An emetic should next be given, and afterwards a purge of potassæ tartras, or small repeated doses of antimonium tartarizatum. By means of bleeding and an emetic, Schmucker often restored the eye-sight of soldiers, who had lost it in making forced marches, with very heavy burdens. In amaurosis, suddenly occasioned by violent anger, an emetic is the more strongly indicated after bleeding, as the blindness, thus arising, is always attended with a bitter taste in the mouth, tension of the hypochondria, and continual nausea. Richter mentions a clergyman, who became completely blind, after being in a violent passion, and whose eye-sight was restored the very next day, by means of an emetic, given with the view of relieving some obvious marks of bilious disorder in the stomach.

Scarpa's treatment of the imperfect amaurosis brought on by fevers, deep sorrow, great loss of blood, intense study, and forced exertions of the eyes on very minute or brilliant objects, consists also in removing all irritation from the stomach, and afterwards strengthening the nervous system in general, and the nerves of the eye in particular. In the case originating from fevers, the emetic and opening pills are to be given; then bark, steel medicines, and bitters; while the vapour of the liquor ammoniæ is to be applied to the eye itself.

When the disorder has been brought on by grief, or fright, the stomach and intestines are to be emptied by means of antimonium tartarizatum, and the opening pills; and the cure is to be completed by giving bark and valerian; applying the vapour of liquor ammoniæ to the eyes; ordering nourishing, easily digestible food; diverting the patient's mind, and fixing it on agreeable objects, and recommending moderate exercise. The amaurosis from fright is said to require a longer perseverance in such treatment, than the case from sorrow. (*Scarpa's Osservaz. Cap.* 19.)

In this country, the emetic practice, which has proved so decidedly efficacious on the continent, has not been attended with much success: Mr. Travers even states, that he does not recollect an instance of decided benefit from it, though he has often tried it fairly. He agrees, however, in the indication, as he remarks, that the removal of an irritating, or oppressing cause, will often effect a sudden and marked relief, as by clearing the intestinal canal of vitiated secretions, restoring the digestive functions, or taking away blood where the necessity is indicated. In gastric cases, for which emetics have been particularly recommended, he prefers a long continued course of the blue pill, with gentle saline purgatives, and tonic bitters. (*Synopsis, p.* 299—304.)

The third species of gutta serena, or that which arises from debilitating causes, is of two kinds; in one, the disease is the consequence of a general weakness of the body; in the other, it is the effect of debility, which is confined to the eye itself, and does not extend to the whole constitution.

According to Scarpa, the incomplete amaurosis from general nervous debility, copious hemorrhage, convulsions *ab inanitione*, and long continued intense study, especially by candlelight, is less a case of real amaurosis, than a weakness of sight from a fatigued state of the nerves, especially of those constituting the immediate organ of sight. When this complaint is recent, in a young subject, it may be cured, or diminished by emptying the alimentary canal with small repeated doses of rhubarb, and then giving tonic cordial remedies. At the same time, the patient must abstain from every thing that has a tendency to weaken the nervous system, and, consequently, the eye-sight. After emptying the stomach and bowels, it is proper to prescribe the decoction of bark with valerian, or the infusion of quassia with the addition of a few drops of sulphuric æther to each dose, with nourishing, easily digestible food. The aromatic spirituous vapours (mentioned in the article *Ophthalmy*) may then be topically applied; or if these prove ineffectual, the vapour of liquor ammoniæ. The patient must take exercise on foot, horseback, or in a carriage, in a wholesome, dry air, in warm weather, and avail himself of sea bathing. He must avoid all thoughts of care, and refrain from fixing his eyes on minute shining objects. The impression of vivid light on the retina is always to be moderated by means of flat green glasses. (*Saggio di Osservaz. Cap.* 19.)

One case of temporary palsy of the retina from over-excitement, mentioned by Mr. Travers, yielded to blistering the forehead, and a gentle salivation excited by calomel joined with opium. (*Synopsis*, p. 164.) Another case, brought on by the use of telescopes and sextants, gave way to a copious bleeding, brisk purging with jalap and calomel, blisters to the temples, and a course of mercury. (*Op. cit. p.* 166.)

Mr. Travers remarks, that the amaurosis from depletion is sometimes mistaken for the opposite case, *viz.* that from plethoric congestion: this is owing to the coincidence of a dilated and immoveable pupil, muscæ, and a deep seated pain in the head, with occasional vertigo; and its frequent occurrence in a corpulent habit. By a cautious use of tonics, (says Mr. Travers) it is relieved; by whatever lowers, or stimulates, whether diet or medicine, it is decidedly aggravated. In this form of amaurosis, vision is further enfeebled by the loss of as much blood as flows from two or three leech-bites. (*Synopsis, &c. p.* 160.)

When the weakness is confined to the eye, Richter thinks corroborant applications alone necessary. Bathing the eye with cold water, says he, is one of the most powerful means of strengthening the eye. The patient should dip in cold water a compress, doubled into eight folds, and sufficiently large to cover the whole face and forehead, and this he should keep applied, as long as it continues cold. Or, else, he should frequently apply cold water to his eyes and face with his hand, on a piece of rag.

The eye may also be strengthened by repeatedly applying blisters of a semi-lunar shape above the eye-brows, just long enough to excite redness. Richter likewise speaks favourably of rubbing the upper eye-lid, several times a day, with a mixture of the tinctura lyttæ and spiritus serpilli. (*Anfangsgr. der Wundarz. B.* 3, *p.* 452.)

When no probable cause whatsoever can be assigned for the disease, the surgeon is justified in employing such remedies, as have been proved by experience to be sometimes capable of relieving the affection, although upon what principle is utterly unknown. (See *Gutta Serena.*) To this article, I would refer the reader, before he makes up his mind about any empirical method of treatment, because he will there find many cautions and instructions, given by Beer, respecting the remedies for amaurosis in general. To his remarks, I have also annexed such others on the same topic, as appeared to me interesting.

In the following view of amaurosis, chiefly taken from the valuable writings of Beer, the reader will find a more complete history of the different forms of the disease, and their varieties, than has previously been drawn up in our language. The only points, on which Beer perhaps ventures too far, are those relating to the etiology of the several cases; a subject, in which he displays the usual credulity of the continental surgeons. With his observations, I have taken the liberty to blend a few additional remarks, not caring about the length of the article, where the matter seemed new and interesting.

1. OF THE DIFFERENT FORMS OF AMAUROSIS IN GENERAL.

Beer reckons four species of amaurosis.

The first is a genuine uncomplicated amaurosis, the characteristic symptom of which consists peculiarly and entirely in an impairment or loss of vision, without any morbid change in the organic matter of the eye. To this case, the epithets *proper functional*, used by Mr. Travers, would be quite applicable.

Secondly; there is an amaurosis, which, besides being attended with a diminution, or total loss of vision, is also accompanied with appearances of disease in the organic matter of the eye.

Thirdly; there is another amaurosis, in which, together with the above principal symptom, viz. weakness, or loss of sight, there are also morbid phenomena exhibited in the form of the eye in general, or its particular textures, and especially in the action of the irritable parts.

Lastly; Beer says, he can often point out an amaurosis, in which all the characteristic symptoms of the three preceding cases are more or less combined. (See *Lehre von den Augenkr. B.* 2, *p.* 478.)

Professor Beer's First Species of Amaurosis.

The genuine uncomplicated amaurosis, consisting of a mere diminution or loss of sight, without the appearance of any other defect, is one of the most uncommon forms of complaint, not only because singly operating causes are few, but because they can rarely operate directly upon the optic nerves.

In the true uncomplicated amaurosis, merely the vital qualities of the optic nerve and retina are affected, and after death, nothing preternatural can be traced in those parts, either within or on the outside of the eye-ball. It is in short the case, in which the functions of the retina have become imperfect, or destroyed, the eye appearing in other respects sound.

According to Beer, this simple unmixed form of amaurosis is subdivisible into that amaurotic weakness of sight, or blindness, which depends upon the vitality, or rather sensibility of the optic nerve and retina being too highly raised, and into another case, the proximate cause of which is peculiarly and entirely referrible to depression of such vitality or sensibility. The first example is much less common than the second.

The general symptoms of the simple uncomplicated species of amaurosis, putting out of consideration the morbid increase, or diminution of the sensibility of the optic nerve, are thus described by Beer. In the first place, all morbid appearances are absent, which might be produced in the amaurotic eye by any one preternatural change in the texture, form, or state of that organ. Hence we are obliged to trust almost exclusively to the patient's assertion, that his sight is bad, or quite gone; and not unfrequently, it is necessary, especially, in judicial cases, to employ political artifices, in order to determine whether such assertion be true, particularly when the patient affirms that the blindness is restricted to one eye. Secondly; when the amaurosis is indeed nearly, or quite formed in one eye, a slight degree of strabismus is at most perceptible, arising from the circumstance of the patient's not fixing the eye affected upon any object. This degree of strabismus is noticed by Ackermann and Fischer, as the surest sign of amaurosis. (See *Klinische Annalen von Jena 1st. p.* 144.) And it is particularly pointed out by Richter, as an invariable attendant upon amaurosis. The patient, says he, not only does not turn either eye towards any object, in such a manner, that the object looked at is in the axis of vision; but, he does not turn both his eyes towards the same thing. This was regarded by Richter, as the only symptom, which we can trust, where implicit confidence should not be put in the mere assurance of the patient, that he cannot see, while all the coats and humours of the eyes present their natural appearance. (See *Anfangsgr. der Wundarzn. B.* 3. *Kap.* 14.) Provided this observation be correct, it must be highly interesting to the military surgeon, amaurosis being a common affliction of soldiers, many of whom, however, endeavour to avoid service by pretending to labour under a disqualification, which they well know does not necessarily produce any very considerable alteration in the natural appearance of the part affected. Thirdly; while the disorder is only in the stage of amblyopia, the patient always complains of continually multiplying muscæ volitantes, or of the visus reticulatus, or nebulosus. Fourthly; luminous forms appear before the eyes, especially in the dark, even when the patient is entirely blind. Fifthly; the decrease of vision goes on to complete blindness, without any material interruption, or retrogression. Sixthly; when only one eye is quite blind, and the eyesight on the other side is perfectly undisturbed, there is one infallible symptom of this amaurosis, namely, *if the sound eye be very carefully covered, the pupil of the blind one immediately expands, and the iris becomes quite motionless, notwithstanding the diseased eye be exposed to the strongest light possible.* However, this criterion is mostly wanting, because the amaurosis, unattended with any perceptible defect, except loss of vision, is seldom confined to one eye, but usually affects both. (See *Lehre von den Augenkr. B.* 2, *p.* 481-82)

1. *Of the genuine uncomplicated amaurosis, dependent upon what Beer terms preternaturally high vitality, or rather, as we should say, a morbid increase of sensibility in the optic nerve.*

This form of amaurosis is described by Beer as having two stages: in the first, the patient never becomes blind; the eye-sight not being lost till the end of the second stage. The disease always forms with great quickness, so that the limits between the two stages are frequently very indistinct.

The first stage commences with a peculiar sensation of fulness in the eye-ball, joined with continually increasing, violent, and annoying, luminous appearances, and a remarkable weakness of sight. These symptoms are soon followed by a stupifying, constantly increasing headach, during which the power of vision manifestly diminishes, without the slightest defect being perceptible either in the eye itself, or its surrounding parts. The patient, however, is always marked by an athletic constitution, or at all events, by such symptoms of general and local plethora, and of a phlogistic diathesis, as cannot be mistaken.

Upon the advance of the disorder into its second stage, the headach becomes irregular, being less violent at some periods than others; the patient feels as if there were before his eyes, a thick net, or gauze, which, in a bright light, appears quite black, but in the shade, fiery and shining. This net or gauze, when there is any temporary determination of blood to the head and eyes, as in straining at stool, is immediately rendered considerably more dense; and when such determination of blood is often repeated, or long maintained, the density at length remains much greater than before, and consequently, the patient suddenly grows more blind, and is very quickly entirely bereft of vision. This complete loss of sight, in the second stage, if efficient assistance be not given, is ultimately produced by the progress of the disease, even without any accidental determination of blood, though never quite suddenly. At last, all power of discerning the light is abolished, under incessant stupifying headachs, which are sometimes weaker, sometimes stronger, and attended with a sensation, as if the dimensions of the eye were increased, and indeed, it really feels harder, than in the healthy state.

All those circumstances, which produce a long and repeated determination of blood to the head and eyes, must be considered as the principal causes of this kind of amaurosis. Beer especially adverts to the habit of sleeping at night with the head low, in individuals who retire early to rest, and with their arms extended above their head. Here also the observations are nearly all applicable, which have been already delivered respecting the effects of immoderately exerting the eye-sight and intellects, and concerning the too great irritation of the eye by the light in typhoid fevers. Nor, in the etiology of this species of amaurosis, should what has been stated about idiosyncrasies be forgotten. (*Lehre von den Augenkr. p.* 483-85.)

While the first stage has not yet terminated, and consequently while the power of vision is not obliterated, if the patient can and will put himself without delay into the requisite condition for the cure, a favourable prognosis may invariably be given. But, the prognosis is much less promising, when the second stage has already begun, or is threatening to begin, and consequently when the power of seeing is either completely or nearly destroyed, notwithstanding the blindness may not be of more than two days' standing; particularly, if the patient cannot immediately have the best assistance. However, some slight hope of the reestablishment of sight may always be entertained, even though the amaurosis be complete, if it be not of long standing. But when the disorder has existed several months, it is hardly ever practicable to do more, than restore a very partial degree of vision. When, in typhus fever, this amaurosis has been brought on altogether by the immoderate irritation of the light, Beer has constantly found the case quite irremediable, the general debility, which often lasts so long after typhus, having no slight share in the prevention of a cure. The prognosis is most favourable, when the amaurosis depends upon some idiosyncrasy which is known, and can be at once removed; and very discouraging is the prospect of relief, when many different causes are concerned in the production of the complaint; while that true sympathetic amaurosis, which arises not merely from over exertion of the eye, but also from great and immoderate mental application, is very serious, both with respect to the fate of the eye itself, and the life of the patient, amaurosis, under these circumstances, being not unfrequently the forerunner of impairment of the intellects, or absolute mania. (*Beer, vol. cit. p.* 486.)

As in this species of amaurosis, a determination of blood to the head and eyes is never altogether absent, and has generally had a great share in the first production of the complaint, it must be self-evident, that during the whole course of the disease, every thing should be rigorously avoided which can tend to bring on such determination of blood, or disturbance of the circulation; and when these states already exist, no pains must be spared to lessen and remove them. Hence, when general plethora prevails, venesection is the earliest indication; and, if this be not effectual, and the local plethora in the head and eyes still continues, topical bleeding with leeches, &c. must be practised. But, if no signs of universal plethora exist, and there be merely a determination of blood to the head and eyes, local bleeding will be sufficient. At the same time, bathing the feet in lukewarm water, containing salt, or mustard, or applying sinapisms of mustard to the calves, and using gentle opening clysters, aperient medicines, cooling drinks, and a strict vegetable diet, will very much contribute to lessen the determination of blood, and any prevailing impetuosity of the circulation. These antiphlogistic curative means must be aided by keeping the eyes in a natural, yet complete state of rest, and in particular by keeping the whole body quiet in the recumbent posture, with the irritation of what would otherwise be only an ordinary degree of light, constantly diminished. Nay, in typhoid patients, attacked with this form of amaurosis, the interception of the light by blinds and eye-screens, or a light fine linen bandage, will be of itself effectual to arrest the disorder at once, and prevent blindness, unless the first stage be already too far advanced. When the most careful adoption of the foregoing means is only followed by an imperfect and slow return of vision, the treatment is to be aided by cold bathing of the eye, in practising which care must be taken not to let the patient's head lean forwards. According to Beer, the sympathetic amaurosis, unaccompanied by any appearance of organic disease, and brought on by immoderate exertion of the brain, always demands, in its first stage, not only local, but general antiphlogistic treatment, even though no particular plethora may be present.

What is named by Mr. Travers the *proper functional* amaurosis, belongs to the class of cases here considered by Beer: the extreme states of light and temperature, and too much exertion of the organ, are the chief causes of it. The remission, or removal, of these hurtful circumstances even of itself, Mr. Travers remarks, will do much towards the cure. The continuance of them frustrates the end of treatment, and the amaurosis becomes confirmed, and ultimately passes into the organic form. (*Synopsis*, *p.* 297.)

When the surgeon meets with this species of amaurosis in the second stage, Beer recommends the gradual use of local fluid stimulants, and tonic remedies, applied, partly by rubbing them upon the eyebrow, and partly in the form of the vapour of æther directed immediately against the eye. An attempt must also be made to restore the sensibility of the optic nerve, by rubefacients, and if these be unavailing, by such means as occasion a shock of the vessels and nerves. When, however, it is clear that liniments and vapours of æther are quite ineffectual, these local measures must be combined with suitable general means: a light nutritious diet; an allowance of wine and beer; daily exercise in the open air, particularly in sunshiny meadows, until the patient be rather fatigued; the slow ascent of hilly places; the exercise of pumping or sawing wood in winter; bathing in mineral steel waters, &c. and the empirical use of antiparalytic and tonic remedies, amongst which latter, however, steel medicines are to be employed with the greatest circumspection. (*Beer, Lehre von den Augenkr. b.* 2, *p.* 487-88.)

2. *Of the genuine uncomplicated amaurosis arising from* (*what Beer denominates*) *preternatural depression of the vitality* (*sensibility*) *of the optic nerve.*

According to Beer, this amaurosis differs from the preceding, by its formation being usually very slow, and its not exhibiting any traces of those two very different stages, which are peculiar to the other case. It also invariably commences with the visus reticulatus, or nebulosus, without any alternation with a blinding glare of light; and the eyesight is sometimes considerably better, and sometimes weaker, which always depends upon the accidental operation of internal or external circumstances. Thus, it may be noticed, that in these cases, immediately after a good repast, the enjoyment of excellent wine and liquor, after unexpected great joy, after the spirits have been raised by the pleasures of a convivial party, or directly after a violent fit of anger, the sight undergoes great amendment. On the other hand, sudden fright, great anxiety, profound grief, loss of sleep, long fasting, &c. constantly produce an immediate aggravation of the blindness; and the difference between these effects is, that the melioration of the eyesight never continues long, while the diminution of it not only remains but gets worse and worse. It is not at all uncommon for this species of amaurosis to make its appearance as a night-blindness, because common artificial light is much too feeble to make due impression upon the diminished sensibility of the optic nerve; and consequently these patients always show a partiality to a very strong light. To such weak-sighted individuals, the flame of a candle, or the moon, appears as if covered by a dense veil, with an expanded halo round it of various colours. There is no complaint made of pain in the head or eyes; and no sensation of fulness or weight is experienced in the eye-ball; much less are there any signs of the disease in the structure and form of the eye, or in the action of its irritable textures; but, when it has been long complete, it is usually conjoined with a debilitated habit.

Every thing, says Beer, that tends to produce great weakness, either locally in the eyes, or both locally and constitutionally, must at least be regarded as a more or less obvious cause of this amaurosis; that is to say, when the case is a mere impairment or loss of sight, without other morbid appearances; for, as we shall presently find, there are several kinds of amaurosis, which, though they depend upon direct local debility, or local and general debility together, do not by any means arise in the form of simple diminution or loss of sight, free from every appearance of complication and disease in the eye: here belong especially shocks affecting the optic nerve, the brain, or the whole nervous system, produced rather by moral, than physical causes; for a simple physical shock of the nerves, especially when it falls directly upon the eye, commonly produces at once a considerable diminution of cohesion in the nervous texture, as is more or less evinced by the appearances of the eye in general, and by the action of its irritable parts in particular. Secondly must be reckoned every considerable and long continued loss of blood or other nutritious fluid. Thirdly, a long residence in a dark place, and the entire nonemployment of the eye. Fourthly, the debility of age, and dulness of the whole nervous system, particularly when the patient's eyesight has been hurt in his youth by immoderate exertion, and the eyes are of a dark colour. Fifthly, the present form of amaurosis sometimes comes on as an immediate consequence of typhus, especially when the fever has been attended with severe diarrhœa, and nasal hemorrhage; but, in the latter case, the amaurotic blindness is rarely complete. (*Lehre von den Augenkr. B.* 2, *p.* 491-92.)

With respect to the prognosis, this species of uncomplicated amaurosis, unattended with any defect in the structure of the eye, is generally much seldomer curable than the former, because the cause of the disorder usually consists of an assemblage of many concealed and difficultly discoverable circumstances, and because it is rarely possible to put the patient under all the conditions, which are essential to the cure, even when the causes of the disease are understood; as for instance, when the disease has arisen from extreme indigence, or domestic trouble. Even when a cure is effected, it is with the greatest difficulty, and not till after a considerable time. Hence, though circumstances may have a favourable appearance, no promise should be made, and when the amaurosis is already complete and of long standing, great patience must be enjoined during the treatment. In very poor persons, and in hospitals, says Beer, this species of amaurosis may always be regarded as incurable, because, in such examples, the operation of the medicines indicated can never be properly seconded by diet, nutritious food, mental encouragement, and requisite exercise in an open pure air.

At the commencement of the disorder, the depressed vitality (or rather sensibility) of the optic nerve should be raised, if possible, by the gradual use of stimulating liniments, and the vapour of æther. The rest of the treatment, recommended by Beer, resembles that of the second stage of amaurosis from morbid sensibility of the optic nerve. His plan is also to try the use of weak remedies first, and then gradually those which have a more powerful operation. (*Beer, vol. cit. p.* 493-94.)

Beer's Second Species of Amaurosis; Cat-eye Amaurosis.

This species of the disorder, of which Beer has yet met with but one form, rarely increases to complete blindness; it occurs chiefly in very old persons, and it is perhaps this affection to which some oculists have given the unmeaning name of *amblyopia senilis.* Sometimes, however, this kind of amaurosis takes place in young persons and children; and one circumstance, that demands particular notice, in its nosology, is, that it always takes place either in thin, dwindled, old, gray-headed subjects, nearly in the state of marasmus senilis, in whom consequently the exchange of organic matter is carried on but tardily, or else in young subjects, who are unhealthy, and disposed to consumption, hectical adults, emaciated children, and as a consequence of severe injuries of the eye. While this amaurosis is not perfectly formed, the iris retains its mobility, and the pupil is neither preternaturally dilated, nor contracted; but, when once the patient is quite bereft of vision, the motions of the iris are slow, and the pupil larger than in a healthy eye in an equal degree of light. At the bottom of the eye very far behind the pupil, a concave pale gray, bright yellowish, or variegated reddish opacity is developed. By this the eyesight is not merely weakened, but rendered quite confused, since all objects, but especially smallish ones, appear to be confounded together, particularly when the patient tries to inspect closely any determinate body. The further the disease advances, the brighter and more visible is the bottom of the eye, the paler is the colour of the iris (a thing very conspicuous in dark-eyed persons,) and when once the amaurosis is complete, so that no susceptibility of the impression of light is left, then, upon an attentive examination of the eye, one can mostly perceive, at the troubled deeper part of the eye, a very slender vascular plexus, which merely consists of the ordinary ramifications of the central artery and vein, which are now visible at the pale-coloured bottom of the eye. In a half-darkened place, such an eye presents a shining yellowish, or reddish appearance, but only in certain positions of the eye-ball; and, in this respect, it is somewhat similar to the eye of a cat, whence Beer chooses to term the complaint cat-eye amaurosis. The disorder is also not accompanied with any other essential morbid appearances, except the decline of vision, or complete blindness. (*Lehre von den Augenkr. B.* 2, *p.* 496.) Beer, in fig. 1. tab. 4. of his second vol. has given, from nature, an admirable representation of this very remarkable species of amaurosis. The differences in the appearances at the bottom of the eye, in this case, from those presented in the early stage of fungus hæmatodes of that organ, will be best understood by referring to the article *Fungus Hæmatodes.* On this point, however, I may here briefly state, that, in the cat-eye amaurosis, there is *no projection*, but, on the contrary, *a concave depression* in the axis of vision. Cat-eye amaurosis may be known from incipient cataract, by the opacity being more deeply situated, and having a shining pearly lustre. (See *Journ. of Foreign Med. vol.* 4, *p.* 168.)

Beer observes, that the causes of this species of amaurosis are so obscure, that whatever is offered upon the subject can be received only as conjecture. After what has been said in the foregoing paragraph is considered, about the particular individuals who are liable to be affected, and the change of the iris to a pale colour, as a constant symptom of this case, a suspicion may be entertained, that a deficiency of the pigmentum nigrum, and of the tapetum of the uvea, in consequence of the stoppage of this secretion, may be the cause of the disease. Beer justly remarks, that much might be learned on this point from the dissection of eyes thus affected; but he has never met with the opportunity.

The prognosis cannot but be very unfavourable; for, as the surgeon is ignorant of causes, he cannot know what means ought to be adopted for their removal. It is fortunate, however, that this amaurosis rarely attains its highest degree, but almost constantly remains in the form of a more or less considerable amblyopia.

Just as little is yet known respecting any well regulated mode of treatment: all that Beer has learnt from his own opportunities of remark is, that, in individuals prone to consumption, or somewhat hectical, but not dangerously so, and especially in emaciated children, whose bellies are not at the same time tense and hard, this amaurotic impairment of sight may sometimes be kept from getting worse, by the careful employment of such general remedies, regimen, and diet, as are calculated to improve the health. But, in the most fortunately managed cases, Beer never knew a step made towards the removal of the disease. (*Lehre von den Augenkr. B.* 2, *p.* 497-98.)

Beer's Third Species of Amaurosis, and its Varieties.

1. *Of the amaurosis produced by bitters, coal-smoke, or the effect of lead.*

This amaurosis in its progress presents different stages, to which the utmost attention must be paid, in order to avoid treating the case wrongly, or producing complete blindness. The limits between these stages, however, are so faintly marked, that one cannot wonder at their being overlooked by a superficial observer. In the first stage, the complaint never induces entire blindness, but only a more or less considerable diminution of vision.

A manifest turgescence of the blood-vessels, not only in the conjunctiva, but in the sclerotica itself; a disagreeable sensation of fulness in the eye; a perfectly motionless state of the iris; a very considerable dilatation of the pupil; and a peculiar undescribable pale-blackness of that opening, without any appearance that can be called turbidness; a singular pellicle-like cloud, which renders large objects indistinct, and quite conceals all smaller ones; and, finally, a more or less remarkable trembling of the limbs; are the characteristic symptoms of the first stage.

On the other hand, says Beer, in the second stage, the patient is quite deprived of vision; the pupil is exceedingly large; the iris quite motionless, even when the eye-lid is rubbed over the eye; the pupillary edge of the iris is angular, usually only towards the two canthi, so that the breadth of the iris is greatest in the perpendicular direction; nearly every part of the white of the eye exhibits a faint redness; the edges of the eyelids, especially in fair persons with a very delicate irritable skin, are somewhat discoloured; the upper eyelid, in consequence of relaxation, hangs farther down over the eye, than natural; the movements of the eye and eye-lids are languid; and different muscles are affected with spasm, especially those of the limbs and spine. If, in this stage of the disorder, the power of distinguishing light be completely abolished, then the other external senses, and, at last, the internal ones, but particularly the hearing, speech, and memory, fail. Nay, not unfrequently this form of amaurosis is attended with delirium, and, when produced by the poison of lead, it may be accompanied with lead-colic, ileus, and contractions of the hands and feet.

The abuse of bitters of every kind, whether as articles of food or medicine, especially chicory-coffee, bitter almonds, various high-seasoned dishes, quassia, &c.; likewise of narcotics, especially opium, hyoscyamus, belladonna, thorn-apple, and cynoglossum; lastly, the long continued and imprudent employment of preparations of lead, paint, &c.; the application of lead cosmetics, and accidental preparations of this mineral, adulterated wine, &c. are the causes of this form of amaurosis, which Beer has often seen, and mostly treated with success.

While the disease is in its first stage, the prognosis is always very favourable, indeed sometimes the blindness now goes off again, without any interference of art. This may happen when it has not yet attained a considerable degree; when the patient avoids every thing conducive to the disease; when he accidentally places himself under such circumstances, as promote the recovery; and when he is not very plethoric; there is no determination of blood to his head and eyes; he has not a phlogistic diathesis; he is not disposed to obstinate constipations; and the amaurotic weakness of sight has not occurred in the advanced stage of pregnancy. However, Beer is convinced, from repeated observation, that this amaurosis, even though it be not quite in its second stage, and it be skilfully treated, may last a long while, when produced by belladonna, stramonium, and the poison of lead.

When once the disorder reaches its second stage, and the patient is completely blind, the prognosis becomes very serious, though somewhat less so if a glimmering of light can be discerned. But, if all sense of light be lost, only a remote and distant hope of the re-establishment of sight must be allowed, notwithstanding all other circumstances may be favourable to the cure. When, however, in a completely amaurotic eye of this kind, any thing wrong is visible in the transparent parts of the organ, or there is a strong tendency to a general varicose affection of its blood-vessels, the complication is always very unpromising, as sooner or later violent pains supervene, and the blindness is irremediable.

When, in the first stage of this complaint, recourse is at once had to fluid stimulant remedies, useful as they are in the second, it is lucky if the patient do not completely lose his sight. On the contrary, when no complications exist, and the impairment of vision is altogether the effect of the above mentioned causes, a gentle antiphlogistic treatment will preserve him from such a misfortune. When plethora exists, a few ounces of blood may be taken away by venesection, and leeches applied behind the ears, when after bleeding, a determination of blood to the head and eyes still continues in full habits, or there is any tendency to inflammation. The same topical bleeding, without venesection, but with lukewarm pediluvia, containing salt or mustard, is proper, when no general plethora exists; and merely a determination of blood to the head and eyes and some acceleration of the circulation prevail. Internally, lemon juice, or the liquor ammoniæ acet. has excellent effects; and, externally, poultices, composed of bread-crum and vinegar, or fomentations containing oxycrat, are the means which Beer has found most successful in the first stage of this form of amaurosis.

As in the first stage, a moderate antiphlogistic general or local treatment is the only one which can be adopted, and which in urgent cases may yet save the patient from blindness, so, in the second stage, the internal and external employment of fluid stimulants is of great service: for example, naphtha combined with camphor inwardly; liniments to the eye-brow, and the vapours of æther to the eye. The amaurosis, produced altogether by the poison of lead, and complicated with lead-colic and ileus, will require, in addition to the foregoing means, such remedies as are known to be of service in these latter disorders. (*Beer, Lehre von den Augenkr. B.* 2, *p.* 499—503.)

2. *Of the symptomatic amaurosis in individuals affected with hysteria, hypochondriasis, epilepsy, and convulsions.*

This amaurosis is rarely permanent, and usually subsides as soon as the spasmodic, epileptic, or convulsive attack is over. However, the complaint may begin at two periods, viz. either during such an attack, or (what is more uncommon) afterwards, and it never loses its symptomatic character. The pupil always remains perfectly clear, and of a shining blackness, even when the disease has induced entire blindness; but, a slight dull pain in the forehead, especially about the eye-brow, constantly preceding and accompanying the blindness, generally lasts a good while after the amaurosis has completely subsided.

Besides the foregoing general symptoms, the following characteristic appearances present themselves in hysterical and hypochondriacal patients, who suffer frequent attacks of violent spasm. The pupil is much dilated, and the iris, which is immoveable, seems evidently to project in a convexity forwards, when the eye is inspected sidewise; consequently, the anterior chamber is lessened. The eye itself does not move freely in its socket, the patient experiencing an annoying, and sometimes a truly painful sensation, as if the eye-ball were forcibly compressed; (*Ophthalmodynia.*) Every attempt, which the patient himself makes to move the eye, or the surgeon to push it out of the position, which it has assumed, is unavailing and excessively painful. The eyelids are either painfully shut, or incapable of being shut at all; the eye-sight is very weak, but seldom quite impeded; and, at the termination of each attack, vision returns, though every paroxysm leaves it more and more debilitated, until at length, the spasmodic attacks of blindness frequently occurring, and lasting a long while, it is entirely lost. But, when the disorder has acquired its utmost degree, the eye always still retains the power of discerning the light, and it seldom happens, that vision is abolished by the first or second attack. It is different with respect to the characteristic phenomena of this amaurosis, in hysterical or hypochondriacal patients, especially when often affected with spasms, before, during, or after which, the impairment of sight originates; for, though the pupil may continue quite clear, it cannot escape the notice of an attentive observer, that, together with a pupil of diminished diameter, there exists a peculiar motion of the iris, a constant fluttering of it between expansion and contraction, technically called *hippus pupillæ.* This convulsive state of the iris is mostly accompanied with a similar affection of the eye-lids, namely, with an involuntary blinking, *nictitatio,* and not unfrequently with an involuntary pendulum-like rolling of the eye-ball, *nistagmus.* In these patients, the amaurotic injury of sight hardly ever proceeds directly to complete blindness, but more commonly remains as a weakness of vision, characterized during the rest of life by ceaseless oscillations of the eye-ball, aversion to light, and frequent sensations, as if there were shining fiery objects before the eyes.

With regard to the symptoms in epileptic patients, in addition to the general effects above enumerated, this case of symptomatic amaurosis is distinguished by an untroubled, but very expanded pupil; considerable diminution of the motion of the iris; a dilated state of the pupil even under the stimulus of the strongest light, and tremulous motions of the eye-ball, which continue during life, after the epilepsy and amaurosis are cured; and the case is further characterized by amblyopia, which rarely increases to complete blindness.

According to Beer, the amaurosis connected with convulsions, is most frequent in children. The first and most prominent symptom of this incomplete or complete amaurosis consists in an extremely violent convulsive rotation of the eye-ball, especially upwards, not unfrequently attended with the most violent convulsive motions of the eye-lids. The pupil is excessively dilated, and scarcely the least movement of the iris is distinguishable on exposing the eye to the strongest light. When the general twitchings are over, and only an amaurotic weakness of sight is left, strabismus occurs in both eyes in various directions, though the eyes very seldom deviate from the axis of vision in the direction towards the inner canthus. When the general convulsions happen frequently, and are violent and of long duration, the amaurotic weakness of sight usually changes into perfect blindness, in which the pupil, though it be regularly clear, and of a shining blackness, is greatly expanded, and the eyes constantly retain their faulty position and pendulum-like motion.

The causes of this amaurosis are specified, as it were, in the title of this section: for, whatever tends to bring on hysteria, hypochondriasis, epilepsy, or convulsions, in an evidently nervous individual, who either has had from birth weak, irritable eyes, or has gradually debilitated them by over-exertion, may give rise to this species of amaurosis.

With respect to the prognosis, it is observed by Beer, that even when merely an amaurotic weakness remains, the prognosis is always serious; but it is naturally still more unfavourable, when the blindness is complete, and when the loss of sight has suddenly recurred after violent spasmodic, epileptic, or convulsive attacks, without such attacks themselves ever returning. Under these circumstances, Beer has not hitherto seen more than two instances of such blindness partially cured. Generally, some hope of recovery may be entertained, when the amblyopia, or even complete amaurosis, begins with these attacks, but always terminates with them, without leaving any serious impairment of vision. On the contrary, it is a very bad sign, not only in regard to the removal of this symptomatic amaurosis, but likewise to the cure of the original disease, when the amaurosis invariably precedes these attacks, and lasts a considerable time after their cessation. As yet, Beer says, he has not known any such patients cured, either of their spasms, epilepsy, or convulsions, much less of their blindness: on the contrary, after three or four attacks, perfect amaurosis remains, and some of the patients die in one of these paroxysms.

As this amaurosis is merely a symptomatic effect of the above general disorders, its removal must entirely depend upon the success, with which their treatment is conducted. Were the blindness to continue, however, after the cure of the original disease, the surgeon could do nothing more, than try an empirical mode of treatment, and ascertain what good could be effected with antispasmodic and tonic medicines. (*Beer, Lehre von den Augenkr. B.* 2, *p.* 506—10.)

3. *Of the symptomatic amaurosis from infarction, obstruction, and induration of the abdominal viscera.*

The following is Beer's account of the complaint: the extremely slow formation of this amaurosis gives it something characteristic, for during ten, twenty, and more years, the patients may have a continually increasing weakness of sight, without becoming completely blind, or quite incapable of following their business. The pupil is invariably found to be dilated, of a pale blackish colour, though very transparent; the somewhat convex iris moves in the varying degrees of light, but very inertly; its pupillary edge is not circular, as in the healthy state, but is drawn into an angle sometimes at one point, sometimes at another; and not only the turgescence of the blood-vessels of the conjunctiva, but a reddish, yellowish, rather smutty tinge of the whole white of the eye, are evident to the most common observer. As the weakness of sight increases, the patient sees all objects through a thick mist, which, when blindness approaches, seems for a day or two as black as soot, and, for another day or two, of a light gray colour. Hence the patient usually talks of the white and black days. In most patients, those phenomena at length take place, which have been described in speaking of the *visus interruptus.* The purple lips, and wan countenance, correspond to the state of the eyes. A stupifying dull universal headach, depriving the patient of all inclination to employ his eyes or intellects while any vision is retained; a constantly disturbed state of the digestive functions; and, generally, the whole host of complaints connected with the morbid state of the abdominal viscera, are the never-failing companions of this amaurosis, which, however, does not invariably end in complete blindness.

As for the etiology of this species of amaurosis, every thing that is calculated to induce the above-mentioned morbid state of the abdominal viscera must naturally be taken into calculation; for the affection of the eye is but a symptomatic effect of a general disorder of the chylopoietic organs. Studious persons, and other individuals, who lead sedentary lives, and give immoderate application, or who live upon unwholesome food, are particularly subject to this kind of blindness. However, in duly contemplating its causes, attention must be paid to the almost incessant determination of blood to the head and eyes, prevailing in a greater or lesser degree, and also to the very troublesome hemorrhoidal complaints, as two important circumstances, arising from habitual costiveness, inseparable from the existing state of the abdominal viscera. Further it is to be understood, that this amaurosis does not attack every individual, who has such disease in the abdomen, but only those whose eyes have been weak, either from birth or previously to the general complaints, or else, during these complaints, have been immoderately strained.

The surgeon who has learned in practice, and not in the closet, the nature of this chronic disease of the abdominal viscera, and the true nervous connexion between these organs and the affected eyes; and who has also learned from the same source the peculiarity of constitution, habits, &c. of the patient, will know how impossible it is to make any favourable prognosis; for, says Beer, the obstinacy and almost total incurability of the principal complaints, of which the amaurosis is merely a symptom, are known to such a practitioner by the *argumentum crucis*. Even when there is a well-founded hope of cure, Beer argues, that it is difficult to keep the patient under all the requisite conditions for the successful management of the case, on account of his ordinary inflexibility and long acquired habits. Nay, sometimes, this amaurosis is a very bad omen, in respect to the issue of the case generally; for, according to Beer, when its origin is attended with jaundice, and the affection of the eyes increases with uncommon rapidity to complete blindness, or the jaundice suddenly comes on, during the development of the amaurosis, ascites, or hydrothorax, almost constantly follows, and, in the latter case, speedy dissolution.

Nothing can be plainer than that, in this alarming case, little can be accomplished by surgery, but that every thing must depend upon judicious medical treatment. Beer remembers with sorrow the time, when numerous patients afflicted with this kind of amaurosis became mournful victims to the favourite nauseating plan of treatment. He cannot, therefore, too earnestly warn surgeons against that indiscriminate practice, without altogether denying its efficacy, when adopted with prudence and certain cautions. (See *Gutta Serena.*) Here any employment of external means, even of such as would appear to be of the most innocent nature, always does harm, and if rashly used, or so as chemically to irritate the eye, they may quickly blind the patient. Thus, electricity and galvanism may instantaneously produce complete blindness, attended with severe, obstinate headach; which unfortunate change may be accounted for, when the constant determination of blood to the head and eyes is recollected. If the infarction of the abdominal viscera be successfully removed, the symptomatic amaurosis, depending upon it, is sure to diminish; but, when the visceral obstruction and induration are of long standing, the amaurosis is then as incurable as the diseased state of the viscera. (*Beer, Lehre von den Augenkr. B. 2. p.* 512-15.)

4. *Of the symptomatic gastric amaurosis.* In no instance has Beer yet seen this amaurosis terminate in complete blindness, excepting when the disease was occasioned by worms in the bowels. The present form of the disorder is always characterized by a considerable dilatation of the pupil, the inner margin of the iris not forming a very regular circle, and the motions of the same organ being exceedingly sluggish, even under the irritation of the strongest light; but the pupil constantly preserves its natural, clear blackness, and there is a frequent involuntary discharge of tears. Besides these pathognomonic symptoms in the eye itself, there are other remote appearances in the constitution, denoting the existence of certain complaints, as the cause of this amaurosis; for when the affection of the eye originates as a sympathetic effect merely, from a redundance of foul acidity in the stomach, the patient incessantly complains of acid eructations, attended with severe heartburn and epiphora. On the contrary, when the amaurotic weakness proceeds merely from indigestion, the case is accompanied with a tedious, troublesome sense of weight at the scrobiculus cordis; continual eructations, as if occasioned by rotten eggs in the stomach; a yellowish, thickly furred tongue; oppressive thirst; and either an invincible dislike to fish or flesh, and repeated inclination to vomit; or, a swelled belly, and tension of the hypochondria.

On the other hand, when the gastric amaurosis is altogether a sympathetic consequence of worms, it often increases to complete blindness, as Beer has very often remarked, and, in addition to the above described characteristic symptoms, the portion of the sclerotica, surrounding the cornea, has a blue appearance; nay, the eyelids, and all the circumference of the eye are said to exhibit quite a peculiar bluish tinge; while the eye itself is remarkable for its unsteadiness and irregular motions. At the same time, children thus affected, as long as they are not blind, usually squint with both eyes, on which account they are not unfrequently reprimanded by their parents and masters, who look upon the deformity as the result of bad habit; a mistake which is the more likely to happen, because these children have a continual irritation and itching in the mucous membrane of the nose, compelling them, as it were, unconsciously, to be frequently picking or wiping their noses. Such children usually have pale countenances; sometimes, also, a true leucophlegmatic habit; an insatiable appetite, and repeated gripings; and, in many cases, considerable swelling and tension of the belly.

As far as Beer's experience reaches, the prognosis in the sympathetic gastric amaurosis is always very favourable, even though the disorder may have attained the degree of complete blindness, provided the complaints, which have been assigned as its cause, are the only ones. But, says Beer, it should be remembered, that, in these cases, children with worms are often scrophulous; and adults, who are troubled with acidities in the stomach, are frequently gouty; while other patients, who complain of dyspeptic symptoms, may labour under hysteria, hypochondriasis, or infarction, obstruction, or actual hardness of one or other of the abdominal viscera, whereby this amaurosis, or even a mere weakness of sight, is often rendered incurable, and made to degenerate into complete blindness.

When the case is uncomplicated, the cure is easy enough; for, with regard to foul acidities in the stomach, Beer has never found it necessary, in the earliest stage, to prescribe any thing but absorbent medicines, which are to be followed by a long careful employment of light, tonic bitters, joined with the spiritus ætheris nitrici. In the second form of the complaint, the frequent drinking of a large quantity of warm water was often found of itself effectual, to remove both the general disorder, and that of the eye, a very gentle vomiting being thus excited, without straining, and the stomach completely freed from what was the source of indisposition. When the saburræ have a tendency to be discharged upwards, as indicated by continual nausea and disposition to vomit, emetics, which never operate without some violence, are to be most carefully avoided in plethoric individuals, or those who have a manifest determination of blood to their heads and eyes, or any acceleration of the circulation. The caution, here given, must be observed, even though emetics may on other accounts seem advisable; and according to Beer, the determination of blood and the state of the system here mentioned, are commonly attendant upon this species of amaurosis. Indeed (notwithstanding the testimony of Schmucker, Richter, and Scarpa, in favour of emetics in this case), Beer positively affirms, that the violent operation of an emetic frequently converts this sympathetic amaurotic weakness of sight all on a sudden into blindness. Although I apprehend that Beer may here be somewhat prejudiced against emetics, candour obliges me to add, that, in this country, their efficacy in the present disease is by no means equal to the representations of Richter and Scarpa. When there is less tendency to vomiting, but the case is attended with an oppressive sense of weight about the stomach, frequent eructations, as if arising from rotten eggs, an inflated belly, and tense hypochondria, a gentle aperient clyster may be ordered, especially when the bowels have been for some days confined, in which circumstances Beer has found, that tolerably brisk purgatives are always of the greatest service, both in regard to the general complaints, and the amaurotic weakness of sight; the removal of the offensive matter from the alimentary canal being immediately followed by a cessation of the determination of blood already mentioned. Lastly, when this amaurosis originates altogether from the presence of worms in the bowels, common anthelmintics are to be prescribed. In all these cases, says Beer, mere local treatment is quite inapplicable, and may do mischief. (*Beer, Lehre von den Augenkr. B.* 2, *p.* 517—21). Yet, as I have already explained in the foregoing pages, Scarpa and Richter here again differ very materially from this experienced oculist.

5. *Of the amaurosis, from the recession of acute cutaneous eruptions, as described by Beer.*

The peculiarity of this amaurosis is, that it comes on very rapidly, and always at that period of scarlatina, the measles, and less frequently the small-pox, when these contagious eruptions do not come out completely, but, from some cause or another, are suddenly repelled. This affection of the eyes, however, does not always induce perfect blindness. The pupil is invariably found preternaturally contracted, but quite transparent; the iris motionless; its pupillary edge however regularly shaped; while no characteristic appearance, like a palpable turgescence of the blood-vessels of the conjunctiva, is present. In a note, Beer remarks, that, although this amaurosis is not characterized by any particularly striking peculiarities of appearance, the diagnosis, especially in such children as can speak and complain of the considerable diminution, or entire loss of their sight, is facilitated by the existing general exanthematous disorder; and, the more so, as the affection of the sight almost always commences with rapidity in the first stage of the eruption.

With respect to the causes of this amaurosis, Beer remarks, that, if the sudden check of the eruption does not always produce such impairment of sight, but much more commonly ophthalmy, the explanation is, that, in children, one circumstance, essential to the origin of amaurosis, is frequently wanting, viz. a directly or indirectly formed considerable weakness of the immediate organ of vision, that is to say, of the optic nerve and retina. The production of amaurosis by the mere recession of eruptions, is a circumstance in which I could never put implicit reliance; and here we find Beer himself compelled to associate with the explanation a previous weakness of the eye. With the above few, but unfavourable appearances in the eye, the prognosis is hopeful, if proper assistance be given without delay, that is to say, before the exanthematous disorder has quite ended. But, when the latter indisposition has terminated, and the amaurotic blindness yet remains, or when the impairment of sight has already existed a long while, an attempt to cure the patient may indeed be made, but, as far as Beer's experience goes, the chance of success is very small.

When the eruptive stage of the general disorder is not over, the indication is to promote, by every possible means, the coming out of the eruption. For this purpose, Beer recommends sudorifics in general, camphor, the warm-bath, &c. And, when the surgeon first sees the patient in a later stage of the exanthema, the same remedies may be tried, though the result will be more uncertain; and in the ultimate period of the general affection, there is a necessity for employing, together with these remedies, various alterative medicines. Local means, applied directly to the eye, are always hurtful, while the constitutional illness lasts, and afterwards are, at the best, only useless. When the eruptive disorder is completely gone, but the amaurosis continues, alteratives may be of service, and in debilitated subjects they should be combined with the calamus aromaticus, (sweet-flag) and camphor, or bark. In this stage, also, the excitement of some counter-irritation is absolutely requisite. On the continent, this is sometimes done on the arm with the cortex mezerei; but it is a better practice to rub antimonial ointment alternately behind the ear, and upon the nape of the neck, so as to maintain for a sufficient time an itch-like breaking out upon the integuments. (*Beer*, *Lehre von den Augenkr. B.* 2, *p.* 523—25.)

6. *Of rheumatic amaurosis.*

According to Beer, rheumatic amaurosis is not very uncommon, and is so plainly denoted by certain symptoms, that it cannot well be mistaken; namely, a perfectly clear pupil wavers in the mid-state between contraction and dilatation, the iris seeming to be nearly motionless; the eyes weep from the slightest causes, and constantly betray more or less aversion to light; the case is invariably attended with wandering, irritating pains, sometimes affecting the eye-ball itself, sometimes the vicinity of the eye, and, in other instances, the teeth or neck. Also, when both eyes are affected together, which is not regularly the case, a cast of the eye, which cannot be called actual squinting, may be remarked, and frequently the motion of the eye-ball is chiefly obstructed only in one direction, though sometimes a true obliquity of the organ exists: (*luscitas*). In nearly every instance, there is considerable weakness of the levator muscle of the upper eye-lid, and, not unfrequently, a complete blepharoplegia; but total blindness is seldom produced.

According to Beer, this amaurosis, which is to be considered as chronic rheumatism, often arises from keeping the head long exposed to the air, and is chiefly met with in individuals who, while sweating profusely from the scalp, and brow, in warm weather, have taken off their hats, and remained with their heads a long while uncovered. As, however, in warm weather, the generality of persons expose themselves in this manner, and few are attacked by amaurosis, I infer, that something more is requisite for the production of the disease.

Under certain circumstances, the prognosis is by no means unfavourable, and Beer mostly succeeded in effecting a perfect cure when the amaurosis was not completely formed, and not of very long standing; the patient had no tendency to gout, and when, during the treatment, every thing, likely to bring on an attack of that disease, was avoided.

In this amaurotic weakness of sight, the treatment consists not simply of local means, which indeed are always needful, but likewise of general remedies. With regard to the latter, Beer assures us, that manifold experience has convinced him of the preference which ought to be given to the extract of guaiacum, joined with camphor, and given alternately with the compound powder of ipecacuanha; which remedies, as soon as the wandering pains about the eye and eyebrow begin to be milder, and more fixed to one part, are to be succeeded by the extract of aconitum, antimonial preparations, and flowers of sulphur. Externally, the most powerfully operating means are not to be omitted, especially blisters applied successively behind the ears, to the temples, and eyebrows; and as soon as the pain has completely subsided in these last parts, and is perhaps more concentrated in the eye, frictions are to be made on the eyebrow with liniments, containing at first a moderate quantity of opium, and afterwards of the extractum conii. At length, when the pain in and about the eye is nearly subdued, but some degree of amaurotic weakness of sight is left, frictions with naphtha and a small proportion of tinctura lyttæ and tinctura opii, will be found exceedingly beneficial. Afterwards, when a considerable time has transpired, without the recurrence of the slightest rheumatic pain in the eye, its vicinity, or the head, but the eyesight is not perfectly re-established by perseverance in the above general and local treatment, and especially, when the paralytic affection of the levator of one or other of the upper eyelids continues, (as often happens), galvanism may be tried, with the cautions elsewhere premised. (See *Gutta Serena*). And in the most desperate cases, Beer approves of making an issue in the depression between the angle of the jaw and the mastoid process, and keeping it open for a fortnight after the recovery seems complete. (*Lehre von den Augenkr. B.* 2, *p.* 526—29.)

7. *Of the amaurosis from the stoppage of a catarrh.*

In this instance, as Beer observes, the circumstances of the pupil becoming very much dilated, yet retaining all its wonted transparency, the iris being motionless, and its pupillary edge not regularly circular, but angular, will not form any criterion, because these morbid appearances are common to several forms of amaurosis. But, the constant projection of the margin of the pupil into an angle directed towards the temple, whereby the pupil is also inclined more towards the external, than the internal canthus, is a peculiar mark of the case, and as difficult of explanation as the displacement of the pupil towards the root of the nose in what Beer and others consider as syphilitic iritis. The patient also complains of the eye being unusually dry; of a sensation of particular fulness in it; of a very troublesome dryness of the nose on both sides, even though the amaurosis be restricted to one eye; and his feelings are constantly those of a person who is in a dusty room.

These subjective symptoms (says Beer) are conjoined with an extraordinary heaviness about the root of the nose, and a shooting pain in the head, extending from the region of the frontal sinus outwards to the temple, and upwards to the top of the head. This case of amaurosis, however, never terminates in complete blindness, though the impairment of vision may attain a degree, which approaches the latter state. The diagnosis will be materially facilitated by an inquiry into the history of the disease, when it will be found, that the affection of the sight followed the sudden stoppage of a violent catarrh.

According to Beer's experience, when an abundant discharge of mucus from the nose can be excited, there are few cases of amaurosis, in which the prognosis is as favourable as in the present example. The indication is to reproduce, as quickly and as freely as possible, the secretion of mucus from the nose; but this object is not to be at once attempted with the most powerful sternutatories; for (as Beer can affirm from his own experience) such treatment is apt to fail, and do more injury, than benefit. The steam of warm water is first to be directed up the nostrils; secondly, warm emollient, mucilaginous decoctions, especially that of mallows, are to be inhaled within the nose; and, lastly, a warm, weak solution of manna in milk. Yet, says Beer, even with these applications, one must proceed with caution; for, when they are made too strong, the headach and weakness of sight are almost instantly augmented. At most, half a scruple of manna canellata is to be dissolved in from four to six ounces of milk; and for children and irritable females, the mixture should be still weaker. When the mucous membrane of the nose is soft and somewhat tumid, when the dryness of the nose is in some measure lessened, when the patient feels as if his nostrils were constantly filled with thick mucus, which he endeavours to get rid of by blowing his nose; when the sense of heaviness about the root of the nose increases, and the violent headach changes into a dull heavy feel; the precise crisis has arrived, when great benefit may be derived from the powder of mild aromatic herbs, blended with a small proportion of calomel. After this has been employed some time, brisk sternutatories may be tried, like those composed of aromatic vegetable powders mixed with black hellebore, or the vapour of strong volatile smelling salts, caustic ammonia, &c. These means frequently bring about a profuse discharge of thick, fetid mucus, after which the disagreeable sensations about the root of the nose, and eyebrow, gradually cease, the nose is left moister than usual, and the eyesight is at length completely restored. The only thing, which it is necessary for the patient most strictly to avoid, during the whole of the treatment, is cold air, exposure to which (according to Beer's observations) may be the means of frustrating every endeavour to complete the cure. (*Beer, Lehre von den Augenkr. B.* 2, *p.* 530-34.)

8. *Of the genuine paralytic amaurosis.*

This is not an unfrequent case; it always originates very suddenly, attended with a manifest contraction of the pupil, which opening has not lost any of its natural clearness; and there is complete immobility of the iris, the pupillary margin of which does not present the slightest irregularity. However, either some muscle of the globe of the eye, the levator of the upper eyelid, or the orbicularis palpebrarum, nay, several of these muscles, and sometimes all of them together, are affected with paralysis; while the blindness itself is almost always not only complete, but not unfrequently so complete, that every vestige of sensibility to light is lost. The functions of the puncta lachrymalia are also more or less impeded, whence a greater or lesser degree of epiphora usually accompanies the disorder, as a natural effect of the abolished, or diminished absorption and conveyance of the tears into the lachrymal sac; circumstances generally occurring whenever the orbicularis palpebrarum is paralytic. A completely amaurotic eye of this description, says Beer, has the greatest possible resemblance to a dead eye. When all the muscles of the globe are palsied together, the eye can no longer preserve its situation in the orbit, but protrudes, as it were, lifeless (*Ophthalmoptosis paralytica*); while the whole tunica conjunctiva is commonly œdematous, or very blood-shot; and it is not unusual to find this amaurosis conjoined either with paralysis of certain muscles of the face, or even with hemiplegia.

The causes of the true paralytic amaurosis comprise violent concussions of the eye-ball itself, unaccompanied with any solution of continuity, or any displacement of the internal parts of this organ; concussions of the upper and lower margins of the orbit, especially the eyebrow, and neighbouring part of the forehead, without any laceration of the frontal and infraorbitary nerves; and concussions of the whole brain, or spinal marrow: sometimes, however, the disorder is only a symptomatic effect of apoplexy. In the three latter cases, the blindness regularly extends to both eyes.

When the amaurosis is only the momentary consequence of a simple concussion of the eye-ball, without any breach in its internal texture, if the retina be not wounded, and none of the inner parts of the eye displaced, the case always admits of a perfect cure by proper treatment; and, says Beer, it is incredible, how much may here be accomplished, by beginning the treatment judiciously, even when the eyesight has been nearly or quite abolished, and the concussion of the eye-ball has been so serious, as to produce an effusion of blood in the chambers of the aqueous humour. Beer owns, however, that cures of the latter description, of which the ophthalmic hospital at Vienna has afforded many examples, are only to be considered as extraordinary occurrences, and therefore should not form any general inference for the prognosis. But, when this amaurotic loss of sight is the effect of a severe concussion of the brain or spinal marrow, and the case is unequivocally denoted by its general well-known characteristics, and its history; or when the disorder is the symptom of an apoplectic fit; the prognosis is very unfavourable, not merely with respect to the restoration of sight, but the patient's life itself.

In cases of paralytic amaurosis, even where it proceeds from a concussion of the eye itself or its vicinity, a complete cure cannot always be expected from merely local remedies. The treatment, however, should regularly begin in this manner, and the surgeon first try whether it will answer, or not. For this purpose, Beer particularly recommends the employment of all those nervous remedies, the cautious gradual use of which in the empirical treatment of amaurosis is particularly praised by that author. (See *Gutta Serena*). Should local means fail, gradual recourse must be had to antiparalytics and tonics. (*Lehre von den Augenkr. B.* 2, *p.* 535, &c.)

9. *Of the symptomatic amaurosis from hydrocephalus.*

According to Beer, this amaurosis may occur, as a symptomatic effect, not merely in internal hydrocephalus and collections of water in the ventricles of the brain, but also in external hydrocephalus and spina bifida. In the two latter cases, the diagnosis is easy; but, in the two first, it is more obscure, though it may generally be made out by attention to the following characteristic symptoms. The perfectly black, clear pupil is very much dilated; the iris is completely motionless, its pupillary edge forming here and there a very small, hardly distinguishable angle; the amaurotic eyes, for they are constantly both affected, are either prominent and fixed in a lifeless way, the muscles of these organs evincing little propensity to contract, or they are in a state of continual oscillation in various directions, never, however, in the line of the straight muscles; but, the appearance is rather as if there were an incessant struggle between these last and the oblique muscles. In the sclerotica around the cornea, an extraordinary bluish tinge may be noticed. Children never hold their heads up, but incline it to one side or the other; and, if they are old enough to walk, they tread very insecurely, hobble along, and frequently tumble down. Lastly, the os frontis projects in a remarkable degree, and the child, completely bereft of vision, at length dies with convulsive, or apoplectic symptoms.

The cause of this amaurosis, which is merely a symptom, depends upon the principal disease, namely, the hydrocephalus, and it would appear, indeed, that the blindness, which does not accompany every case of internal hydrocephalus, is particularly attendant upon collections of water in the ventricles. And Beer informs us, that, in two cases, in which he saw this amaurosis as a symptomatic effect of spina bifida, he found, after death, a prodigious quantity of water in all the four ventricles.

As hydrocephalus, especially the internal species, and collections of water in the ventricles, are almost always incurable, it is plain enough what expectation can be entertained of a recovery of the eyesight. Yet, when the amaurosis is truly a symptom of water in the ventricles, the stage of the disorder is known, and the practitioner has not been consulted too late, something may yet be done, as Beer has learnt from experience. The surgeon, however, will rarely be able to render any benefit, because his services are usually not required until the last stage, and it only remains for him to foretel the melancholy fate both of the patient's eyesight and life. In the very uncommon case of amaurosis, which is a symptomatic effect of external hydrocephalus, if the health be not too much reduced, there is always more hope.

Medical treatment will sometimes do good, if not administered too late. The period, when the oculist is consulted, says Beer, is never that in which inflammation of the brain exists, and, whatever good can now be done, is generally to be done with calomel and digitalis. (See *Lehre von den Augenkr. B.* 2, *p.* 539—41.)

Beer's Fourth Species of Amaurosis and its Varieties.

1. *Traumatic amaurosis.*

Beer applies the epithet *traumatic* to such cases of amaurosis as are the consequence of a considerable wound of the eye itself, its surrounding parts, or the skull. Here consequently is first arranged the amaurosis produced by laceration and stretching of the branches of the frontal nerve from irregular scars about the eye-brow. Secondly, Beer reckons the amaurosis arising from external violence, directed in such a degree against the upper or lower side of the orbit, that the retina is torn, and many of the internal softer textures of the eye forced out of their natural situations. Thirdly, Beer includes every weakness of sight, or perfect amaurosis, which is the result of such injuries of the eye-ball itself as extend to the retina, so as either violently to bruise or lacerate it, or cut or pierce it. For the prognosis and treatment of all these cases, he refers to his observations upon ophthalmy. Nor does he choose here to treat of the perfectly complicated amaurosis, which is a direct consequence of a coup-de-soleil, because it never happens unpreceded by a violent general inflammation of the eye-ball, and therefore is to be regarded as an effect both of the injury and the inflammation together; but which, like the symptomatic amaurosis, following common and genuine internal ophthalmy, may be easily known by the total insensibility to light, and the evident changes in the texture and shape of the eye; and is quite as incurable as the other example, to which we have alluded. (*Lehre von den Augenkr. B.* 2, *p.* 542.)

2. *Gouty amaurosis*

assumes two forms. According to Mr. Travers, gout attacks the eye, through the medium of the stomach. Vomiting occurs with pain in that organ, on the subsidence of an inflammation in the extremities, and is succeeded by violent pain in the head. The loss of sight, he adds, is sudden and permanent. (*Synopsis, &c. p.* 163.) The gouty amaurosis, described by Beer, is perhaps badly named: at all events, there are some circumstances in its history which must create doubts on the subject. Gouty amaurosis, he says, has two forms: the first is characterized by a very considerable dilatation and angular displacement of the pupillary edge of the iris towards the canthi; a continually increasing slowness in the movements of the iris, and final immobility of this organ; an actual change of colour at both its circles; a dull, glassy blackness of the pupil, and even a tarnish in the lustre of the cornea; an alternate appearance of the gray and black cloudy substances, described in the account of the general symptoms of amaurosis, which effect lasts while the patient is not totally blind. The disorder is further indicated by a fleeting, wandering, irritating, yet not very severe pain, all about the vicinity of the eye; a manifest tendency to a varicose enlargement of the blood-vessels of the conjunctiva and sclerotica; a very transient melioration of sight after meals, or any accidental excitement or stimulus; a considerable temporary decrease of it after the operation of any causes, which depress the spirits; the excessively slow formation of the disease, for which several years are usually required; and, lastly, by the nature of the patient's constitution. For, in general, this amaurosis (if we are to believe Beer) always attacks both eyes at once, and is confined to fanatic, dark-eyed women, and very irritable, slender, weak, maiden females, who either have suffered from scrophula in their childhood, or from severe acute or chronic diseases at a later period of their lives; who are not yet far advanced in years;

and whose menses have never been very irregular, though profuse. This form of amaurosis is restricted to no particular classes of society; it is not, however, so commonly noticed in the higher orders; while it is most frequent in the working middle classes, and scarcely ever remarked in the lowest ranks, especially country people.

It is remarked by Beer, that, although the second form of gouty amaurosis makes its attack upon males, as well as females, the latter, on the whole, are most frequently affected, particularly about the period when the menses cease. This amaurosis which is seldom formed quickly, that is to say, in a few weeks, or months, but mostly requires years for its production, begins with cloudy, indistinct vision; an appearance of different colours before the eyes; and a peculiar sensation as if insects were crawling over the skin around the eye. The pupil becomes manifestly dilated, and presents a dull greenish-gray colour, which, however, is easily distinguished from the colour seen behind the pupil in the amaurotic cat-eye, and plainly depends upon some defect in the vitreous humour, (*glaucoma*). Also the iris, the pupillary edge of which is drawn towards both angles of the eye, as in the first form of the disorder, undergoes an obvious change of colour, first at its lesser circle, which becomes of an uncommonly dark hue, and then at its greater circle. The alteration of colour, here spoken of, certainly proceeds from a general varicose state of the blood-vessels of the eye, which affection daily augments, and is attended with vehement pain in the organ and surrounding parts, or even in the whole head, or one side of it, whether the blindness attack one or both eyes together. This violent pain, however, which is such as often to distract the patient, is unsteady and irregular, being immediately aggravated by every violent mental emotion, whether of the exalting or depressing kind, every sudden and considerable change of temperature, every quick accession of wet cold weather, or when the patient stays only for a short time near a very heated fire-place, lies on feather pillows, with the affected eye resting upon them, or covered with flannel, or he has been eating any indigestible food. It is very remarkable, that these attacks of pain subside without any medical assistance, in the dry warm season of the year, and in a mild, not too hot, climate are often kept off for several years. Upon every such attack of gouty pain, the glaucoma becomes more evident, the pupil larger and more angular, and the eyesight perceptibly weaker. At length, during one of these painful exacerbations, vision is completely abolished, not the least sensibility to light remaining; and the pupillary edge of the iris, together with the lesser circle of the same organ, then entirely disappears, being inverted towards the lens. The cirsophthalmia also gets so much worse, that the sclerotica acquires a smutty grayish-blue colour; and, at length, the bluish windings of vessels may be noticed at various points, particularly about the place where the tendons of the muscles are affixed. Afterwards the green, or what may be more properly called, the glaucomatous cataract, is manifestly developed, and the eye then generally wastes under the most violent attacks of pain. The light, which the patient always thinks he sees, but which, according to Beer, is produced of a reddish or bluish colour in the interior of the eye, like galvanism, keeps up the hope of recovery; but, all consciousness of this luminous appearance ceases as soon as the eye begins to waste. The first degree of gouty amaurosis readily changes to the second, especially in persons who are getting into years, or are near the period of life when menstruation terminates.

That in amaurotic patients of the foregoing kind, a certain morbid tendency to gout exists, may be inferred from what has been already said of the peculiarities of constitution which are noticed. In such individuals, therefore, it is not extraordinary, that the first degree of gouty amaurosis should originate, and almost uninterruptedly augment to complete blindness, while certain general and local causes are incessantly operating upon the eyes; such as long grief affecting a very sensible mind; excess in wine; sleepless nights, occasioned by care or fear; straining the eyes, either by too much reading, particularly at candle-light, or by any of the fine kinds of work usually done by women; bad, unwholesome sorts of food; and want of good air, and proper exercise.

The causes of the second form of gouty amaurosis, says Beer, are the same as those of gout in general, which, however, are very imperfectly known. Whatever in certain individuals has the effect of promoting, or actually bringing on an attack of gout, may excite this amaurosis, especially, when at the same time hurtful or debilitating circumstances are affecting or have been affecting the eyes. It is to be recollected, however, says Beer, that just in the same manner as few of the individuals, exposed to the influence of these last circumstances, are attacked with gout, so few gouty subjects are afflicted with this amaurosis, and, consequently, in both cases, a certain predisposition to such disease, already existing in the eyes, seems essential to its production. According to Beer, such individuals as have been afflicted with scrophula or rickets in their youth are very liable to gout, when they grow older; and, says he, gouty disease more frequently attacks dark, brown, or black eyes, than eyes of a light colour, especially when they have been much debilitated in the earlier part of life by immoderate exertion.

In the first degree of gouty amaurosis, Beer observes, that the slightest glance at the etiology of the case must show, how unfavourable the prognosis is; for, notwithstanding the disease frequently requires many years to be completely formed, and the causes are by no means so obscure, as in the second degree of the disorder, yet, they are generally such as absolutely cannot be removed, because interwoven, as it were, with the constitution. In fact, the surgeon being hardly ever able to check, much less cure, the blindness, is usually obliged to be an inefficient spectator of its progress. According to Beer, the apothecary's magazines contain no remedies, which are adequate to the cure of this amaurosis. A total change of the whole constitution would be requisite, ere success could be expected, and such change it is not in the power of physic to accomplish. The practitioner may give advice, and make the attempt; but, notwithstanding every exertion, the patient usually falls into a state of complete and irremediable blindness. In one single example, Beer succeeded in checking the disease, by persuading the patient to observe a strict regimen, not a grain of medicine being given; but the patient still remains weak-sighted, though various medicines have latterly been tried.

The following are Beer's observations on the prognosis in the second stage of gouty amaurosis. If in the first stage, there is scarcely any hope of preserving the sight, where the causes of the disease are apparently known, how little expectation of success can be entertained in the second stage, where the causes are involved in perfect obscurity, and are probably in some measure dependant upon a propensity to gout existing in the constitution from childhood. Indeed, when the patient is living under the influence of such circumstances, as are known to promote gout, certain blindness may be predicted. The same termination may also be foretold, without any chance of error, when glaucoma is evidently present; and, though a weak power of vision be yet left, this will soon be for ever lost. It is doing a great deal in these cases to free the patient from intolerable pain, and, by active resistance to gout, perhaps, still preserve the other eye, where this is not yet affected, or not in a serious degree. But if the practitioner find, when he is first consulted, that the green or glaucomatous cataract is already formed, there is then not the slightest chance of obviating the pain, which ordinarily continues, until the eye is completely wasted away, and the fissure of the eye-lids has permanently sunk in the orbit and closed.

With respect to the treatment of the second stage of gouty amaurosis, Beer observes, that it should be like that of gouty iritis. In particular, attention must be paid to the attacks of pain, and palliative means adopted. The patient should not lie upon feather beds, nor especially feather pillows, but only employ articles of this kind, which are stuffed with horse hair. Neither must he expose himself to an atmosphere, which is at the same time both cold and damp; and, if he cannot altogether take care of himself in this respect, at all events, let him keep his head and feet warm and dry; shun every thing which tends to impede the functions of the skin; and avoid pork-meat, every thing cooked with hog's lard, and very acid salt dishes, like herrings. With what are usually considered as gout-medicines, the practitioners should act very circumspectly; and, as in gouty iritis, he should pay close attention to the state of the constitution, rather seeking to afford relief by means of a well-regulated diet, than by the employment of much physic.

With arthritic amaurosis, says Beer, is to be classed an amaurotic, rapidly-formed, complete blindness of both eyes, which is the immediate result of a sudden violent fright; but only takes place in such individuals as are excessively nervous and irritable, and more or less prone to, or actually affected with, gout. The most striking effect, characterizing this consequence of arthritic amaurosis, is that change, which is instantaneously produced in the structure and form of the eye at the moment when the patient recovers from his fright, and comes to his senses again, of which defects in the interior structure and form of the eyes there was not previously the smallest vestige, and these organs, if not quite healthy, could only be termed weakish. These changes are indicated by a considerable dilatation of the pupil, which is drawn into an angle upwards and downwards; by the complete immobility, and the projection of the iris towards the cornea; by the manifest appearance of vessels fully distended with blood, on the greater circle of the iris; by all the symptoms of a beginning glaucoma; and by a general varicose affection of the blood-vessels: which two latter effects from this period incessantly continue, attended with violent pain in the head and eyes. (*Lehre von den Augenkr. B.* 2, *p.* 544, &c.)

3. *Of the amaurosis occasioned by the sudden cure of particular cutaneous diseases, and of old ulcers of the leg.*

Most of the cases, which appertain to this class, are said to have a great resemblance to the second form of gouty amaurosis. According to Beer, when psora, porrigo, old ulcers of the leg, &c. are suddenly healed, a consequence more frequent than amaurosis, is a sympathetic ophthalmy, which indeed may easily be removed by judicious treatment, but, if unskilfully managed, may prove very obstinate and dangerous. This eminent oculist thinks, that, in children, amaurosis is very rarely produced by the indiscreet cure of crusta lactea, and, with one single exception, the blindness has appeared to him to be a symptomatic effect of water in the ventricles of the brain, formed (as he perhaps too credulously supposes) in consequence of the injudicious repulsion of the cutaneous disorder.

When this amaurosis assumes its ordinary form, Beer has not yet been able to remark in it any peculiar characteristic symptoms, by which it can be effectually distinguished from the second form of gouty amaurosis, excepting, first, that it originates and increases very suddenly, while the true arthritic amaurosis is a long time, and for the most part several years, in forming. Secondly; that, at its commencement, it is never attended with violent pain in the eyes, or head. Hence, the diagnosis will depend very materially upon a correct recollection of circumstances. But, according to Beer, there are some cases, in which, besides the complete blindness, unattended with the slightest power of perceiving light, there is no characteristic symptom, but extraordinary enlargement of the pupil, total immobility of the iris, and an inanimate projection of the eye.

Respecting the causes of this amaurosis, Beer says, that he has nothing important to offer. He owns, that, after the sudden cure of certain cutaneous diseases, and of old ulcers of the legs, an amaurotic blindness does not always ensue; and he believes, that the reason why the bad effects take place in other organs, sometimes the brain, the lungs, or the bowels, &c. may probably depend upon this or that organ happening to be most predisposed to disease. Here the discerning reader will not require me to point out to him, that such a mode of accounting for things is entirely hypothetical, and destitute of proof: it is indeed so convenient a sort of explanation, that it admits of being extended to all diseases, without exception. If we are to believe Beer, the prognosis is very uncertain, and, in many cases, highly unfavourable; first, because an organic part, namely, the optic nerve, is directly affected, which by the operation of external and internal causes, is soon rendered unfit for the performance of its functions. Secondly; because, in the majority of examples, important changes immediately take place in the organization of the whole eye, which are particularly difficult of removal, when the nervous textures are affected. Thirdly; because it is impossible to know, whether morbid changes may not already exist in the retina, or course of the optic nerve.

In the treatment, Beer, who places implicit reliance upon the above statement of causes, is an advocate for reproducing, as quickly as possible, the original disease, and, if that cannot be done, he thinks some artificial disease should be formed in lieu of it. For these purposes, he often employs blisters, and friction with antimonial ointment. His treatment, where amaurosis happens to follow the cure of itch, seems very objectionable, as it consists in inoculating the poor patient again with psoric infection, as if it were not more tolerable to remain blind, than live perpetually scourged with the other disorder; for the Professor's theory leaves us uninformed of the circumstances, under which the patient whose sight is restored by this expedient, could ever venture to have a sound skin again, without the risk of a fresh attack upon his eyes. But, it seems even from Beer's account, that the patient's subjecting himself to the itch will not always cure his eyes; for, says he, when this method fails, friction with antimonial ointment should be tried.

When amaurosis follows the healing of old sores, Beer recommends the formation of them again by applying to the cicatrix strong mustard cataplasms, and the muriate of soda; and, if the new ulcers cannot be made to discharge properly, he praises the application of issues to the calves of the legs, and, in urgent cases, to the thighs. These plans are to be aided by such medicines, as act specifically upon the skin, like antimonials, especially the sulphur auratum antimonii: Beer also speaks favourably of sulphur baths; and, in cases complicated with debility, administers tonics, particularly the calamus aromaticus and bark. (See *Lehre von den Augenkr. B.* 2, *p.* 556—63.)

4. *Of amaurosis, as the immediate consequence of a violent fit of anger, which has been kept under with difficulty.*

This case, which is described by Beer as one of the most uncommon forms of amaurosis, begins at once with a very considerable enlargement of the pupil, without any sensible angles in the margin of this opening, but with complete immobility of the iris; a thick plexus of dilated blood-vessels in the conjunctiva; a red yellowish colour of the whole sclerotica; and, usually, a greater or lesser degree of a suddenly formed jaundice; a slight turbidness of the aqueous humour, and complete loss of sight in one, or both eyes, yet without all sensibility to light being abolished. It is not uncommon for the case to be combined with hemiplegia, in which event, only one eye, namely, that on the paralytic side, is entirely blind, while the other is simply weakened; or there are merely signs of paralysis observable in the parts around the eyes, the muscles of the face, or even in organs at a greater distance from the eyes, in which event, vision is impeded in both eyes.

In amaurosis in general, there is often a peculiarity of constitution clearly concerned in the production of the disease, and this seems here to be the case; for, says Beer, "though I have not met with many examples of the present kind, and have had the treatment of still fewer, the patients, whom I have seen, were all very choleric, and bilious, and had dark-brown, or almost black eyes. In every case, the amaurosis began, and was formed in a moment, after the patient had been affected with violent anger, which was repressed with great difficulty, to which gusts of passion he was evidently very subject. Yet (adds Beer), it should be remarked, that all these patients had been immoderately exerting their eyes in various kinds of employment, a little while previously to the attack."

The few opportunities, which Beer has had of seeing this form of amaurosis, incline him to regard the prognosis as very uncertain, especially when professional aid is delayed for some days or weeks, after the commencement of the blindness.

Beer represents the treatment as liable to equal uncertainty: twice he succeeded in effecting an immediate partial restoration of sight, by giving a gentle emetic. In three other cases, where he had not been consulted directly after the beginning of the attack, the emetic plan had no effect. In the two first cases, vision was re-established by long perseverance in the exhibition of arnica, joined with camphor, and in the use of sulphurous baths, by which means the hemiplegia was also removed. The other three patients however continued completely blind; nor could Beer render them any benefit, though he tried the whole catalogue of antiparalytics and antispasmodics. (*Lehre von den Augenkr. B.* 2, *p.* 563—65.)

5. *Of the amaurosis, which follows the stoppage of a catarrh, with collection of mucus and matter in the frontal sinus.*

Beer has had as yet the management of only three cases of this species of amaurosis, which appears to be one of the least frequent forms of the disorder: in each instance, it was indicated by the following characteristic phenomena; though he acknowledges, that, in the first example which occurred, he was very uncertain about the diagnosis. Directly after the sudden stoppage of a violent catarrh, the patient experiences an oppressive, dull, continually increasing pain about the root of the nose and frontal sinuses, and, at the same time, a considerable amaurotic weakness of sight takes place, either in one or both eyes, attended with various luminous appearances; with a contracted, perfectly round, but palish black pupil; complete immobility of the iris; a deviation of one eye from the axis of sight, when only one is affected; and of both eyes, when the affection extends to both of them. Hence, when the two eyes are open, the patient sees objects double. The case is also attended with weakness of the upper eye-lid; great dryness of the nose; a constant sensation as if the nostrils were filled with dust; reiterated fits of sneezing come on, during which ugly, transient, luminous forms suddenly and rapidly present themselves before the eyes. When the disease is not understood, or neglected, the eye-ball at length protrudes from the orbit outwards and downwards, in which state the pain in the frontal sinuses becomes irregular, but more severe; the eyesight continues to grow decidedly worse; and, from this period, the patient not only discerns all objects very feebly, but in an imperfect mishapen manner. At length, the front of the sinus not only projects forwards, but forms a swelling, which has the softness of cartilage, in which stage, vision is quite abolished, and all sensibility to light destroyed.

With respect to an explanation of the manner, in which the alleged cause of this form of amaurosis operates, Beer is more reserved than on some other occasions, and declines offering any hypothesis: he merely states his belief, that actual inflammation within the frontal sinus has a principal share in bringing on the blindness.

As for the prognosis, Beer thinks that some hope of the recovery of sight may be entertained, when vision is not already completely gone, and, in particular, that this benefit may be expected from judicious treatment, when the objects, which the patient is yet capable of discerning, have not a perverted, false, deformed appearance. On the contrary, nearly every hope is past, if all sensibility to light is not only quite annihilated, but the eye-ball more or less pushed from its socket by the distention of the frontal sinus.

With regard to local treatment, if the case be not too far advanced, the indications and remedies are here exactly the same as those recommended in speaking of a former case of amaurosis from the sudden stoppage of a catarrh. In the present instance, while the pain is violent and incessant, there is still greater necessity for avoiding all irritating means, on account of the inflamed state of the frontal sinus. Therefore, in the early stage of the disease, when the pain is violent, and when during its prevalence the blindness threatens to augment rapidly, leeches should be applied to the temple, and, if there be any symptomatic fever, a moderate general antiphlogistic treatment ought to be adopted. When the pain about the root of the nose and frontal sinus has considerably declined; when it has become dull and irregular; when the mucous membrane of the nose is moist, soft, and tumid; when the patient feels disposed to blow his nose every moment, and he can do this without at all increasing the pain in the frontal sinus, or eye itself; then the first opportunity has arrived for the use of stimulants, recommended in speaking of the amaurosis from suppressed catarrh. They are to be employed, however, with the utmost caution. Blisters are to be laid on the eye-brow, and afterwards liniments rubbed upon the same part, and about the root of the nose, such as spiritus camphoræ, naphtha, and tincture of opium. Internal alteratives should likewise be ordered, especially arnica, conjoined with guaiacum, and camphor. When, by this local and general treatment, no discharge of mucus is obtained from the nose, and the symptoms are not materially lessened; but, on the contrary, the eye-ball commences to protrude from the orbit; or, should this change already have happened, together with a projection of the anterior parietes of the frontal sinus; then, if this portion of the skull be yet firm and unyielding, there is no other resource left but that of making a perforation into the sinus with a small trephine; or, if the bone be soft enough, the opening may be made with a common perforator. In this manner, an outlet is formed for the mucus any matter collected in the sinus, to which cavity any requisite applications may now be directly made. Beer says, the case is now to be treated as an ill-conditioned ulcer, and he asserts, that it may sometimes be proper to destroy altogether the mucous membrane, which lines the sinus; a proceeding which I have great difficulty in supposing to be correct. If the surgeon defer making an opening too long, Beer says, that the eye is rapidly destroyed, and the mischief of the bones in the orbit extends so quickly from the orbitar process of the frontal bone to the os ethmoides, os unguis, &c. that it is now difficult to put a stop to the ravages of the disorder. (See *Lehre von den Augenkr. B.* 2, *p.* 566—71.)

6. *Of the sympathetic amaurosis in lying-in women, from suppression of the secretion of milk.*

This case is set down by Beer as one of the most uncommon varieties of amaurosis. It comes on rapidly, after sudden stoppage of the secretion and excretion of the milk, with violent headach, concentrated about the forehead and eyebrows; troublesome luminous appearances; an inconsiderable dilatation of the pupil; and scarcely any perceptible irregularity in the pupillary edge of the iris, which is quite motionless, somewhat altered in colour, and swollen. The disease is also accompanied with great aversion to light; a palpable turgescence of all the blood-vessels of the conjunctiva; a slight turbidness of the transparent media of the eye; and, at first, with a mere weakness of sight, which, in the end, suddenly changes into complete amaurotic blindness. The breasts, which before the attack were full of milk, are now empty, and hang down like bags, but are quite free from pain.

Beer is of opinion, that this form of amaurosis must be regarded as a true sympathetic effect, the cause depending upon the suppressed secretion of milk. This, says he, is proved, not only by the amaurotic blindness immediately following the stoppage of such secretion, but also by the method of treatment. It is acknowledged, however, that a further investigation of this part of the subject would be attended with great obscurity. As far as this eminent oculist can speak, from the few cases which he has had an opportunity of seeing, the prognosis is always unfavourable when the blindness is complete, and particularly when there is a manifest diseased change in the transparent parts of the eye; for, in the latter case, he has known patients remain perfectly blind, though the secretion of milk had been most successfully and expeditiously re-established. In one instance, the remedies applied to the breast, instead of reproducing the secretion of milk, excited in the part a painful inflammation and abscess, during which the weakness of sight subsided, though it was very considerable.

In considering other analogous cases of amaurosis, enough has already been said concerning the first and most important indication, namely, the re-establishment of the action which is obstructed; and here the only question is, about the manner in which that object can be most expeditiously and safely affected. For, says Beer, it should be distinctly understood, that the prevention of a complete amaurotic blindness essentially depends not only upon the renewal of the secretion from the breasts, but upon this change being made without delay. The remedies, which Beer has found most effectual for this purpose, are warm poultices applied to the breasts, and at first composed of simple emollients, and afterwards of more stimulating ingredients, such as hemlock, camomile flowers, &c. When the breasts have more of a leucophlegmatic appearance, than that indicative of a fulness of the mammary gland, and disposition to a renewal of the milk secretion, Beer strengthens these poultices with aromatic herbs, and applies them alternately with well-warmed bags, full of dry aromatic plants, and sprinkled with camphor. These last means are very useful at night, or when the patient is asleep, and fresh warm poultices cannot be put on sufficiently often. In the day-time, the breasts should be frequently and gently rubbed with warm flannels, medicated with olibanum and mastick. This plan is to be followed up until the secretion and excretion of milk are renewed, and the amaurotic amblyopia has subsided. When the secretion either cannot be restored by the foregoing means, or the eyesight does not return with the re-established secretion, internal remedies must be tried, especially arnica, joined with calomel and camphor. Issues or setons should also be formed, and kept open for a considerable time. Such is the treatment by which Beer once succeeded in stopping the increase of this kind of amaurosis, though the result was not indeed what could be named a cure. (*Lehre von den Augenkr. B. 2, p.* 572—75.)

7. *Of the symptomatic amaurosis from morbid changes, either in the optic nerves, and their sheaths, or in the bones of the cranium, or the brain itself.*

Beer says, a very considerable number of cases of this form of amaurosis which have fallen under his notice, have enabled him, as it were, not only to know it at once, but to describe its exact symptoms.—1st, Its formation is constantly very slow, and in all cases the patient is not only completely deprived of vision, but, for more or less time previously to his death, rendered quite incapable of distinguishing light. 2dly, A second peculiar symptom of this amaurosis consists in morbid changes in the structure of the eye, which are at first scarcely perceptible, and increase very slowly. 3dly, The amaurosis either originates during an attack of violent headach, which continues almost uninterruptedly until death, or the headach does not come on until complete blindness has taken place; or the patient may have no pain whatever either in his eyes, or head. 4thly, In the progress of this amaurosis, objects invariably seem to the patient to be perverted, disfigured, &c.

Symptoms when the disorder proceeds from disease of the optic nerves, or their sheaths.

This case comes on slowly, and rarely attacks both eyes together. It always commences with a black cloud, which grows more and more dense, and with a troublesome, alarming perversion and disfigurement of every object, without the least painful sensation in the eye or head. The patient merely complains of a slight sensation of dull pressure at the bottom of the orbit, as if the eye-ball were about to be forced from its socket, of which displacement, however, there is not yet the smallest appearance. In the very beginning of the disease, the pupil is already considerably dilated, and the pupillary edge of the motionless iris presents angles at several points, the pupil sometimes representing an irregular pentagon, or hexagon. By degrees, though very slowly, a glaucomatous change of the vitreous humour ensues, and afterwards of the lens itself, the only species of glaucoma which Beer has ever noticed quite unattended with a varicose affection of the blood-vessels of the eye. At last, the globe of the eye becomes perceptibly smaller than natural; but a complete atrophy does not ensue.

Symptoms when the case proceeds from disease of the skull or brain.

In this form of amaurosis, which usually attacks both eyes together, or at least one very soon after the other, the blindness also commences very slowly, with appearances as if every object looked at were perverted or disfigured. However, there is no black cloud, but rather an obscurity or confusion of every object. The disease in this stage is also accompanied with frequent giddiness, ugly luminous spectra, and, for the most part, with aversion to light, uncommonly lively motions of the iris, a contracted pupil, angles in the upper and lower portions of the pupillary margin of the iris; an evident turgescence of the blood-vessels of the eye, gradually augmenting with most violent headach into actual cirsophthalmia; frequent convulsive motions of the eyes and eyelids, and strabismus of one or both eyes, ending in a true deviation of one or both these organs from their natural positions. Under these symptoms, vision is afterwards entirely abolished; and the headach, though subject to remissions, grows so much worse, extending back to the spine, that the patient is often nearly frantic, and, indeed, after a time, a destruction of the external senses happens, followed by that of the intellectual faculties. The first of the external senses which is lost, is always the hearing, which infirmity is next followed by loss of the smell, or taste, or both these senses together; and then the memory, and other intellectual powers decline. In this stage of the disorder, the eyeball not unfrequently protrudes from the orbit; a pathognomonic symptom, to which Beer attaches great importance, because it is an infallible criterion of a diseased state of the bones of the orbit, of the parts which invest this cavity, and of the optic nerve and dura mater, in the sella turcica. In such cases, complete mania now usually follows, and this sometimes in its most violent form, unless the patient happen to be first carried off by paralytic symptoms; life, under these circumstances, never lasting any considerable time.

As far as our external senses can discover, the cause of both these forms of amaurosis, as the title of this section specifies, lies in certain morbid changes in the structure of the optic nerve and its investments, or in diseased alterations of the bones of the cranium, the dura mater, and the brain. But, how these changes arise, is not so easy of explanation. The morbid changes in the structures above mentioned, which Beer had himself ascertained by dissection, consist in a real induration of the optic nerves, and an adhesion of them to their sheaths, while within the skull these ash-coloured, gray, very much diminished nerves presented no vestige of medullary structure even as far as their origin from the brain. On the contrary, the optic thalamus presented externally its natural appearance. The retina seemed to have lost its pulpy matter, was tough, not easily torn, and appeared to consist but of a vascular membrane. In one example, although both eyes had been completely deprived of sight together, Beer found only the retina and optic nerve of the left side in this state of atrophy as far forwards as the point of union in the sella turcica. On the other hand, the optic nerve of the right eye was hard, without being in the least dwindled, and was closely adherent to its external coverings. Anteriorly to their decussation, nothing at all preternatural in either nerve could be discerned. But, the left corpus striatum was so indurated, that a very sharp strong scalpel was required for its division, though in colour and shape it was perfectly natural. On this side, also, the plexus choroides was entirely wanting. In three amaurotic patients of this kind, Beer found hydatids between the coverings of the optic nerve, and, where such hydatids lay, the medullary matter seemed to have been displaced by their pressure. With the utmost care, he could not trace the ophthalmic ganglion.

Paw also found in the optic nerve a large hydatid, which had produced amaurosis. (*Obs. Anat. Rarior. Obs.* 2.) In Mr. Heaviside's museum, there is a preparation of the optic nerve of an amaurotic eye, where a tumor of considerable bulk has grown from the neurilema. (See *Wardrop's Essays on the Morbid Anatomy of the Human Eye, Vol.* 2, *p.* 157.) In this work are specified examples of various other morbid changes of the optic nerve, especially calculous concretions within it, the presence of a viscid, muddy, gray fluid, in the thickened neurilema, instead of pulp, a dwindling of the nerve, &c.

To the present description of cases, Beer refers the instance recorded by Haller, (*Opusc. Pathol. Obs.* 65, *p.* 172,) in which a calcareous mass was found betwixt the membrane of Ruysch, and the vitreous humour. According to Beer, there is preserved in the pathological and anatomical museum of the general hospital at Vienna, an eye, distended with a similar osseous mass, without the capsule of the lens being at all affected. Examples, in which the amaurotic blindness arose from abscesses in the brain, are reported by Ballonius (*Paradigmota Hist.* 7), by Pelargus, (*Med. Jahrg.* 3, *p.* 198;) Peyronie (*Mém. de l'Acad. Royale de Chir.* 1, *p.* 212,) Schaarschmid (*Berlin Nachrichte*, 1740, *No.* 26,) Langenbeck, (*Neue Bibl.* 1, *p.* 61,) and Mr. Travers, (*Synopsis, p.* 143.) The latter author has recorded an instance in which a firm lardaceous tumor, of the size of a garden bean, situated on the same side as the blindness, compressed the optic ganglion and nerve at its origin from it, (*Synopsis, p.* 151.) I have seen a case of amaurosis, in which a tumor as large as a middling-sized apple was found in the anterior lobe of the brain, attended with protrusion of the eye, and vast destruction of the bones. Mr. Travers has seen amaurosis produced by a medullary fungus of the brain. A case, occasioned by disease of the thalamus, is related by Villeneuve (*Journ. de Med. continué* 1811, *Fevr. p.* 98;) another of a tumor of the thalamus on the same side as the blindness, is recorded by Ford, (*Med. Commun. Vol.* 1, *No.* 4;) and other swellings in various parts of the brain are described in *Ephem. Nat. Cur. Dec.* 3, *Ann.* 9, and 10, *Obs.* 253; *De Haen's Ratio Medendi, P.* 6, *p.* 271; *Journ. des Savans*, 1697; *Muzell's Wahrnehm.* 2, *No.* 13; *Plater, Obs. lib.* 1, p. 108; *Thomann, Annalen für* 1800, p. 400, &c. On this part of the subject, I beg leave to refer also particularly to my friend Mr. Wardrop's valuable *Essays on the Morbid Anatomy of the Human Eye, Vol.* 2, *p.* 174, *&c.*

The morbid alterations of the bones of the cavity of the skull mostly happen at its basis, and not only may caries take place, but still more frequently exostoses of various forms, which are sometimes so small that they are first detected by the bone giving the feel of a rough grater. At the same time they are so sharp, that if the finger be passed rudely over them, it will be painfully hurt. In these cases, the bones of the cavity of the skull are always found extremely thin; the diploe is almost entirely wanting, and the parietes of the orbit are preternaturally diaphanous, and in some places imperfect. Beer speaks of a lady's skull, who had been completely blind, and for some weeks previously to her death insensible, in which instance scarcely any part of the cavity of the skull could be carelessly touched, without risk of scratching the fingers with spiculæ. Once in an amaurotic boy, who, for a short time before his death, was so insane, that he used to devour his own excrement, Beer found at the side of the sella turcica a long considerable spicula, which passed directly through the optic nerves at the place of their decussation. A case of amaurosis produced by a spicula of bone, injuring the opposite side of the brain, is related by Anderson. (See *Trans. of the Society of Edinb. Vol.* 2.) Sometimes the ethmoid bone has been found carious, (*Ballonius, Paradigmata, No.* 7); sometimes other parts of the cranium. (*Mursinna, Beobacht* 1, *No.* 6; *Schmueker, Vermishchte Sehrift.* 2, *p.* 12.) Nor is it unfrequent to find the medullary substance of the brain itself as soft as pap, while the cortical substance is full of blood-vessels and unusually firm, the convolutions being hardly distinguishable.

Many of the causes of amaurosis are of such a nature, as to render the disease totally incurable. Of this description is fungus hæmatodes, in which the structure of the retina and optic nerve is changed in a remarkable manner, the whole cavity of the eye-ball becoming filled with a substance resembling medullary matter, and the optic nerve changed in its form, colour, and structure. (See *Wardrop's Essays on the Morbid Anatomy of the Human Eye, Vol.* 2, *p.* 156, 8*vo. Lond.* 1818.)

On the authority of Ecker, one case is upon record, where the cause of amaurosis depended upon an aneurism of the central artery of the retina. (*Pinel, Nosographie Philos. Vol.* 2, *p.* 122.)

In another instance, the macula lutea, which is naturally a yellow spot near the centre of the retina, was found black. (*Mém. de la Société Méd. d'Emulation, an.* 1798.)

Bonetus, in his *Sepulchretum Anatomicum, lib.* 1, *sect.* 18, describes various cases which were quite incurable: after death, the blindness in one instance was found to be occasioned by an encysted tumor, weighing fourteen drams, situated in the substance of the cerebrum, and pressing on the optic nerves near their origin. In a second, the blindness was produced by a cyst, containing water, and lodged on the optic nerves, where they unite. In a third, it arose from a caries of the os frontis, and a consequent alteration in the figure of the optic foramina. In a fourth, the cause of the disease was a malformation of the optic nerves themselves. In some of the instances, in which no apparent alteration can be discovered in the optic nerve, the late Mr. Ware conjectured, that a dilatation of the anterior portion of the circulus arteriosus may be the cause of the affection. The circulus arteriosus is an arterial circle, surrounding the sella turcica, formed by the carotid arteries on each side, branches passing from them to meet each other before, and other branches passing backwards, to meet branches from the basilary artery behind. The anterior part of the circulus arteriosus lies directly over, crosses, and is in contact, with the optic nerves, and just in the same way as the anterior branches lie over the optic nerves, the posterior ones lie over the nervi motores oculorum. Hence Mr. Ware attempted to refer the amaurosis itself, and the paralytic affection of the eye-lids, and muscles of the eye, sometimes attendant on the complaint, to a dilatation of the anterior and posterior branches of the circulus arteriosus. The frequently diseased state of the trunk, or small branches of the carotid arteries at the side of the sella turcica, is noticed by Dr. Baillie in his useful work on Morbid Anatomy, and, he says, the same sort of diseased structure is also found in the basilary artery and its branches. (See *Ware's Chir. Obs. on the Eye.*)

L. Heister, Apologia et uberior Illustratio Systematis sui de Cataracta, Glaucomate, et Amaurosi, 12*mo. Altorf,* 1717. *J. B. G. Œhme, de Amaurosi,* 4*to. Lips.* 1748, *in Halleri Disp. Chir.* 2, 265. *Jos. Warner, Description of Human Eye, and Diseases,* 8*vo. Lond.* 1754. *Trnka de Krzowitz, Historia Amauroscos,* 8*vo. Vindob.* 1781. *Gius. Flajani, Collezione d'Osservaz. &c. T.* 4, *p.* 173. 187, 8*vo. Roma,* 1803. *D. G. Kieser, Ueber die Natur, Ursachen, Kennzeichen und Heilung des schwarze Staars,* 8*vo. Gott.* 1811. *Langenbeck, Neue Bibl. für die Chirurgie, B.* 1; *Hannover,* 1815. *J. Beer, Lehre von den Augenkrankheiten, B.* 2, 8*vo. Wien,* 1817. *James Wardrop, Essays on the Morbid Anatomy of the Human Eye, Vol.* 2, 8*vo. Lond.* 1818. *The two latter books are works of the highest merit; and, as we have no translation of the first, I have thrown a good deal of the information, which it contains on amaurosis, into the present Edition. B. A. Winkler, De Amaurosi,* 12*mo. Berol.* 1818. *Vermischte Chirurgische Schriften von J. L. Schmucker, B.* 2, *Berlin. Ed.* 2. 1786. *Remarks on Ophthalmy, &c. by James Ware. Inquiry into the causes preventing success in the extraction of the Cataract, &c. by the same. Osservazioni sulle Malattie degli Occhi di A. Scarpa, Venez.* 1802. *This book has gone through five Editions in Italy. The last, which is much improved, has been well translated by Mr. Briggs. W. Hey in Practical Observations in Surgery, and Med. Obs. and Inquiries, Vol.* 5. *Schmucker's Wahrnehmungen, B.* 1, *p.* 273. *Richter's Anfangsgründe der Wundarzneykunst, B.* 3. *Chandler's Treatise of the Diseases of the Eye, chap.* 24. 8*vo. Lond.* 1780. *Some scattered remarks in the posthumous work on the diseases of the eye, of the late J. C. Saunders, &c. De Wenzel, Manuel de l'Oculiste, ou Dictionaire Ophthalmologique,* 8*vo. Paris,* 1808. *J. Stevenson, On the Nature, &c. of the different Species of Amaurosis.* 8*vo.* 1821. *B. Travers' Synopsis of the Diseases of the Eye, &c.* 8*vo. Lond.* 1820, *subsequently republished; a work abounding in original and valuable remarks.*

Many additional observations, connected with the subject of *Amaurosis*, will be found in the articles *Cataract, Diplopia, Fungus Hæmatodes, Gutta Serena, Hemeralopia, Hemiopia, Nyctalopia, Sight, Defects of, &c.*

AMBE. (from αμϐη, the projecting edge of a rock.) An old chirurgical machine for reducing dislocations of the shoulder, and so called, because its extremity projects, like the prominence of a rock. Its invention is referred to Hippocrates. The ambe is the most ancient mechanical contrivance for the above purpose; but, it is not at present employed. Indeed, it is scarcely to be met with in the richest cabinets of surgical apparatus. It is composed of a piece of wood, rising vertically from a pedestal. With the vertical piece is articulated, after the manner of a hinge, an horizontal piece, with a gutter formed in it, in which the luxated limb is laid and secured with straps. The patient places himself on one side of the machine; his arm is extended in the gutter, and secured; the angle, formed by the union of the ascending piece, and by the horizontal branch, is lodged in the armpit, and then the horizontal branch is depressed. In this way extension is made, whilst the vertical part makes counter extension, and its superior part tends to force the head of the humerus into the articular cavity. But, there is nothing to fix the scapula, and the compression made by the superior portion of the vertical piece of the machine tends to force the head of the humerus into the glenoid cavity, before it is well disengaged by the extension. (See *Boyer on Diseases of the Bones, Vol. II.*)

AMBLYOPIA. (from αμϐλυς, dull, and ωψ, the eye.) Hippocrates means by this word, in his Aph. 31. Sect. 3. the dimness of sight, to which old people are subject. Modern writers generally understand by amblyopia incomplete amaurosis, or the weakness of sight attending certain stages and forms of this disorder. (See *L'Encyclopedie Methodique; Partie Chirurgicale; Art. Amblyopie.*)

AMMONIÆ MURIAS. AMMONIA MURIATA. *Sal Ammoniac.* Its chief use in surgery is as an external discutient application. (See *Lotio Ammon. Muriatæ cum Aceto.*)

Mr. Justamond recommends the following application to milk-abscesses: ℞ Ammoniæ Muriatæ ℥j. Spiritus Roris marini lbj. Misce. Linen rags are to be wet with the remedy, and kept continually applied to the part affected.

There can be little doubt of the utility of this lotion in dispersing the induration, left after mammary abscesses; but, while these cases are accompanied with much pain, tension, and inflammation, emollient fomentations and poultices are to be preferred.

AMPUTATION. The operation of cutting off a limb, or other part of the body, as the breast, penis, &c.

Such an operation frequently becomes indispensably proper, on the principle of sacrificing a branch, as it were, for the sake of taking the only rational chance of saving the trunk itself. Indeed, the suggestion of this measure, in cases of mortification, where there is no chance of the parts recovering, may be said to be derived from nature herself, who by a process, to which I shall advert in speaking of *mortification*, detaches the dead from the living parts; this separation is followed by cicatrization, and the patient recovers.

The necessity for amputation has always existed, and ever will continue, as long as the destructive effects of injuries and diseases of the limbs cannot be obviated in any other manner. As Graefe observes, there was once a period, (I should say, about forty years ago) when the operation was more frequently practised, than at present, and this fact is to be imputed less to the caprice of surgeons, than to the imperfection of the means which used to be employed for the relief of local diseases. For then aneurisms of the limbs, and some other cases, at present treated with success, were always deemed incurable without amputation. Boucher, Gervaise, Faure, and Bilguer inveighed against the frequent performance of amputation on the field of battle; yet their arguments must prove of little value, unless a path were at the same time traced, which would conduct us to the method of remedying the circumstances which form the necessity for the operation. When this condition is fulfilled, and more effectual modes of treatment are devised, as for instance, with respect to the gunshot wounds, specified by Bilguer, then the necessity for amputation in such cases would cease of itself. (*Normen fur die Ablösung grösserer Gliedmassen*, *p.* 13, 4*to. Berlin*, 1812.)

As the author of another valuable modern work has said, it is an excellent observation, founded on the purest humanity, and justified by the soundest professional principles, that to *save one limb is infinitely more honourable to the surgeon, than to* have performed numerous amputations, however successful; but, it is a remark, notwithstanding its quaintness, fully as true, that it is much better for a man to "to live with three limbs, than to die with four." (*Hennen on Military Surgery*, *p.* 251, *Ed.* 2.)

To this saying should be added the reflection, that some unfortunate beings, influenced by a relish for life, have been known to submit to the loss of all their legs and arms, and yet recover. In the Hôtel des Invalides at Paris, mutilated objects are in recollection, who had lost their thighs and arms, so that, unless assisted, they could not stir, and it was necessary to feed and wait upon them, like new-born infants. (*Morand Opusc. de Chir. p.* 183, *and Graefe Op. cit. p.* 23.)

The amputation of the large limbs was anciently practised under many disadvantages. The best way of making the incisions was unknown; the ignorance of the old surgeons about the right method of stopping hemorrhage was the death of a large proportion of the patients, who had courage to submit to the operation; the mode of healing the wound by the first intention was not understood, or not duly appreciated; and the instruments were as awkward and clumsy, as the dressings were irritating and improper.

Modern practitioners have materially simplified all the chief operations in surgery; an object, which has been accomplished not merely by letting anatomical science be the main guide of their proceedings; not simply by devising more judicious, and less painful methods; not only by diminishing the number, and improving the construction of instruments; but, also, in a very essential degree, by abandoning the use of a multitude of external applications, most of which were useless or hurtful.

The Greek, Roman, and Arabian practitioners amputated limbs with feelings of alarm, and, in general, with the most melancholy results; while modern surgeons proceed to the operation completely fearless, well knowing that it mostly proves successful: hence, as Graefe justly remarks, nothing can be more evident, than that the patient's safety must depend very much upon the kind of practice. (See *Normen fur die Ablösung grösserer Gliedmassen*, *p.* 1.) By practice, is here implied the mode in which the operation is performed, the way in which the wound is dressed, and the whole of the after-treatment.

But, much improved as amputation has been, it cannot be dissembled, that it is an operation at once terrible to bear, dreadful to behold, and sometimes severe and fatal in the consequences which it itself produces, while the patient, if saved, is left for ever afterwards in a crippled, mutilated state. Hence it is the surgeon's duty never to have recourse to so serious a proceeding, without a perfect and well-grounded conviction of its necessity. Amputation should be generally regarded as the last expedient to which a surgeon ought to resort; an expedient justifiable, as a late writer says, only when the part is either already gangrenous, or the seat of so much injury, or disease, that the attempt to preserve it any longer, would expose the patient's life to the greatest danger. (*Dict. des Sciences Med. T.* 1, *p.* 472.)

Although, says a distinguished modern surgeon, this amounts to a confession, that the cure of some local disorders is not within the limits of our art, yet, on the other hand, it furnishes a proof, that surgery may be the means of saving life under circumstances, which, without its assistance, would infallibly have a fatal termination. The operation is adopted as the safest measure: the cause is removed for the prevention of consequences. (*Graefe, Op. cit. p.* 14.)

Nothing can be more absurd, or more misapplied, than the censures sometimes passed upon amputation, because the body is mutilated by it, &c. Although, as a modern writer remarks, the objection proves the limitation of human knowledge and ability, it must be very unfair on this account to throw blame on surgery, or the practitioner who thus saves the patient's life. For, without dwelling upon the fact, that a humane surgeon would never amputate through a mere love of operating, and without urgent cause, one may simply ask, are all diseases in their nature curable? Does not the surgeon cure such as are curable, without mutilation? And are not cases, which were in the beginning remediable, often first brought to the surgeon, when from neglect they have become totally incurable? Is it not his duty then to employ the only means left for saving the patient? And is not the preservation of a long and healthy life a compensation for the sacrifice? Would it not be just as reasonable to blame an architect, when the irresistible force of lightning or a bomb destroys his building? Indeed, is it not rather a greater honour to surgery, that, even when death has already taken possession, as it were, of a part, and is threatening inevitable destruction to the whole, a means is yet furnished, not only of saving the patient's life, but of bringing him into a state, in which he may recover his former good health? (*Brünninghausen, Erfahrungen und Bemerkungen über Die Amputation, p.* 11, 12*mo. Bamberg*, 1818.)

Though amputation is in every respect much better, than in former times, and its right performance is by no means difficult, I would not wish to be thought to say, that it is always or even usually done *secundum artem*, because long opportunities of observation have convinced me of the contrary; and the reason of the knife being yet so badly handled in this part of surgery, may generally be imputed to carelessness, slovenly habits, or, what is as bad, a want of ordinary dexterity. There are several egregious faults in the method of amputating, which even many hospital surgeons in this metropolis are guilty of; but these we shall find, when we criticise them, are, for the most part, easily avoidable, without any particular share of skill being required. A greater difficulty is to ascertain with precision the cases, which demand the operation; those in which it may be dispensed with; and the exact periods at which it should be practised. These are considerations requiring profound attention, and the brightest talents. The most expert operator (as Mr. O'Halloran observes) may not always be the best surgeon. To do justice to the sick and ourselves, we must in many cases, rather avoid, than perform, capital operations; and with respect to amputation, if we consider the many cases, in which it has been unnecessarily undertaken, or done at unseasonable periods, it may be suspected, that this operation, upon the whole, may have done more mischief, than good. At all events, it is not enough for a surgeon to know *how* to operate; he must also know *when* to do it. (See *O'Halloran on Gangrene and Sphacelus: preface.*)

For such reasons, I shall first take a view of the circumstances, under which, the best surgeons deem amputation necessary: though it may be proper to observe, that, in each of the articles, relative to the particular diseases and injuries, which ever call for the operation, additional information will be offered.

1. *Compound fractures.*

In a compound fracture, the necessity for amputation is not altogether proportioned to the seriousness of the accident, but, also frequently depends in part upon other circumstances. For example, in the field and on board of a crowded ship, it is not constantly in the surgeon's power to pay such attention as the cases demand, nor to procure for the patient the proper degree of rest and good accommodation. In the field, there is often a necessity for transporting the wounded from one place to another. Under these circumstances, it is proper to have immediate recourse to amputation, in numerous cases of bad compound fractures, some of which, perhaps, might not absolutely demand the operation, were the patients so situated, as to be capable of receiving all the advantages of the best and most scientific treatment in a well ventilated quiet house, or hospital, furnished with every desirable convenience. At the same time, daily experience proves, that there are many other cases, in which it would be improper to have recourse to the knife, even under the most unfavourable circumstances of the above description. So, when a compound fracture occurs, in which the soft parts have not been considerably injured; in which the bones have been broken in such a direction that they can be easily set and kept in their proper position, or in which there is only one bone broken, amputation would be unnecessary and cruel. But, when the soft parts have been more extensively hurt, and the bones have been so badly broken, that perfect quietude and incessant care are required to afford any chance of recovery, it is a good general rule to amputate whenever these advantages cannot be obtained.

The bad air in crowded hospitals and large cities, a circumstance so detrimental to wounds in general, is another consideration which may seriously lessen the chances of saving a badly broken limb, and should be remembered in weighing the reasons for and against amputation.

On this part of the subject, I find the sentiments of Graefe interesting: besides an absolute, says he, there is a relative, necessity for amputation: it is the most mournful, and proceeds altogether from unfavourable external circumstances, though, alas! in many cases nearly unavoidable, when life is to be preserved. In war, every bloody action furnishes proof of what has been stated. The number of the wounded is immense; the number of surgeons for the duty too limited. The supplies, most needed, are at a distance. In these emergencies, though the military surgeon may from routine and genius be able to suggest the quickest method of obtaining what is wanted, know how to avail himself of every advantage, which circumstances permit, and contrive tolerable substitutes for such things as are deficient, yet, this will not always do. Were we (says Graefe) here to complain of the government not providing due assistance for the defenders of our native soil, to many the remonstrance would only appear reasonable. Yet, they who manage the medical affairs of the Prussian army may not constantly have it in their power to avert the inconvenience. The general cannot foretel the number and nature of the wounds, which may happen, so as to enable the medical department to take with them exactly the apparatus required, without encumbering the army with a redundance of useless articles. The enemy, perhaps, captures the medical stores; or the rapid movements of particular corps cut us off from the principal depôts. Detachments often skirmish at remote points. The hospitals may lie several miles in the rear of the line; and, for want of means, the transport of the imperfectly dressed wounded may continue night and day. Hardly are the sufferers brought into the nearest hospital, in the most pitiful state from pain, anxiety, and cold, when an order is given to break up, and they must be conveyed still further towards their grave; and a thousand other circumstances, as Graefe observes, which deprive the wounded of the requisite attendance, and essential number of surgeons, together with the most necessary stores, make it desirable to simplify every wound as much as possible; which, indeed, is the only means of shunning the reproach, that while we are endeavouring to save one man's limb, we let another die.

Who doubts, says Graefe, that a soldier with a gunshot wound, complicated with a smashed state of the bones, may sometimes be saved, without loss of his limb, by employing all the means, which the resources of surgery offer? But these very resources are often wanting in a campaign; and the business of dressing the patient would occupy the surgeon several hours daily, during which his useful assistance could not be extended to other sufferers. Notwithstanding the utmost care, the removal of patients from one place to another frequently makes their wounds extremely dangerous, or fatal; and we now lose many a man, who, had he undergone amputation, would have been able to bear the journey. (See *Normen für die Ablösung grösserer Gliedmassen, p.* 15. 16.)

From what I have seen of the ill effects of moving patients with bad compound fractures of the lower extremity, produced by gunshot violence, I am convinced, that, as a general rule, it is better to perform amputation; but, if this be not done, and an attempt is to be made to save the member, it will be more humane, when the army is retreating, and the enemy are not savages, to leave such wounded behind, than subject them to all the fatal mischief of hastily and roughly transporting them in such a condition. It gives me particular pleasure to find the preceding sentiment confirmed by Dr. Hennen, whose knowledge and experience in military surgery entitle all his opinions to the greatest attention: in noticing what ought to be done with the wounded, when the army is compelled to retreat, he says, "it then becomes the duty of a certain proportion of the hospital staff to devote themselves for their wounded, and become prisoners of war along with them; and it may be an encouragement to the inexperienced, while it is grateful to me, to observe, that I have never witnessed, nor traced, on inquiry, an act of unnecessary severity practised either by the French or English armies on their wounded prisoners."

Compound fractures of the thigh, produced by gunshot violence, too often have an unfavourable termination, especially when the accident has been caused by grape-shot, or even a musket-ball, fired from a moderate distance, and the patient is moved from one place to another after the receipt of the injury. In the military hospital at Oudenbosch, in the spring of 1814, I had charge of about eight bad compound fractures of the thigh, of which cases only one escaped a fatal termination. This was an instance, in which the femur was broken a little way above the knee. Another patient was extricated by amputation from the perils, immediately arising from the splintered displaced state of the bone, the serious injury of the muscles, and enormous abscesses, but was unfortunately lost by secondary hemorrhage. All these patients had not merely been struck by grape-shot, or else by balls fired from a short distance, but they had been moved from Bergen-op-Zoom into my hospital, five or six days after the receipt of the injury, the very worst period possible, on account of the inflammation being then most violent. From the ill success of these cases, many a surgeon, who saw them, might be inclined to think, that immediate amputation ought generally to be performed for all compound fractures of the thigh, as soon after the receipt of the injury as possible. And such is my own sentiment, whenever the accident has been caused in the violent manner above specified, or whenever the patient must be moved any distance in a waggon after the occurrence of the injury. It may be right to state, however, that I have known more than one compound fracture of the thigh cured, where the accident had not been occasioned by gunshot violence, and I have been informed of one or two successful cases, where the bone was broken by a pistol-ball. In St. Bartholomew's hospital, two compound fractures of the thigh were pointed out to me some time ago, as cases likely to end favourably. However, these may only have been lucky escapes, deviations from what is common, and not entitled to any stress, with the view of affecting the general excellent rule of amputating where the thigh-bone is broken by gunshot violence.

As Mr. Guthrie has accurately observed, one circumstance which increases the danger of fractures of the femur, from gunshot violence, is, that the bone is very often broken obliquely, the fracture extending far above and below the point immediately struck by the ball. (*On Gunshot Wounds, p.* 189, 190.) This disposition of the thigh-bone to be splintered for several inches when hit by a ball, and the increased danger, arising from the occurrence, are also very particularly commented upon by the experienced Schmucker, who was surgeon-general to the Prussian armies in the campaigns of Frederick the Great. (See his *Vermischte Chirurgische Schriften, B.* 1. *p.* 39. 8*vo. Berlin.* 1785.) In several of the cases, under the care of Dr. Cole and myself in Holland, the bone was split longitudinally, to the extent of seven or eight inches.

According to Schmucker, all fractures of the middle or upper part of the femur, are attended with great danger. "But (says he) if the fracture be situated at the lowest part of the bone, the risk is considerably less, the muscles here not being so powerful; in such a case, therefore, amputation should not be performed, before every other means has been fairly tried; and very frequently I have treated fractures of this kind with success, though the limb sometimes continued stiff. But (says Schmucker) if the bone be completely fractured or splintered by a ball at its middle, or above that point, I never wait for the bad symptoms to commence, but amputate ere they originate, and, when the operation has been done early enough, most of my patients have been saved. However, when some days had transpired, and inflammation, swelling, and fever had come on, I must candidly confess, that the issue was not always fortunate. Yet the operation should not, on this account, be dispensed with; for, if only a few can thus be saved out of many, some benefit is obtained, as, without this step, such few would also perish." (*Vermischte Chir. Schriften*, *B.* 1. *p.* 42.) What I saw of compound fractures of the thigh, after the assault on Bergen-op-Zoom, we may remark, coincides with the results of Schmucker's ample experience; for the only two patients, who survived the bad symptoms proceeding directly from the fracture, were, one whose femur was broken near the knee; and another, whose limb I took off, on account of a fracture of the middle of the bone, accompanied with abscesses of surprising extent. The latter was a case, however, in which the limb ought to have been removed earlier. The following remarks, by Mr. Guthrie, I consider judicious and correct.

"The danger and difficulty of cure, attendant on fractures of the femur from gunshot wounds, depend much on the part of the bone injured; and, in the consideration of these circumstances, it will be useful to divide it into five parts. Of these, the head and neck included in the capsular ligament, may be considered the first; the body of the bone, which may be divided into three parts, and the spongy portion of the lower end of the bone exterior to the capsular ligament, forming the fifth part. Of these, the fractures of the first kind are, I believe, always ultimately fatal, although life may be prolonged for some time. The upper third of the body of the bone, if badly fractured, generally causes death at the end of six or eight weeks of acute suffering. I have seen few escape, and then not with a useful limb, that had been badly fractured in the middle part. Fractures of the lower or fifth division, are in the next degree dangerous, as they generally affect the joint; and the least dangerous are fractures of the lower third of the body of the bone. Of these even I do not mean to conceal, that when there is much shattered bone, the danger is great, so that a fractured thigh by gunshot, even without particular injury of the soft parts, is one of the most dangerous kinds of wounds that can occur." (See *Guthrie on Gunshot Wounds*, *p.* 190.)

In compound fractures, as Mr. Pott has correctly pointed out, there are three points of time when amputation may be proper. The first of these is immediately, or as soon as possible after the receipt of the injury. The second is, when the bones continue for a great length of time without any disposition to unite, and the discharge from the wound has been so long, and is so large, that the patient's strength fails, and general symptoms foreboding dissolution come on. The third is, when a mortification has taken such complete possession of the soft parts of the inferior portion of the limb, quite down to the bone, that upon the separation of such parts, the bone or bones shall be left bare in the interspace.

The first and second of these are matters of very serious consideration. The third hardly requires any.

When a compound fracture is caused by the passage of a very heavy body over a limb; such, for instance, as the broad wheel of a waggon or loaded cart, or by the fall of a very ponderous body on it, or by a cannon shot, or by any other means so violent as to break the bones into many fragments, and so to tear, bruise, and wound the soft parts, that there shall be good reason to fear, that there will not be vessels sufficient to carry on the circulation with the parts below the fracture, it becomes, as Mr. Pott observes, a matter of the most serious consideration, whether an attempt to save such a limb will not occasion loss of life. This consideration must be before any degree of inflammation has seized the part, and therefore must be immediately after the accident. When inflammation, tension, and a disposition to gangrene in the limb have arisen, the period is highly disadvantageous for operating, and the patient's chances of being saved by amputation, under these circumstances, are much smaller than before the changes here spoken of had taken place. At the same time, there are certain examples of mortification from external causes, where, as far as one can judge from the results of later experience than that of Mr. Pott, the surgeon should not defer amputation, even though the disorder be yet in a spreading state, attended with considerable swelling and tension reaching far up the limb. This is a subject, however, which will require more explanation hereafter. (See what is presently said on *Mortification.*) Nor are the cases, to which reference is made, meant to affect the general truth of the observation, delivered by the most experienced surgeons of every age, that when a limb is extensively swelled and inflamed, with a part of it either in a state of spreading mortification, or ready to become gangrenous, the period is so unfavourable for amputation, that very few patients, so circumstanced, ever recover after the operation. Nor is it meant to be insinuated, that in the very cases, which form exceptions to the general rule of not amputating before the tendency to gangrene has ceased, the patient might not have had an infinitely better chance of his life, had the operation been done immediately after the first receipt of the injury, before any disposition to gangrene had bad time to be produced.

The necessity of immediate or very early decision, in this case, makes it a very delicate part of practice; for, however pressing the case may seem to the surgeon, it will not, in general, appear in the same light to the patient, to the relations, or to bystanders. They will be inclined to regard the proposition as arising from ignorance, or an inclination to save trouble, or a desire to operate; and it will often require more firmness on the part of the practitioner, and more resignation and confidence on the part of the patient, than is generally met with, to submit to such a severe operation, in such a seeming hurry, and upon so little apparent deliberation; and yet it often happens, that the suffering this point of time to pass, decides the patient's fate.

This necessity of early decision arises from the quick tendency to mortification, which ensues in the injured limb, and too often ends in the patient's death. That this is no exaggeration, says Pott, melancholy and frequent experience evinces, even in those whose constitutions, previous to the accident, were in good order; but much more in those, who have been heated by violent exercise, or labour, or liquor, or who have led very debauched and intemperate lives, or who have habits naturally inflammable and irritable. This is often the case when the fracture happens to the middle part of the bones, but is much more likely to happen when any of the large joints are concerned. In many of these cases, a determination for or against amputation, is really a determination for or against the patient's existence.

That it would have been impossible to have saved some limbs, which have been cut off, no man will pretend to say; but this does not render the practice injudicious. Do not the majority of those who get into the above hazardous condition, and on whom amputation is not performed, perish in consequence of their wounds? Have not many lives been preserved by amputation, which, from the same circumstances, would otherwise most probably have been lost?

Pressing and urgent as the state of a compound fracture may be, at this first point of time, still it will be a matter of choice, whether the limb shall be removed or not; but, at the second period, the operation must be submitted to, or the patient must die.

The most unpromising appearances at first, do not necessarily, or constantly end unfortunately. Sometimes, after the most threatening first symptoms, after considerable length of time, great discharges of matter, and large exfoliations of bone, success shall ultimately be obtained, and the patient shall recover his health and the use of his limb.

But sometimes, after the most judicious treatment through every stage of the disease; after the united efforts of physic and surgery; the sore, instead of granulating kindly, and contracting daily to a smaller size, shall remain as large as at first, with a tawny, spongy surface, discharging a large quantity of thin sanies, instead of a small one of good matter; the fractured ends of the bones, instead of tending to exfoliate, or to unite, will remain as perfectly loose and disunited as at first, while the patient shall lose his sleep, his appetite, and his strength; a hectic fever, with a quick, small, hard pulse, profuse sweats, and colliquative purging, contributing at the same time to bring him to the brink of the grave, notwithstanding every kind of assistance: in these circumstances, if amputation be not performed, Mr. Pott asks, what else can rescue the patient from destruction?

The third and last period is a matter which does not require much consideration. Too often the inflammation consequent upon the injury, instead of producing abscess and suppuration, tends to gangrene and mortification, the progress of which is often so rapid, as to destroy the patient in a very short space of time, constituting that very sort of case in which amputation should have been immediately performed. But sometimes even this dreadful malady is, by the help of art, put a stop to, but not until it has totally destroyed all the surrounding muscles, tendons, and membranes quite down to the bone, which, upon the separation of the mortified parts, is left quite bare, and all circulation between the parts above and those below, is by this totally cut off. In this instance, whether the surgeon saw through the bare bone, or leave the separation to be effected by nature, the patient must lose his limb. (See *Pott's Remarks on the Necessity, &c. of Amputation in certain Cases, &c. Chir. Works, vol.* 3.)

For the consideration of a variety of complicated cases, which affect the question of amputation in compound fractures, I must refer to the article *Gun-shot Wounds.*

2. *Extensive contused and lacerated wounds.*

These form the second class of general cases requiring amputation. Wounds without fracture are not often so bad as to require this operation. When a limb, however, is extensively contused and lacerated, and its principal blood-vessels are injured, so that there is no hope of a continuance of the circulation, the immediate removal of the member should be recommended, whether the bones be injured or not. Also, since no effort on the part of the surgeon can preserve a limb so injured, and such wounds are more likely to mortify, than any others, the sooner the operation is undertaken the better.

In these cases, as in those of compound fractures, though amputation may not always be necessary at first, it may become so afterwards. The foregoing observations, relative to the second period of compound fractures, are equally applicable to badly lacerated wounds, unattended with injury of the bones. Sometimes a rapid mortification comes on; or a profuse suppuration, which the system can no longer endure. (*Encyclopédie Méthodique; Partic Chir. t.* 1, *p.* 80.)

3. *Cases in which part of a limb has been carried away by a cannon ball.*

When part of a limb has been torn off by a cannon-ball, or any other cause, capable of producing a similar effect, the formation of a good and serviceable stump, the greater facility of healing the clean, regular wound of amputation, and the benefit of a far more expeditious, as well as of a sounder cure, are the principal reasons which here make the operation advisable.

This was an instance, in which some former surgeons disputed the necessity of amputation. They urged as a reason for their opinion, that the limb being already removed, it is better to endeavour to cure the wound as speedily as possible, than increase the patient's sufferings and danger, by making him submit to amputation. It must be remembered, however, that the bones are generally shattered, and reduced into numerous fragments; the muscles and tendons are unequally divided, and their ends torn and contused. Now, none of the old surgeons questioned the absolute necessity of extracting the splinters of bone, and cutting away the irregular extremities of the tendons and muscles, which operations would require a longer time, than amputation itself. Besides, we should recollect, that, by making the incision above the injured part, so as to be enabled to cover the bone with flesh and integuments, perfectly free from injury, the extent of the wound is so diminished, that the healing can be accomplished in one third of the time which would otherwise be requisite, and a much firmer cicatrix is also obtained. Such reflections must convince us, that amputation here holds forth very great advantages. It cannot increase the patient's danger, and, as for the momentary augmentation of pain, which he suffers, he is amply compensated by all the benefits resulting from the operation. See *Gunshot Wounds.*

4. *Mortification.*

Mortification is another cause, which, when advanced to a certain degree, renders amputation indispensably proper. We have noticed, that bad compound fractures, and wounds, often terminate in the death of the injured limb. Such surgeons as have been determined, at all events, to oppose the performance of amputation, have pretended, that the operation is here totally useless. They assert, that when the mortification is only in a slight degree, it may be cured, and that when it has spread to a considerable extent, the patient will perish, whether amputation be performed or not. But this way of viewing things is so contrary to facts, and the experience of every impartial practitioner, that I shall make no attempt to refute the assertion. While it is allowed that it would be very bad practice, to amputate on every slight appearance of gangrene, it is equally a fact, that when the disorder affects the substance of a member, the operation is generally the safest and most advantageous measure. Nay, there are, as we shall presently see, certain forms of mortification, in which the early performance of amputation is the only chance of saving the patient.

Practitioners have entertained very opposite opinions, concerning the period when one should operate in cases of mortification. Some pretend, that whenever the disorder presents itself, and especially when it is the effect of external violence, we should amputate immediately the mortification has decidedly begun to form, and while the mischief is in a spreading state. Others believe, that the operation should never be undertaken, before the progress of the disorder has stopped, even not till the dead parts have begun to separate from the living ones.

The advocates for the speedy performance of amputation declare, that the further progress of the mortification may be stopped, and the life of the patient preserved, by cutting above the parts affected. However, according to the reports of the greater number of eminent surgical writers, this practice is highly dangerous, and undeserving of confidence. Whatever pains may be taken in the operation, only to divide sound parts, there is no certainty of succeeding in this object, and the most skilful practitioner may be deceived. The skin may appear to be perfectly sound and free from inflammation, while the muscles which it covers, and the parts immediately surrounding the bone, may actually be in a gangrenous state. But even when the soft parts are found free from apparent distemper, on making the incision, still, if the operator should not have waited till the mortification has ceased to spread, the stump will almost always be attacked by gangrene. Surgeons who have had opportunities of frequently seeing wounds which have a tendency to mortify, entertain the latter opinion. Such was the sentiment of Pott, who says, that he has often seen the experiment made, of amputating a limb in which gangrene had begun to show itself, but never saw it succeed, and it invariably hastened the patient's death.

The operation may be postponed, however, too long. Mr. S. Sharp, in particular, recommended too much delay, advising the operation never to be done, till the natural separation of the mortified parts had considerably advanced. Mr. Sharp was a surgeon of immense experience. and his authority carries with it the greatest weight. But, perhaps, he was too zealous in his opposition to a practice, the peril of which he had so often beheld. When the mortification has ceased to spread, there is no occasion for further delay. We now obtain, just as certainly, all the benefits of the operation, and get rid of a mass of putridity, the exhalations from which poison the atmosphere which the patient breathes, and are highly detrimental to his health. Nay, according to the reports of writers, patients in these circumstances may actually fall victims to the absorption of the putrid matter which is suffered to remain too long. However, this danger would not be so considerable as that which would arise from too precipitate an operation; and it is better to defer amputation a little more than is absolutely requisite, than run any risk of doing the operation before it is certain, that the parts have lost their tendency to gangrene.

In the article *Mortification*, we have noticed particular cases of gangrene, where, according to Larrey's experience, the surgeon is not to wait for the line of separation being formed, but have recourse to the immediate performance of amputation. The experience of Mr. Lawrence tends also to confirm the propriety of such practice. (See *Medico-Chir. Trans. vol.* 6, *p.* 156, *&c.*)

In an example, where a large part of the arm was deeply affected with gangrene from external violence, and the disorder was yet making rapid progress, I once recommended the performance of amputation at the shoulder-joint. On the whole, this instance was favourable to the practice; for, though the patient died at the end of a fortnight, probably he would not have lived twenty-four hours, had the operation not been done; nor was the stump attacked with mortification, a circumstance worthy of attention, because it is a danger particularly insisted upon by the opponents of amputation, under the preceding circumstances; and, had it not been for a large abscess, which formed in the back, as was supposed, from a violent blow received in the fall, which produced the original injury, there were well-grounded hopes of recovery. The patient, here spoken of, was attended by Dr. Blicke, of Walthamstow.

There is likewise a species of gangrene, which is pointed out by Mr. Guthrie, as requiring early amputation. "A soldier (says he) shall receive a flesh-wound from a musket-ball in the middle of the thigh, which passed through the limb apparently, on a superficial inspection, without injuring the main artery; or it shall pass close behind the femur, where the artery turns to the back part of the bone; or it may go through the middle of the bone, from behind forwards, between the condyles of the femur into the knee-joint, and the patient shall walk to the surgeon with little assistance, be superficially dressed, and, in many cases, considered slightly wounded; yet, the femoral artery and vein, of the whole of these cases, and, indeed, in many others, shall be wounded, or cut across, and the local inflammation be so slight as to obtain little attention. On the third, or fourth day, the patient shows his toes discoloured, and complains of pain and coldness in the limb below the wound, the constitution begins to sympathise with the injury, and the surgeon probably thinks the case extraordinary. Perhaps he suspects the real state of the injury; but is surprised that a wound of the femoral, or popliteal artery, with so little attendant injury, could cause mortification, &c. He is anxious to do something; but, mortification, or at least gangrene having commenced, he must, according to general rule, await the formation of the line of separation. The temperature of the leg, a little above the gangrene, is good, perhaps higher than natural; he hopes it will not extend farther, and it probably does remain stationary for a little time. At last, the parts originally affected, the toes, become sphacelated, and gangrene quickly spreads up the leg as far as the wounded artery, by which time the patient dies."

For the purpose of preventing such a disaster, where the artery, or artery and vein have been divided, Mr. Guthrie recommends the performance of amputation, as soon as the gangrene is perceived to extend beyond the toes; and the swelling and slight attendant inflammation, which is marked more by the tumefaction, than the redness of the part, has passed higher up, than the ankle. (See *Guthrie on Gunshot Wounds*, *p.* 60-61.)

5. *White-swellings.*

Scrofulous joints, with diseased bones, and distempered ligaments, and cartilages, is another case, in which amputation may become absolutely necessary. As Mr. Pott remarks, there is one circumstance attending this complaint, often rendering it particularly unpleasant, which is, that the subjects are mostfrequently young children, so as to be incapable of determining for themselves, which inflicts a very distressing task on their nearest relations. All the efforts of physic and surgery often prove absolutely ineffectual, not only to cure, but even to retard the disease in question. Notwithstanding many cases admit of cure, there are numerous others which do not so. The disease often begins in the very inmost recesses of the cellular texture of the heads of the bones, forming the large articulations, such as the hip, knee, ankle, and elbow; the bones become diseased in a manner, which we shall explain in the article (*Joints*), sometimes with great pain and symptomatic fever; sometimes with very little of either, at least in the beginning. The cartilages covering the ends of these bones, and designed for the mobility of the joints, are totally destroyed; the epiphyses in young subjects are either partially, or totally, separated from the said bones; the ligaments of the joints are so thickened, and spoiled by the distemper, as to lose all natural appearance, and become quite unfit for all the purposes for which they were intended: the parts appointed for the secretion of the synovia, become distempered in like manner; all these together furnish a large quantity of stinking sanious matter, which is discharged either through artificial openings, made for the purpose, or through small ulcerated ones. These openings commonly lead to bones which are diseased through their whole texture. When the disease has got into this state, the constant pain, irritation, and discharge, bring on hectic symptoms of the most destructive kind, such as total loss of appetite, rest, and strength, profuse night sweats, and as profuse purgings, which foil all the efforts of medicine, and bring the patient to the brink of destruction.

It is an incontestable truth, that, unless amputation be performed, a patient thus situated must perish; and it is equally true, that numbers, in the same circumstances, by submitting to the operation, have recovered vigorous health. (See *Pott on Amputation.*)

It is a fact, highly important to be known, that in these cases, amputation is attended with more success, when performed late, than when undertaken at an early period before the disease has made great advances. This is particularly fortunate, as it affords time for giving a fair trial to such remedies as are best calculated to check the progress of the disorder, and obviate all necessity for the operation. (*Encyclopédie Méthodique, Tom.* 1, *p.* 83.) See *Joints—White-Swelling.*

6. *Exostoses.*

Here it will be sufficient merely to mention, that this disease may render amputation necessary, when the tumor becomes hurtful to the health, or insupportable, on account of its weight, or other circumstances, and cannot be removed by any of the plans specified in the article *Exostosis.*

7. *Necrosis.*

Another distemper, sometimes producing a necessity for amputation, is necrosis, or the death of the whole, or of a very considerable part, of the bones of the extremities, accompanied with such extensive abscesses, such disease of the soft parts, such disorder of the constitution, and prostration of strength, that every hope of a cure being effected by a natural process must be renounced. By necrosis, is here meant, not merely some disease, which destroys the surface of a bone, but one which extends its depredations to the whole of the internal substance, and that from end to end. Portions of the bones die from a variety of causes, such as struma, lues venerea, deep-seated abscesses, pressure, &c.; and bones in this state, when properly treated, often exfoliate and cast off their dead parts. But, when the whole substance of a bone becomes diseased, from end to end, frequently no means will avail. In the words of Mr. Pott, the use of the scalper, the raspatory, and the rugine, for the removal of the diseased surface of bones; of the trephine, for perforating into the internal texture of the diseased bone, and of exfoliating applications, (if there be any such which merit the name) will prove in many instances unavailing, and, unless the whole bone be removed by amputation, the patient will die. Mr. Pott's refutation of Bilguer, who asserts that amputation is not requisite in these instances, is a masterly and most convincing production; but I would not exactly do as the former of these writers has done, and positively affirm, that every extensive necrosis, affecting a bone nearly its whole length, must inevitably require amputation. The power of nature in restoring the bones is sometimes wonderful, as will be hereafter explained. (See *Necrosis.*)

The very late period, at which an extensive necrosis may follow the injury of a bone, and make amputation necessary, is sometimes almost incredible. Schmucker details the case of a captain, who received a musket-ball through the left arm, four or five inches above the elbow. The bone was violently struck, but not broken; several exfoliations followed, and after more than a year's treatment, the patient appeared perfectly cured. For nine years this officer remained well; but, at the end of this time, being on a journey, he was attacked with pain and inflammation in the wounded part, and febrile symptoms. He hastened to Berlin, and put himself under the care of Theden and Schmucker, who found an abscess in the situation of the former wound, and, as an opening had been already made, the bone could be felt stripped of its periosteum. At length, a piece of bone exfoliated, and became loose, precisely under the brachial artery, which interfered with its removal. Notwithstanding the discharge, the elbow-joint continued swelled, and there were red points observable, not only above that joint, but also over the heads of the ulna and radius, indicating disease of those bones. Amputation was therefore performed by Theden, and the patient got quite well. On examining the os brachii, a splinter was found three inches in length, and one in breadth, its edges being thin and sharp, while its centre was more than three lines thick. The bone, every where about the place, where it had been struck by the ball, seemed to consist of callus without any medullary cavity, and the whole of it down to the elbow had no periosteum. The cartilage appeared also disposed to separate, and the periosteum was detached from the radius and ulna, which were likewise affected with necrosis. (See *Schmucker's Vermischte Chir. Schriften, B.* 1, *p.* 23. *Ed.* 2.)

8. *Cancerous and other inveterate diseases, such as fungus hæmatodes.*

Cancerous, inveterate diseases, and malignant incurable ulcers on the limbs, sometimes render amputation a matter of necessity. In treating of cancer, we shall remark, that little or no confidence can be placed either in internal or any kind of topical remedies, and that there is nothing, except the total separation of the part affected, upon which any rational hopes of cure can be built. Cancer is not frequently seen on the extremities. Every man of experience, however, must occasionally have seen, in this situation, if not actually cancer, diseases quite as intractable, and which cannot be cured, except by removing the affected part. This may often be accomplished, without cutting off the whole limb. But, when the disease has spread beyond certain bounds, amputation, above the part affected, is the only thing to which recourse can be had with any hope of success. Sometimes when the operation has been delayed too long, even amputation itself will not effect a cure. In a few cases of fungus hæmatodes, the operation has succeeded, however, after the disease had reappeared, and a cure had been seemingly achieved by the excision of the diseased parts. Yet, from what I have seen of fungus hæmatodes, I should much doubt, whether the benefit obtained by amputation would be lasting, as when this disease shows itself only externally, internal organs are mostly at the same time similarly affected. (See *Fungus Hæmatodes.*)

Besides cancerous, there are other ulcers, which may render amputation indispensable. Thus, when an extensive ulcer, of any sort whatsoever, is evidently impairing the health; when, instead of yielding to remedies, it becomes larger and more inveterate; when, in short, it puts life in imminent danger; amputation should be advised.

9. *Various tumors.*

That there are numerous swellings, which destroy the texture of the limbs, rendering them useless; causing dreadful sufferings, and bringing the patients into the most debilitated state, no man of observation can fail to have seen. When such tumors can neither be dispersed, nor cut out with safety, amputation of the limb is the only resource.

Mr. Pott has particularly described a tumor affecting the leg, for which the operation is sometimes requisite. It has its seat in the middle of the calf of the leg, or rather more towards its upper part, under the gastrocnemius and soleus muscles. It begins by a small, hard, deep-seated swelling, sometimes very painful, sometimes but little so, and only hindering the patient's exercises. It does not alter the natural colour of the skin, at least until it has attained a considerable size. It enlarges gradually, does not soften as it enlarges, but continues through the greatest part of it incompressibly hard, and, when it is got to a large size, it seems to contain a fluid, which may be felt towards the bottom, or resting, as it were, on the back part of the bones. If an opening be made for the discharge of this fluid, it must be made very deep, and through a strangely distempered mass. This fluid is generally small in quantity, and consists of a sanies mixed with grumous blood: the discharge of it produces very little diminution of the tumor, and very high symptoms of irritation and inflammation come on, and advancing with great rapidity, and most exquisite pain, very soon destroy the patient, either by the fever, which is high, and unremitting, or by a mortification of the whole leg. If amputation has not been performed, and the patient dies, after the tumor has been freely opened, the mortified and putrid state of the parts, prevents all satisfactory examination; but, if the limb was removed, without any previous operation (and which Mr. Pott, in his experience, found to be the only way of preserving the patient's life), the posterior tibial artery will be found to be enlarged, distempered, and burst; the muscles of the calf to have been converted into a strangely morbid mass; and the posterior part of both the tibia and fibula more or less carious. (*Pott on Amputation.*)

It seems only necessary to adduce another species of tumor to illustrate the necessity of amputation. The following case is related by Mr. Abernethy. A woman was admitted into St. Bartholomew's Hospital with a hard tumor in the ham. It was about four inches in length, and three in breadth. She had also a tumor in front of the thigh, a little above the patella, of lesser size and hardness. The tumor in the ham, by its pressure on the nerves and vessels, had greatly lessened the sensibility, and obstructed the circulation of the leg, so that the limb was very œdematous. As it appeared impossible to remove this tumor, and its origin and connexions were unknown, amputation was performed. On examining the amputated limb, the tumor in the ham could only be divided with a saw. Several slices were taken out of it by this means, and appeared to consist of a coagulable and vascular substance, in the interstices of which, a great deal of bony matter was deposited. The remainder of the tumor was macerated, and dried, and it appeared to be formed of an irregular and compact deposition of the earth of bone. The tumor on the front of the thigh was of the same nature as that of the ham, but contained so little lime, that it could be cut with a knife. The thigh bone was not at all diseased, which is mentioned, because when bony matter is deposited in a limb, it generally arises from the disease of a bone. (*Surgical Observations*, 1804.)

Before the late facts and improvements, relative to the treatment of aneurisms, these cases, on the extremities, were generally set down as requiring amputation. Even Mr. Pott, and J. L. Petit, wrote in recommendation of such practice, and their observations on this subject are among the few parts of their writings, which the enlargement of surgical knowledge, since their time, has rendered objectionable. The surgeon, to whom the honour of first correcting this erroneous doctrine belongs, is A. N. Guenault, who opposed the advice delivered on this subject by Petit. (*Haller, Disp. Chir. vol. 5, p.* 155.)

I shall conclude these remarks on the cases requiring amputation, with advising surgeons never to undertake this serious operation, without consulting the opinions of other professional men, whenever their advice can be obtained. The best operators are often deficient in that invaluable kind of judgment, by which the cases, absolutely demanding amputation, are discriminated from others, in which the operation may be wisely postponed, and a chance taken of preserving the limb.

Historical Remarks on Amputation.

The history of amputation evinces, that the steps of surgery to perfection are slow, and that they even sometimes deviate from the straight path, though, upon all essential points, no retrogradation has ever taken place. Here nature has acted as the guide, and the surgeon's chief merit has consisted in obeying the hints which she herself has thrown out. As already mentioned, the following natural occurrence, no doubt, was one of the circumstances, which first led to the bold practice of amputation; in consequence of disease, and grievous local injuries, whole limbs were sometimes seized with mortification. In the majority of cases, this was attended with so much constitutional disturbance, that the patients died; but, in other less numerous instances, the mortification was confined to the part; suppuration was established between the dead and living parts; the whole of the mortified limb fell off; the suppurating surfaces healed up; and thus, by the powers of nature, the patients were restored to health. Here was clearly proved the possibility of recovery, notwithstanding the loss of a limb. The surgeon, as Brünninghausen remarks, viewed with surprise this course of nature, and hardly ventured to promote it by the feeble means formerly employed, which, however, were not really needed. But, as the mortified parts, previously to their detachment, caused great annoyance by their fetor, a surgical attempt was at length made to get rid of them; in doing which, the knife was always kept from touching the living flesh, on account of a well-grounded fear of bleeding, for the suppression of which no effectual methods were known. Such was the practice that prevailed from Hippocrates down to Celsus. (*Erfahr., &c. über die Amp. p.* 14.) "Partes autem corporis, quæ infra terminos denigrationis fuerint, ubi jam prorsus emortuæ fuerint et dolorem non senserint, ad articulos auferendæ *ea cautione ut ne vulnus inferatur*," *&c.* (De Articulis, sect. 6.) Here we find, that the earliest mode of amputation was that done at the joints.

A. C. Celsus, who lived in the reign of Tiberius, and whose book, de Re Medicâ, should be read by every surgeon, has left us a short description of the mode of amputating gangrenous limbs. (*Lib. 7. c.* 33.) It has been often remarked, that Celsus has left no instructions for securing the divided blood-vessels; but it has not been commonly noticed, that, in his chapter on wounds, he directs us to stop hemorrhage by taking hold of the vessels, then tying them in two places, and dividing the intermediate portion. If this measure cannot be adopted, he advises the use of a cauterizing iron. Several hints are to be met with in the writings of Celsus, from which it may be inferred, that the ligature of bleeding vessels was sometimes practised at the early age in which he lived; and this supposition is strengthened, by a fragment of Archigenes, preserved by Cocchius, on the subject of amputation, where he speaks of tying, or sowing, the blood-vessels. We are not, however, in possession of all the writings of medical authors, prior to the time of Galen, and must therefore remain in doubt upon this point. (*Rees's Cyclopædia, Art. Amputation.*)

This anonymous writer argues, therefore, with some appearance of reason, that if amputation often proved fatal in the days of Celsus, "sæpe in ipso opere," as the expression is, it was owing to the want of some efficacious method of compressing the blood-vessels, during the operation itself; for, whether the use of the ligature were known to the ancients or not, no doubt exists about their ignorance of the tourniquet.

But, admitting that the ancients were not altogether uninformed of the plan of tying arteries, it cannot be credited, that they adopted the practice to any extent; for, if they had, they would not have continued so partial to the cautery, boiling oils, and a farrago of astringent applications. They would also never have had recourse to the barbarous method of cutting the flesh with a red-hot knife, with the view of stopping the hemorrhage by converting the whole surface of the stump into an eschar. Painful in its execution, and horrid in its consequence, as this burning operation was, it seldom proved a lasting antidote to the bleeding, which generally came on in a fatal manner, as soon as the sloughs were loose. On this part of the subject, my own ideas fully agree with those of a distinguished foreign surgeon, who says, that although the document left us may prove, that the ligature was known to the ancients, and employed in cases of aneurisms and wounded blood vessels, nay, that the arteries were secured with a needle and ligature; yet, the practice could not have been extended to the operation of amputation, since with the custom of making the incisions in the dead parts, the method scarcely admitted of being put in execution. (*Brunninghausen, Erfahr. über die, Amput. p.* 29.) Ambrose Paré, therefore, seems to me to deserve as much praise for the introduction of the ligature into common use, as if no allusion to this method whatsoever had existed in the writings of Celsus and other ancients.

The different parts of the operation, meriting particular attention, are, the choice of the part of the limb where the incisions are to begin; the measures for guarding against bleeding during the operation; the division of the integuments, muscles, and bones, which is to be accomplished in such a manner, that the whole surface of the stump will afterwards be covered with skin; tying the arteries, which should be done without including the nerves, or any other adjacent part; placing the integuments in a proper position after the operation; and, finally, the subsequent treatment of the wound.

At the period of making the incision, the ancients contented themselves with having the skin forcibly drawn upward by an assistant; they next divided, with one sweep of the knife, the integuments and flesh down to the bone, and, afterwards, sawed the bone on a level with the soft parts, which were drawn upward. Celsus considered it better to let the incision encroach upon the living flesh, than leave any of the diseased parts behind. "*Et potius ex sana parte aliquid excidatur, quam ex ægra relinquatur.*" (*De Medicina, Lib.* 7, *c.* 33.)

It appears, however, that his views extended further than those of most of his contemporaries, and even his followers, almost down to modern times. After cutting the muscles down to the bone, he says, that *the flesh should be reflected, and detached underneath with a scalpel, in order to denude a portion of the bone, which is then to be sawn as near as possible to the healthy flesh, which remains adherent.* He states that, when this plan is pursued, *the skin around the wound will be so loose, that it can almost be made to cover the extremity of the bone.* It is to be lamented, that this advice, inculcated by Celsus, should not have been comprehended, or that it should have been so neglected, as to stand in need, as it were, of a new discoverer, and that a suggestion of such importance should have remained so long useless. But, the fact is, hemorrhage formerly rendered amputation so dangerous, that the ancient surgeons could not devote much attention to any thing else in the operation, and practitioners amputated so seldom, that we read in Albucasis, that he positively refused to cut off a person's hand, lest a fatal hemorrhage should ensue, and the patient did it himself and recovered. Over that part of the stump which the small quantity of preserved skin would not cover, Celsus recommended compresses, and a sponge dipped in vinegar to be laid. (*De Re Medica, Lib.* 7. *c.* 33.)

Archigenes, who was born at Apamia, in Syria, was the disciple of Agathinus, and physician to Philip, king of that country. He repaired to Rome, where he practised physic and surgery, in the reign of the emperor Trajan, about 108 years after the birth of Christ. (*Portal, Hist. de l'Anatomie et de la Chirurgie, Vol.* 1, *p.* 61.) In the history of amputation, the name of Archigenes is conspicuous, not only because he is supposed to have been acquainted with the use of the needle and ligature for the stoppage of bleeding, but because his description of the operation is in some respects more minute than that of Celsus. For the hinderance of loss of blood in the operation, says Sprengel, (*Geschichte der Chir. B.* 1. *p.* 404, *Hall*, 1805,) he first of all tied up the vessels, and often the whole limb, over which he also sprinkled cold water. The integuments were then drawn upwards from the wound, and confined there with a band; and, after the limb was off, he cauterized the stump, and applied folded compresses. The band was now loosened, and a mixture of leeks and salt laid on the stump, to which were also applied oil and cerate. (*Nicet. Coll. Chir. p.* 155.) Such was likewise the practice of Heliodorus, who thus early made objections to the plan of cutting off a limb by a single stroke, a proposal that was renewed in far later days. The same author has also spoken of amputating at the joints; a method, of which he disapproves. (*Nicet. Coll. Chir. p.* 155.) However, Galen entertained a favourable opinion of it, on account of its safety and expedition. (*Comm.* 4, in *lib. de artic, p.* 650.) Galen's precepts concerning amputation are, upon the whole, very like those given by Hippocrates; for he directs only dead parts to be cut, and the stump to be cauterized. (*De Arte Curativa ad Glouconem, lib.* 2.) By all the old writers, amputation was entirely restricted to cases of mortification; further they were afraid to go; and this precept, and all the other doctrines of Galen, may be said to have been the guide of the whole surgical profession for full fourteen centuries.

The timid Arabians were not partial to amputation, and even in cases of mortification, generally preferred a farrago of useless applications, like Armenian bole, &c. Paulus Ægineta, like Galen, deviated from Celsus's good rule of making the incisions in the healthy parts, and only approved of making the requisite division near them. (*Lib.* 4, *c.* 19, *p.* 140.) Avicenna, however, repeated the directions left by the Greek writers, (*Can. lib.* 4. *Fen.* 3, *tr.* 1, *p.* 454.) and Abu'l Kasem proposed doing the operation with a red-hot knife. (*Chirurg. lib.* 1. *Sect.* 52, *p.* 99.) In the middle ages, little was done for the improvement of amputation. In the 14th century, gunpowder was invented, and soon applied to the purposes of war, so that an abundance of cases must have presented themselves, in which the wise maxim of not deferring amputation, until mortification had come on, but of preventing the mischief by the operation, ought to have struck an intelligent surgeon. One might also expect that practitioners would now have been led to make the incisions in the sound flesh. Unfortunately, the invention of gunpowder, and its immediate consequences in surgery, happened at a period when practitioners were ill qualified to profit by the new lessons of experience set before them. The writings of their predecessors furnished them with no directions how they ought to act, and they were themselves too much confounded at the sight of the mischief for which they were consulted, to be able to form any correct opinion about causes and effects. Their first idea was, that the terrible symptoms proceeded from the parts being actually burned, and they afterwards inclined to the belief that gunshot wounds were poisoned. Hence, the most absurd modes of treatment were instituted, and as Brüninghausen expresses himself, human nature groaned under a new evil, for which there were for some time no true plans of relief. (*Erfahr*, *&c. über die. Amp. c.* 19.) This deplorable state was the natural result of the depression of science in general, and of the healing art in particular, in the days to which I now refer. In these middle ages, as they are called, the population of all Europe was plunged in the deepest ignorance; and whatever little knowledge remained, either of the arts, or languages, was monopolized by the priesthood, the physicians of those times, who, instead of studying the volume of nature, wasted most of their time in discussing the doctrines of Galen. Surgery itself sunk to the lowest ebb, as may be well conceived from the decrees issued at Rheims, by pope Boniface the eighth, forbidding any of the clergy to do any thing themselves which drew blood; and, of course, all the operative part of surgery, that which required the most skill and science, was transferred to a set of illiterate, low-bred mechanics, far inferior to the worst country farriers of modern times. Yet, the clergy, who were here scrupulously averse to soiling their own hands with blood, or hurting their own tender feelings by viewing the agony of their fellow creatures submitted to operations, had no hesitation in taking the chief emoluments and honors of the profession, or in turning over these poor sufferers to men more qualified to torture and murder, than give relief; and, what nearly staggers all credulity, the same professors of christianity, who shuddered to spill a drop of blood themselves, on a proper occasion, as Haller observes, eagerly had a hand, and acted an important part in every sanguinary war, where it was possible for them to interfere. In these dismal days of surgery, the advice delivered by Celsus was renewed by Theodoricus, who used to administer opium and hemlock previously to the operation, for the purpose of rendering the patient less sensible of pain, and afterwards vinegar and fennel were given, with the view of dispersing the intoxicating effects of the preceding medicines. (*Chirurg. lib.* 3, *c.* 10.)

The renowned Guido di Cauliaco was the inventor of the plan of taking off limbs, without any bloodshed. It is better, says he, for the limb to drop off, than be cut off, as in the latter circumstance, the conduct of the surgeon is viewed with spite, because it is supposed that the part might have been saved. Guido's practice consisted in covering the whole membrane with pitch-plaster, and applying round one of the joints so tight a band, that the parts below the constriction ultimately dropped off. (*Chirurg. tr.* 6. *Doctr.* 1. *cap.* 8.) As Sprengel next observes, the method of amputating, suggested by Celsus, was again revived by Gersdorf, who, after the operation, not only drew down over the stump the skin which had been retracted, but applied a hog's or bullock's bladder over the stump, so as to render all burning and stitching of the parts needless. (*Feldbuch der Wundarzn. fol.* 63.) Bartholomew Maggi also endeavoured to preserve a considerable flap of integuments for covering the stump. (*De Vulner. bombard. et sclopet. 4to. Bonon.* 1552 ; see *Sprengel's Geschichte der Chirurgie*, *p.* 404, 406, *8vo. Halle*, 1805.)

At length, in the 15th century, the revival of learning occurred first in Italy. Men now began to think for themselves again, and physicians turned from compilations and scholastic nonsense, to the consideration of nature. Anatomy was cultivated with great ardour, and made brilliant progress under the eminent characters of the time: De la Torre, Berengarius Carpi, Vesalius, Fallopius, Eustachius, and others, who were also for the most part very distinguished surgeons. "*In Italia scientiarum matre medici se nunquam chirurgia abdicarunt. Seculo* 15 *et* 16, *professores medici academiæ Bononiensis*, *Patavinæ*, *et aliarum in Italia illustrium scholarum et manu curaverunt*, *et consilio*, *et inter istos viros summi chirurgi exstiterunt*." (Haller, Bibl. Chir. p. 1. p. 161.) Practitioners now ventured to amputate limbs in the sound part for other incurable diseases, besides mortification; but, the art of stopping hemorrhage after the operation continued imperfect. Though the method of applying the ligature in cases of wounded arteries and aneurisms was understood, yet, from some unaccountable causes, the practice was never thought of in amputations. Even Fallopius knew of no other means for stopping the bleeding, but the cautery. (*De Tum. prætern. p.* 665.) On the whole, the stoppage of bleeding was not attended with a degree of success proportionate to the advances of the healing art in general. Straps, bands, and compresses were indeed put round the member; but, as the circulation of the blood was not yet correctly known, they were not applied in the proper places; being arranged either close to the wound, or several of them put at random round the limb. The effects of such immoderately tight, long-continued constriction could be nothing less than gangrene, and hence, the actual cautery was still chiefly employed. The other means for suppressing hemorrhage scarcely merit the name. Terrified at the insecurity and ill-consequences of such expedients, J. de Vigo, (*Practica in Chirurgia Copiosa*, 491, *Romæ*, 1514,) and Fabricius ab Aquapendente, (*Op. Chir. Venet.* 1619.) disapproved of amputating in the sound flesh, and returned to the principle, inculcated by the ancients, of making the incision in the mortified parts. Others endeavoured to lessen the peril of the bleeding by the rapidity with which the limb was removed, and the instantaneous application of the cautery. For this purpose, L. Botalli invented a sort of guillotine, by means of which a member was severed from the body in an instant, (*De Curandis vulneribus sclopetorum*, *Ludg.* 1560.) while others laid a sharp axe upon the limb, and effected the dismemberment by the blow of a wooden mallet. An example of this barbarous practice is recorded by Fabricius Hildanus, called by his countrymen the patriarch and ornament of the German surgery. In consequence of this fear of bleeding, before he knew of the use of the ligature, he was himself accustomed to amputate with a red hot knife, the representation of which is given in his work. (*De Gangræna et Sphacelo, Op.*) Hildanus became a better surgeon, however, as he grew older, and, in the end, partly contributed to the improvement of amputation, inasmuch as he made the incisions completely in the sound parts, and adopted the method of tying the arteries, as then recently proposed by Paré, but unfortunately in weak persons he still preferred the actual cautery to the ligature. (*Op. p.* 814.) One of his inventions was a linen bag, or cap for the stump; and a sort of retractor for holding back the muscles. According to Sprengel, (*Geschichte der Chir. B.* 1. *p.* 407.) his observations on the pain following the operation, are interesting. (*Op. p.* 807, 814.)

Ambrose Paré, a French surgeon, who flourished in the 16th century, (*Opera, Parisiis*, 1582.) and to whom I have already alluded, made some beneficial innovations with regard to the operation of amputation. It is to his industry, good sense, and skill, that we are chiefly indebted for the abolition of cauterising instruments, and the general use of a needle and ligature for the suppression of the bleeding. (*Lib.* 6. *c.* 28. *p.* 224.)

An anonymous writer has given the following account of the practice and opinions of this distinguished surgeon in relation to amputation. " Paré recommended to cut off the whole of the gangrenous part, if the limb be mortified; but to encroach as little as possible upon the living flesh. At the same time, he laid it down as a rule not to leave a very long stump to an amputated leg; because the patient could more conveniently make use of a wooden leg, with the stump only five finger-breadths long below the knee, than if much more of the flesh were to be preserved. In the arm, however, he left the whole of the living and healthy portion of the member, only separating the diseased part from the sound.

" In preparing for amputation, he directs the skin and muscles to be drawn upwards, and bound tight with a broad bandage, a little above the part, where the incision is to be made. This fillet was intended to answer a threefold purpose: 1st, to afford a quantity of flesh for covering the bone, and facilitating the cure. 2dly, To close the extremities of the divided blood-vessels. 3dly, To dull the patient's feelings, by pressure on the subjacent nerves. When this firm ligature has been applied, Paré directs an incision to be made down to the bone, either with a common large scalpel, or a curved knife. Then, with a smaller curved knife, we are carefully to divide the muscle, or ligament, remaining between the bones of the fore-arm, or leg; after which, we may proceed to saw off the bone as high as possible, and to remove the asperities, occasioned by the saw.

" With the assistance of a curved pair of forceps, he drew out the extremities of the bleeding arteries, either by themselves alone, or with some portion of the surrounding flesh, to be firmly tied with a strong double thread. He now loosened his bandage, brought together the lips of the wound over the face of the stump, and kept them as close as he could, without actual stretching, by means of four stitches, or sutures. If the larger tied vessels should accidentally become loose, he desires the ligature, or bandage, to be again passed round the limb; or, else, what is better, to let an assistant grasp the limb firm with both hands, and press with his fingers over the course of the bleeding vessel, so as to stop the hemorrhage; then, with a square edged needle, about four inches long, and a thread, four times doubled, the surgeon must secure the artery in the following manner. Thrust the armed needle into the outside of the flesh, half a finger's breadth from the vessel which bleeds, and bring it out at the same distance from the bleeding orifice; then surround the vessel with the ligature, pass it back again to within one finger's breadth of the place, where it first entered, and tie a fast knot upon a folded slip of linen rag, to prevent its hurting the flesh. By this means, says Paré, the orifice of the artery will be agglutinated to the adjoining flesh so firmly, as not to yield one drop of blood: but if the hemorrhage were not considerable, he contented himself with the application of astringent powders, &c.

" Thus did this famous surgeon endeavour, by his single example and precepts, to exclude the barbarous use of hot irons in amputation. He says, he knew not of any such practice among the old surgeons; except that Galen recommended us to tie bleeding vessels, towards their origin, in accidental wounds: and he thought proper to do the same in cases of amputation. But, in an apology, at the end of his book, Paré has quoted, in his own defence, a dozen authors, who employed or recommended the ligature before him; and he might have cited many more.

" From the statement we have here given, it may be seen how far the best writers of almost every country have erred in ascribing the original invention of tying arteries to Ambrose Paré. Great merit, indeed, was due to him, for the part he took in extending, and even reviving this incomparable practice: nay, *it is not certain, whether any one before him had ever applied the needle and ligature in similar cases*, i. e. *after amputation*; but how very wide of the truth Mr. John Bell's recent account of this matter is, will appear to every person, who will inquire into the facts themselves; for not only were ligatures and needles in use among the ancients, but likewise the tenaculum, or hook to lay hold of the bleeding vessels, when they had buried themselves in the muscles. We refer our inquisitive readers to Avicenna, Ætius Albucacis, Brunus, Theodoric, Guido di Cauliaco, John de Vigo, L. Bertapaelia, Tagaultius, Petrus Argillata, Andreas a Cruce, &c. &c. where they will find enough to satisfy them on this head." (*Rees's Cyclopædia, art. Amputation.*)

I shall not here expatiate upon the ill-treatment, which Paré experienced from the base and ignorant Gourmelin; nor upon the slowness and reluctance, with which the generality of surgeons renounced the cautery for the ligature. These circumstances may be conceived from what has been already stated. Suffice to add, upon the authority of Dionis, that, almost 100 years after

Paré, a button of vitriol was ordinarily employed in the Hôtel Dieu at Paris for the stoppage of hemorrhage after amputations. And Dionis was the first Frenchman, who openly taught and recommended Paré's method. This happened towards the close of the 17th century, while Paré lived towards the end of the 16th (*Dionis Cours d'Opérat. Paris*, 1707).

As Paré, like the rest of the old surgeons, used to cut directly down to the bone, many of the stumps, which he made, must have been badly covered with flesh, and ill-fitted for bearing pressure. But, all that I have read on the subject of amputation impresses me with a strong conviction, that, in former times, the projection of the end of the bone, the sugar-loaf form of the stump, the frequent exfoliations, and the difficulty in healing the part, and keeping it healed, were as much owing to the mischief done with the cautery, the rude way of dressing the stump, and ignorance of the right method of promoting union by the first intention, as to the mode of operating, or any other circumstance.

By many surgeons, however, the tying of arteries continued to be deemed too troublesome, and hence, they persisted in the barbarous use of the actual cautery: of this number were Pigrai, (*Epitome des Préceptes de Med. et. de Chir. 8vo. Rouen*, 1642); F. Plazzoni, (*De Vuln. Sclopet. 4to. Venet.* 1618), and P. M. Rossi, (*Consult. et. Observ. 8vo. Francof.* 1616.) Nay, so difficult was it to eradicate the blind attachment to the ancients, that Theodorus Baronius, a professor at Cremona, publicly declared in 1609, that he would rather err with Galen, than follow the advice of any other person; and Van Hoorne seems even to have countenanced the detestable machine of Botalli. (Μικροτέχνη, p. 75.)

What, asks Brünninghausen, was the reason why the ligature of the arteries, which is now regarded by the surgeons of all civilized nations, as the best, easiest, and safest method of stopping hemorrhage after amputation, should so long have remained unadopted? Besides the prejudice for the opinions of the ancients, already mentioned, another cause was undoubtedly the imperfect knowledge of the circulation of the blood, a correct description of which was first delivered by the immortal Harvey early in the 17th century. (*Exercitatio Anat. de Motu Cordis et Sanguinis in Animalibus. Francof.* 1628.) For some time, this grand discovery met with violent opposition; but, after it had been acknowledged as an eternal truth, a happy application of it was made to surgery by a French surgeon, named Morell, who, at the siege of Besançon in 1674, invented the field tourniquet, by means of which more certain pressure was made on the trunk of the artery. By this simple invention, founded however on a knowledge of the circulation, the surgeon could at option let the blood of the stump spirt out, or stop its jet entirely; and now, both during and after the operation, he was first enabled to command the hemorrhage, and coolly and judiciously employ whatever measures were indicated; for the most powerful bandages and pressure, previously in use, either stopped the circulation in the whole limb, or could not be made to have the right effect with sufficient quickness. (*Brünninghausen Erfahr., &c. über die Amp. p.* 36.) Morell's tourniquet, however, was very imperfect, and it was not till the year 1718, that J. L. Petit, whose name shines so brightly in the history of surgery, invented the kind of tourniquet now employed.

Richard Wiseman, who is justly considered as the father of good English surgery, saw the necessity of making the incision in the sound parts because gangrene does not always spread evenly, but frequently extends much higher up one side of the limb, than the other. He deemed the actual cautery objectionable, as the sloughs were so long in being thrown off. He applied a ligature round the limb, two inches above the limits of the mortification, and drawing up the muscles, made the incision with a large curved knife, with the back of which he scraped off the periosteum. The bag, or sort of retractor, employed by Fabricius Hildanus, Wiseman thought unnecessary, as the muscles spontaneously drew themselves up as soon as divided. He tied the blood-vessels after the manner of Paré, and deprecated all burning of the stump. After the operation, he drew the flaps over the bone, and either fastened them in this position with stitches, or a tight bandage, though he generally preferred the former, as the surest means of keeping the end of the bone from protruding. Across the stump, he laid a pledget of wax-cerate, and over this a thick layer of armenian bole and other styptics, and the whole was covered with a bullock's bladder, and a roller, applied spirally from the upper part of the remaining portion of the limb, down to the extremity of the stump. On the third day, the dressings were taken off, and a digestive ointment applied. (*Chirurg. Treatises, vol.* 2, *p.* 220, *8vo. Lond.* 1690.)

From this time, amputation may be considered, as being an infinitely safer proceeding, than what it used to be; for, as we have explained, the ligature of the arteries was now practised and commended in Germany by F. Hildanus, in England by Wiseman, and in France by Dionis. Much however remained to be done. The wound was large, and suppurated long and profusely; the healing was slow; the ends of the bones perished, and projecting far beyond the soft parts, retarded the cure so long, that the patient was not unfrequently worn out. Hence the best surgeons began seriously to consider what further could be done, with a view of lessening the exposed surface of the wound, and making a better covering of flesh for the ends of the bones.

According to Sprengel, most of the old surgeons preserved a flap of flesh, and he is therefore by no means disposed to regard our countryman Lowdham, as the inventor of this method, though it is acknowledged, that the latter surgeon's practice was novel, inasmuch as the flap was formed by making an oblique incision through the integuments from below upwards. (See *James Yonge's Currus Triumphalis e Terebintho, 8vo. Lond.* 1679, *and Sprengel's Geschichte der Chirurgie, B.* 1, *p.* 408.) Here, if Sprengel means, that many of the old surgeons endeavoured to preserve a partial covering of flesh for the bone, there can be no doubt of his correctness, because we find, that they drew back the flesh before they divided it, and Celsus and some others even did more, for, after cutting down to the bone, they detached the flesh further from it upwards, previously to taking the saw; but, on the contrary, if Sprengel wishes us to believe, that there were practitioners, who previously to Lowdham, in the operation of amputation, formed what in England is usually understood by a flap, that is a portion of flesh, generally of a semilunar shape, and saved particularly from one side of the member for covering the bone, I cannot see any reason for coinciding with Sprengel's observation. Upon the merit of Lowdham's suggestions, and the practice and principles inculcated by J. Yonge, some reflections lately sent me by Mr. Carwardine, I insert with great pleasure, as perhaps he is right in thinking, that the third edition of this work did not do justice to the memory of the latter writer.

"At the time Yonge wrote (1679) says Mr. Carwardine, it was supposed impossible to heal a stump before the bone had exfoliated, and therefore, no surgeon would venture upon an attempt at uniting the surface by the first intention. Now this union by the first intention, *was the chief object* of Mr. Yonge in proposing the flap operation, and it is to him, and not to Mr. Alanson, who wrote precisely 100 years after him, that we must attribute the honor of this improvement. It is related in a letter addressed to his friend Thomas Hobs, chirurgeon in London, dated Plymouth, August 3, 1678, and published 1679, at the end of his Currus Triumphalis e Terebintho. It begins thus:—

"Sir, I find by yours that you are surprised with the intimation I gave you, of a way of amputating large members, so as to be able to cure them *per symphysin* in *three weeks;* and without fouling or scaling the bone. It is a paradox which I will now evince to you to be a truth, after I have first taken notice of what you affirm, that there is a necessity of scaling the ends of those bones left bare after the usual manner of dismembering before the stump can be soundly cured; that you never yet found it otherwise, but that where it hath been attempted, the stumps have apostumated, and the caries come off thereby.

"Yonge then acknowledges, that it was from an ingenious brother, Mr. C. Lowdham of Exeter, that he had the first hint thereof. He then describes the operation—the laying down the flap over the face of the stump, and sewing it by four or five stitches, &c. After this Yonge proceeds with a methodical enumeration of the advantages of this mode of operating over all others then in use, viz. that it is more *speedy*—the cure not occupying *a fourth of the usual time—no suppuration—no exfoliation*—less danger of hemorrhage—not liable to break open again from slight injury—and lastly, much better adapted to the pressure from an artificial leg, &c.

"The foregoing abstract will show (says Mr. Carwardine) how far Mr. O'Halloran's method, presently to be described, in which he dresses the flap and the stump as distinct surfaces, can be regarded as a revival of Lowdham's operation, or whether it has been superseded or improved upon by the *mechanical* ingenuity of the Dutch and French surgeons:—the apparatus of M. de la Faye and Verduin, appear to have been merely clumsy and unscientific contrivances for the suppression of hemorrhage. Garengeot's operation had also for its object, to supersede the use of the ligature, which, however, after twelve years practice, he was obliged to give up, and tie the vessel before he laid down the flap: (the particulars of all these methods the reader will presently meet with.) Opinions therefore founded upon the practice of these gentlemen, I conceive cannot fairly be admitted as evidence against the flap operation of Lowdham, which nevertheless appears sinking in the estimation of the best modern surgeons: perhaps no material advantage is gained by it over the common mode of operating in the *lower extremities*, as now practised—but even here, cases may occur where we are glad to resort to it: a few years since, I attended a patient in consultation with a friend at Dunmow, in Essex, where we thought it necessary to remove a man's leg for a caries of the tibia. An ulceration in front extended so high, that no integument could be saved, and the limb would have been removed above the knee, if I had not suggested the propriety of making a flap from the calf of the leg. The tibia was obliged to be sawn as high as possible, but the flap was left sufficiently long to cover the surface, and that most important object, the bend of the knee, was preserved to bear the pressure of a wooden leg. In the removal of the arm at the shoulder joint, doubtless the advantages of making a flap from the deltoid, &c. are sufficiently established; but, in the mode of dressing, I presume, that no English surgeon will admit, that the practice of M. Larrey (perhaps the most eminent surgeon that has been formed by the wars of Bonaparte, and whose practice will be hereafter noticed) can supersede the method of Yonge (or Lowdham) who wrote 140 years before him! Larrey introduces charpie beneath the flap to *prevent* union by the first intention! Lowdham's object is simply to lay the flap over the wound to prevent exfoliation, and to heal the surface '*per symphysin*' in three weeks."—To the correctness of these sentiments of Mr. Carwardine, I believe, that every impartial surgeon will bear witness; and it merely remains for me to thank him for his obliging communication, and say, that I have recently looked over the copy of the Currus Triumphalis e Terebintho, preserved in the valuable library of the Medical and Chirurgical Society, and find, that what he has stated is fully confirmed by the contents of that ancient work. At the same time, I retain the belief, that the example set by Mr. Alanson, with respect to the proper method of dressing stumps, and obtaining a speedy union of the wound, is entitled to the praise of posterity, because his advice was so well enforced that it soon produced a revolution in practice, while the correct suggestions of Lowdham and Yonge, like the hint in Celsus, of the double incision, had sunk into oblivion, or were only known to a few admirers of surgical antiquities.

As Sprengel remarks, Purmann, Dionis, (*Cours d' Oper. de Chir.* p. 611.) De la Vauguyon, (*Traité Compl. des Opér. de Chir.* p. 531,) and most other surgeons of the seventeenth century, continued the method of first drawing up the integuments, and then applying a band round the member. Dionis also took particular pains to recommend the ligature of the vessels, and expresses a strong aversion to the actual cautery. Neither did he approve of amputation at the knee joint, because he thought that the patella, which must be left behind, would impede the healing of the stump, and he was apprehensive of the articular surface of the femur becoming diseased. De la Vauguyon relied upon the styptic properties of vitriol, and he praised drawing back the muscles by means of the kind of bag invented by Fabricius Hildanus.

Taking off the limbs at the joints was first commended again in modern times by J. Munnicks, who was more partial to styptics, than the ligature; and for dressing the wound employed compresses and sticking plaster. (*Chirurgia, p.* 101.)

Mauquest de la Mothe adopted the plan of operating recommended by Dionis; he was also one of the first who made common use of the tourniquet in amputations, afterwards drawing out the vessels with the forceps and tying them. (*Traité Compl. de Chir. Vol.* 3. *p.* 171.) Lowdham's original suggestion of amputating with a flap has been briefly noticed. About eighteen years after Yonge's publication, Peter Verduin, an eminent surgeon at Amsterdam, submitted to the judgment of the profession a new kind of flap amputation, which he had put in practice. (See *Dis. Epistolica de Nova Artuum decurtandorum ratione*, 8*vo. Amst.* 1696.) The following are the chief particulars of Verduin's flap operation.

Two compresses were applied, one under the ham, and the other on the course of the large vessels. The thigh was wrapped in a fine linen cloth, which was sustained by some turns of a roller. This apparatus was covered with a piece of leather, six inches broad, furnished with three straps with buckles, to secure it round the part. The tourniquet was placed in the usual manner. The part, above the place intended to be amputated, was surrounded with a leather strap. The point of a crooked knife, which was made to pass as near to the back part of the bones as possible, was thrust in on one side of the leg, and made to come out on the other. The knife was then carried down nearly to the tendo achillis, and thus it separated almost the whole calf of the leg. The flap being formed, the operation was finished in the ordinary manner. The wound was then washed with a wet sponge, in order to clear it from the fragments of sawn bone. The leather strap, which served to secure the flesh, was next loosened, and the flap laid over the stump. The wound was dressed with lycoperdon, lint, and tow, over which was put a bladder, sustained by strips of sticking-plaster. Upon this bladder was placed an instrument, called a *retinaculum*, consisting of a compress, and a concave plate, which were made to press upon the stump, by means of two straps, which crossed each other, and were attached to the broad leather strap surrounding the thigh.

In 1702, Sabourin, an able surgeon at Geneva, gave an account of Verduin's practice to the Royal Academy of Sciences, which, however, declined to pronounce any judgment about it, without further experience.

Though this method of amputation was objected to by Könerding, in a tract published at Amsterdam in 1705, it was afterwards highly extolled by P. Massuet, on account of the quickness with which the stump healed, the safety with which the flap served for the stoppage of the hemorrhage, and the avoidance of exfoliation by the non-exposure of the bone. He also dwelt upon the excellency of the stump for the application of an artificial foot. (*De l' Amputation à lambeau*, 8*vo. Paris*, 1756.) Heister disapproved of the flap amputation, because it appeared to him, that the irritation of the flesh by the projecting bones was apt to cause pain and inflammation: he operated himself after the manner of Dionis, and was strongly in favour of the use of ligatures.

Some excellent precepts were delivered by J. L. Petit concerning amputation. He improved the tourniquet; and, instead of the large crooked amputating knife, formerly employed, first brought into use the straight more moderate-sized knives with sharp backs, now seen in the hands of the best surgeons, because much better calculated than crooked knives, for dividing the flesh by a sawing movement, which is the only right and surgical way of attempting to cut any part of the human body. He proved that making the division in the mortified parts was frequently followed by hemorrhage; and for the suppression of bleeding he thought it the best principle to promote the formation of a coagulum. (*Mém. de l'Acad. des Sciences, an* 1732, *p.* 285. See *Hemorrhage*.) For compressing the vessels, he employed an instrument, which covered the stump, like Verduin's retinaculum, and made pressure by means of a screw. His only objection to Verduin's method was, that the extension of gangrene up the limb frequently hindered the formation of so large a flap. He laid down the valuable general maxim of always removing as much bone, and as little flesh, as possible; for which purpose, he invented what is termed the *double incision*, or dividing the business of cutting through the soft parts into two stages. About an inch higher than the place where he meant to saw through the bones, he first made the circular cut through the integuments down to the muscles; the skin was then pulled up so as to leave the flesh uncovered to the extent of an inch, and the muscles were now divided at the highest point of their exposure. Lastly, the flesh was held out of the way with a retractor, and the bone was sawn through high enough up to allow of its extremity being well covered with flesh and integuments. The greatest defect in the doctrines of Petit, relative to amputation, was the confidence he put in pressure, instead of the ligature. (*Traité des Malad. Chir. vol.* 3. *p.* 126.) The first performance of amputation at the shoulder-joint, by Le Dran, and the improvements and alterations of that operation suggested by Garengeot, De la Faye, Desault, &c. I shall notice in a future section.

In chronological order, the next event, claiming notice, in the history of amputation, was the promulgation of an opinion by T. R. Gagnier, that Verduin's flap-amputation might be traced back to times of great antiquity, the method described by Celsus being very similar. (*Haller, Diss. Chir. vol.* 5. *p.* 161.) On this point, with reference to Lowdham, the true inventor of the flap-operation, I have already delivered my own sentiments.

The flap-amputation of the leg, after Verduin's manner, was tried by De la Faye, who found, that the pressure of the flap was not enough to check bleeding from all the vessels, as it only operated on the anterior tibial artery, and, by pressing the flesh more firmly against the end of the bones, he thought the risk of mortification would be occasioned.

Verduin, and Sabourin, as we have seen, made only one flap. Two French surgeons, Ravaton and Vermale, afterwards thought, that it would be better to save a flap from each side of the limb. They were also advocates for tying the vessels, and bringing the two flaps into contact, so as to procure their speedy union, and hinder exfoliations and profuse suppuration.

However, there is some difference in their methods of forming the flaps. Ravaton, who submitted his plan to the French Academy in 1739, made three deep incisions down to the bone; first, a circular one, with a crooked knife, within four finger-breadths of the bone intended to be sawn; and then with a somewhat larger knife; the two others perpendicularly to the first, one at the fore part, and the other at the back of the limb; and, taking care not to touch the principal vessels, he detached the two flaps from the bone.

Vermale formed the separate flaps by two incisions. After applying the tourniquet, he surrounded the part with two red threads, at the distance of four finger-breadths from each other; one at the place where the bone was to be sawn; the other at the place where the incision of the flaps was to terminate. He afterwards thrust a long bistoury down to the bone, at the forepart of the limb; turned it round the circumference, so that it might come out at the opposite part; then directing the edge of the knife along the bone, he cut down to the inferior thread, where he separated the first flap, which, as the author says, was of a round or conical figure at its extremity. The second flap was made in a similar way on the interior side of the member. (*Traité des Playes d'Armes à feu, par Ravaton, 8vo. Paris,* 1750; *De la Faye, in Mém. de l' Acad. de Chir. T.* 5, *ed.* 12*mo. Vermale, Obs. de Chir. 8vo. Manheim* 1767.)

In presence of M. Quesnay, Garengeot performed the flap amputation according to the method of Verduin and Sabourin. We know, that they made no ligature on the vessels, and that their intention was, that the flap, when applied to the stump, and sustained by a particular apparatus, should reunite, and stop all bleeding.

Garengeot's patient died on the third day after the operation; hemorrhage having had a considerable share in producing death.

The multiplicity of machines, described by Verduin, La Faye, &c. had no other end, but that of keeping the flap near the orifices of the vessels, so as to compress and close them. In consequence of the difficulty of making this compression precisely as required, the most considerable vessels being situated between the two bones, and when cut, generally becoming retracted, Garengeot determined in future to employ ligatures.

With these views, twelve years after the foregoing case, Garengeot performed a flap amputation of the arm, preserving two flaps, according to the method communicated to the Academy by Ravaton. The brachial artery was tied, and the patient was cured, without any exfoliations.

Garengeot made a third trial of this operation on a soldier dangerously wounded in the right foot by the bursting of a bomb, which fractured the interior part of the two bones of the leg, and several of the foot: the patient recovered in twenty-seven days.

In this operation, one single flap was made. Garengeot was fearful, however, that the quick union might create some difficulty in withdrawing the ligatures, and he therefore took a means of hindering adhesion where they were situated; but, of this objectionable plan, I shall not speak. He rightly preferred dressing and bandaging the stump to the use of the compressing machines invented by Verduin and La Faye; and his choice of a straight knife, instead of a crooked one, was equally judicious.

The preceding case dictated a truth, which will last as long as surgery itself, viz. *that it is advantageous to apply the ligatures in such manner as to embrace no more, than the vessel, so that they may fall off the sooner, and the parts more quickly unite. (M. de Garengeot, in Mémoires de l'Acad. de Chir. T.* 5, 12*mo.)*

At one time, an objection frequently urged against the foregoing methods, was, that, when the fresh cut flap was immediately laid over the stump, inflammation and abscesses were apt to ensue. Hence, in 1765, Sylvester O'Halloran, a surgeon at Limerick, was led to make the experiment of deferring laying down the flap till the end of the first eight, or twelve days after the operation, when it was conjectured that the risk of inflammation and abscesses would be diminished. The tenor of O'Halloran's book is apparently corroborated by the facts brought forward. Here we see one of the grand points, insisted upon by our worthy countryman James Yonge, viz. the chance of an immediate union of the wound from laying down the flap without delay, suddenly given up, and because the wound could not always be healed without suppuration, it was determined that it never should do so. However, it is consolatory to find, that O'Halloran's suggestion now exists only in the history, and not in the practice, of surgery.

Alexander Monro, senior, was a great opposer of certain methods, which originated amongst the French surgeons, and, in particular, he disapproved of the tourniquet: he secured the vessels with needles and ligatures; and was the inventor of a bandage, which has been extensively approved of under the name of Monro's roller. (*Medical Essays of Edinb. Vol.* 4, *p.* 257.)

Bromfield, like Le Dran, restricted amputation to a few cases; and he did not acknowledge its necessity, as a matter of course, in every case of gangrene, much less in every instance of white swelling, or caries. From a passage, which I have cited from Dr. Rees's Cyclopædia, it would seem, that the tenaculum was known to the ancients; yet, according to general opinion, (and I cannot affirm that it is incorrect from any passage in my recollection) Bromfield is allowed to be the first modern surgeon who employed this very useful instrument. (*Chir. Cases and Obs. Vol.* 1, *p.* 41, *8vo. Lond.* 1773.)

About the year 1742, the removal of thighs without bloodshed, was a subject a good deal broached. A single case, recorded by Schaarschmid, where a mortified thigh separated without hemorrhage, was the foundation of the scheme. The arteries were completely blocked up, and the parts insensible. (*Haller, Diss. Chir. Vol.* 5, *p.* 155.) A similar occurrence was related by Acrel (*Chir. händels. p. 557* ;) and Lalouette professed himself a believer in the security from hemorrhage, on account of the vessels being filled with coagula, and therefore he also approved of letting dead parts be removed, or rather fall off, without bloodshed. (*Haller, Diss. Chir. Vol.* 5, *p.* 273.)

In cases where the projecting bone of the stump was affected with necrosis, Bagieu, an experienced military surgeon, ventured to amputate a second time, and urged a variety of arguments in defence of the practice. (*Mém. de l'Acad. de Chir. T.* 2, *p.* 274.) He coincided with Le Dran and Bromfield, however, about the propriety of restricting amputation to few cases, and has related numerous examples of limbs being saved, which, according to the doctrines then in vogue, ought to have been cut off. (*Deux Lettres d'un Chir. de l'Armée,* 12*mo. Paris,* 1750.)

M. Louis, a French surgeon of extraordinary talents, introduced the plan of dividing the loose muscles first, and lastly those, which are closely connected with the bone. He noticed, that the muscles of the thigh, after being divided, were retracted in an unequal degree. He observed, that the superficial ones extending along the limb, more or less obliquely, without being attached to the bone, were drawn up with greater force, and in a greater degree, than others, which are deeply situated, in some measure, parallel to the axis of the femur, and fixed to this bone throughout their whole length. The retraction begins the very instant when the muscles are cut, and is not completed till a short time has elapsed. Hence, the effect should be promoted, and be as perfect as possible, before the bone is sawn. In the amputation of the thigh, M. Louis was always desirous of letting the muscles contract as far as they could, and, for this reason, he was rather averse to using the tourniquet, as the circular pressure of this instrument in some measure counteracted what he wished to take place, and hence, at one time he preferred letting an assistant make pressure on the artery, though he subsequently expressed his approbation of the tourniquet proposed by M. Pipelet for compressing the femoral artery. (*Mém. de l'Acad. de Chir. Vol.* 4, *p.* 60. 4*to.*)

Actuated by such principles, Louis practised a kind of double incision different from that of Cheselden and Petit, and different also from Alanson's method, which I shall hereafter notice. By the first stroke, he cut, at the same time, both the integuments and the loose superficial muscles; by the second, he divided those muscles, which are deep, and closely adherent to the femur. On the first, deep, circular, cut being completed, Louis used to remove a band, which was placed round the limb, above the track of the knife. This was taken off, in order to allow the divided muscles to become retracted without any impediment. He next cut the deep adherent muscles, on a level with the surfaces of those loose ones, which had been divided in the first incision, and which had now attained their utmost state of retraction. In this way, he could evidently saw the bone very high up, and the painful dissection of the skin from the muscles was avoided. Louis was conscious, that there was more necessity for saving muscle than skin; and he knew, that when an incision was made at once down to the bone, the retraction of the divided muscles always left the edge of the skin projecting a considerable way beyond them. Hence he deemed the plan of first saving a portion of skin, by dissecting it from the muscles, and turning it up, quite unnecessary. As the bone should always be sawn rather higher than the division of the soft parts, Louis, like J. L. Petit, and most other judicious surgeons, highly approved of the employment of a retractor. He was likewise the author of some valuable instructions for preventing the protrusion of the bone after the operation. (*See Mém. de l'Acad. de Chir. T.* 2, *p.* 268-410, *&c.* 4*to.*) The impartial reader, who takes the trouble to read the remarks on amputation, published by this greatest of all the French surgeons of the last century, with the exception perhaps of J. L. Petit, and Desault, will be impressed at once with the force and perspicuity of his matter, and with the evident propriety of a good deal of the practice inculcated.

In England, Cheselden, and not J. L. Petit, is regarded as the surgeon, who revived Celsus's method, by proposing to divide the soft parts *by a double incision*, that is, by cutting the skin and cellular substance first, and then, by dividing the muscles, down to the bone, on a level with the edge of the skin, so that the bone might be sawn higher up, and its end be more completely covered with skin. Whether Cheselden had the priority in this improvement, I cannot presume to say; but, he gave an account of it in Gataker's translation of Le Dran's treatise on the operations, as early as 1749, which was long prior to the appearance of Petit's posthumous writings; and Mr. Cheselden further mentions, that, during his apprenticeship to Mr. Fern, he had communicated to that gentleman his sentiments about the double incision.

In order to hinder the stump from assuming a pyramidal, or sugar-loaf shape, which sometimes happened notwithstanding every improvement hitherto mentioned, a circular bandage was employed, which acted by supporting the skin and muscles, and preventing their retraction. This bandage, when properly applied, from the upper part of the limb downward, fulfilled in a certain measure the end proposed, though many stumps yet turned out very badly. Mr. Sharp was induced, therefore, to revive the ancient plan of bringing the edges of the skin together with sutures; but, the pain and other inconveniences of this method were such, that it was never extensively adopted, and Mr. Sharp himself ultimately abandoned it. The cross-bandage, however, which he used to put over the end of the stump, remains in fashion even at the present day. (*Treatise on the Oper. p.* 216; *Critical Inquiry, p.* 268.) It is to be regretted, that an excellent modern surgeon, the late Mr. Hey, should have commended, so much as he has done, the use of sutures, in bringing together the edges of the wound after amputation. (*Practical Observations in Surgery, p.* 534, *Edit.* 2.)

In opposition to Louis, the inefficiency of his method for hindering the protrusion of the bone was asserted by Valentin, who thought the object might be better attained by dividing the parts, while they were in a state of tension, for which purpose, he recommended changing the posture of the limb, according to the parts, which he was about to cut. (*Récherches Critiques sur la Chirurgie moderne, 8vo. Amst.* 1772). Valentin's proposal seems never to have made much impression on the profession; whether on account of its inconvenience, or inefficacy, I know not: certain it is, many cases present themselves, in which the posture of a limb absolutely cannot be changed during the operation, owing to the nature of the disease, or cannot be altered without extreme agony.

At this period arose the celebrated controversy about the propriety of amputation in general. As Sprengel remarks, several French surgeons now began to be convinced, with Le Dran and Bagieu, that the operation was undertaken on too light grounds, and, in particular, that many bad complicated fractures might be cured without amputation. Such was the doctrine of Boucher (*Mém. de l'Acad. de Chir. T.* 2, *p.* 304), Gervaise (*Anfangsgr. der Wundarzn. 8vo. Strasb.* 1755), and Faure (*Mém. qui ont concouru pour le prix de l'Ac. de Chir. Vol.* 1, *p.* 100). The latter especially urged the prudence of delay, in gunshot wounds, and comminuted injuries of the bones. But, the writer, who at this time made most noise in the world, by his general condemnation of amputation, was Bilguer, (*Diss. de Membrorum Amputatione, 8vo. Hal.* 1761), whose sentiments received a complete a refutation from his own contemporaries, Pott, (*Chir. Works, Vol.* 2), Morand, (*Opusc. de Chir. T.* 1, *p.* 232), and De La Martinière (*Mém. de l'Acad. de Chir. Vol.* 4, *p.* 1), and also from later writers, to whom reference will be made in speaking of *Gunshot Wounds.* Even Bilguer himself was compelled to admit the necessity of amputation in cases of gangrene. (*Anweis für die Feldwundärzie, S.* 170.)

Bilguer's colleague, the celebrated Schmucker, inclined to the same doctrines, and has detailed several cases, where limbs were not only shattered, but actually carried away by balls, yet where a cure followed without amputation. One of his maxims was, that it was better for the member to be taken off by gunshot, than by the surgeon's knife, as the ball operated on a healthy subject, the knife on a person debilitated by an hospital. (*Chir. Wahrn. Th.* 2. *S.* 493.) In a later valuable essay on this subject, he restricts amputation to shattered limbs, affected with gangrene. His mode of operating was that of M. Louis. He sanctioned joint-operations at the hip and shoulder; but condemned those of the knee and elbow, as never answering. (*Verm. Schrift. Th.* 1. *S.* 3.)

Soon after the middle of the last century, the practice of amputating at the joints began to excite increased attention; but, as this is a topic, to which I must presently return, it is unnecessary now to dwell upon it. The writings of Puthod, Wohler, Brasdor, Barbet, Sabatier, Park, Moreau, and Vermandois, in relation to this subject deserve particular notice.

I now come to Mr. Alanson, whose name is as conspicuous in the history of amputation as that of any surgeon yet mentioned. His chief objects were to hinder a protrusion of the bone, and promote union by the first intention. He rejected the band, which was formerly put round the limb for the guidance of the knife, as altogether useless, and an impediment to the quick performance of the circular incision through the skin. When the tourniquet had been applied, an assistant grasped the integuments with both hands, and drew them and the muscles firmly upwards. The operator then fixed his eye upon the proper part where he was to begin the incision, which was made with considerable facility and despatch, the knife passing with greater quickness in consequence of the tense state of the integuments.

After the incision through the skin had been made, the assistant still continued a steady support of the parts, while Mr. Alanson separated the cellular and ligamentous attachments with the point of his knife till as much skin had been drawn up as would, with the muscles, divided in the particular way hereafter recommended, fully cover the whole surface of the wound. Then, instead of applying the knife close to the edge of the integuments, and dividing the muscles in a circular perpendicular manner down to the bone, Mr. Alanson proceeded as follows: when operating upon the thigh, and standing on the outside of the limb, he applied the edge of his knife under the edge of the supported integuments, upon the inner margin of the vastus internus muscle, and cut obliquely through that and the adjacent muscles, upwards as to the limb, and down to the bone, so as to lay it bare about three or four finger-breadths higher than is usually done, by the common perpendicular circular incision. He now drew the knife towards himself; then keeping its point upon the bone, and the edge in the same oblique line already pointed out for the former incision, he divided the rest of the muscles in that direction all round the limb; the point of the knife being in contact with, and revolving round the bone through the whole of the division.

According to Mr. Alanson, the speedy execution of the above-directed incision, will be much expedited by one assistant continuing a firm and steady elevation of the parts, and another taking care to keep the skin from being wounded, as the knife goes through the muscles, at the under part of the limb. Mr. Alanson censures the old method of depriving the bone of its periosteum to a considerable extent, above and below the part, where the saw was to pass, not only as creating unnecessary delay, but, since the periosteum serves to support the vessels in their passage to the bone, as apt to produce exfoliations, above the part where the bone is to be divided with the saw. Instead of this practice, he recommends first the application of the retractor, as advised by Gooch and Bromfield; and then denuding the bone at the part, where the saw is to pass, whereby the bone may be sawn off higher than is usually practised; a material object for hindering a projection of the bone, and forming a small cicatrix.

If the flesh of a stump, formed in the thigh, agreeably to the foregoing plan, be gently brought forward after the operation, and the surface of the wound be then viewed, it may be said to resemble in some degree, a conical cavity, the apex of which is the extremity of the bone; and the parts, thus divided, Mr. Alanson thought the best calculated to prevent a sugar-loaf stump.

The part, where the bone is to be laid bare, whether two, three, or four finger-breadths higher, than the edge of the retracted integuments; or, in other words, the quantity of muscular substance to be taken out, in making the double incision, must be regulated by considering the length of the limb, and the quantity of skin that has been previously saved by dividing the membranous attachments. The quantity of skin saved, and muscular substance taken out, must be in such exact proportion to each other, that the whole surface of the wound will afterwards be easily covered, and the limb not more shortened, than is necessary to obtain this end.

After the removal of the limb, Mr. Alanson drew each bleeding artery gently out with the tenaculum, and tied it as nakedly as possible, with a common slender ligature. When the large vessels had been tied, the tourniquet was immediately slackened, and the wound well cleaned, in order to detect any vessel, that might otherwise have remained concealed with its orifice blocked up with coagulated blood; and before the wound was dressed, its whole surface was examined with the greatest accuracy, by which means Mr. Alanson frequently observed a pulsation, where no hemorrhage previously appeared, and turned out a small clot of blood from within the orifice of a considerable artery. He is very particular in recommending every vessel to be secured that is likely to bleed on the attack of the symptomatic fever; for besides the fatigue and pain, to which such an accident immediately exposes the patient, it seriously interrupts the desired union of the wound. He used always to clean the whole surface of the wound well with a sponge and warm water, as he thought, that the lodgment of any coagulated blood would be a considerable obstruction to the quick union of the parts.

The skin and muscles were now gently brought forwards; a flannel roller was put round the body, and carried two or three times rather tightly round the upper part of the thigh, as at this point, it was intended to form what Mr. Alanson called a sufficient basis, which materially added to the support of the skin and muscles. The roller was then carried down in a circular direction to the extremity of the stump, not so tight as to press rudely or forcibly, but so as to give an easy support to the parts.

The skin and muscles were now placed over the bone, in such a direction, that the wound appeared only as a line across the face of the stump, with the angles at each side, from which points, the ligatures were left out, as their vicinity to either angle might direct. The skin was easily secured in this posture by long slips of linen, or lint of the breadth of about two fingers, spread with cerate, or any cooling ointment. If the skin did not easily meet, strips of sticking plaster were preferred. These were applied from below upwards, across the face of the stump, and over them a soft tow-pledget and compress of linen; the whole being retained with the many-tailed bandage, and two tails placed perpendicularly, in order to retain the dressings upon the face of the stump.

Mr. Alanson censured the plan of raising the end of the stump far from the surface of the bed with pillows, as the posterior muscles were retracted by it; and he considered it best to raise the stump only about half a hand's breadth from the surface of the bed, by which means the muscles were put in an easy relaxed position. The many-tailed bandage Mr. Alanson found much more convenient than the woollen cap, frequently used in former times to support the dressings; and he observes, that, though this seems well calculated to answer that purpose, yet if it be not put on with particular care, the skin is liable to be drawn backwards from the face of the stump; nor can the wound be dressed, without first lifting up the stump to remove the cap. (See *Alanson's Practical Obs. on Amputation*, *8vo. Lond.* 1779.)

The chief peculiarity of Alanson's method of operating, namely the mode, in which he recommends the oblique division of the muscles to be performed, did not, however, meet with universal approbation, and his extensive dissection of the skin from the muscles was complained of as excessively painful. The formation of a conical wound, by following Alanson's directions, was regarded by several as impracticable. (See *Marten's Paradoxieen, B.* 1. *S.* 88; *Loeffler, Beytrage* 1. *No.* 7; *Wardenburg. Briefe EinesArztes* 2 *B. p.* 20; *Richter, Anfangsgr. vol.* 7; *Graefe, Normen, &c. p.* 8; *Hey. Pract. Obs.*) In my opinion, there can be no doubt of the truth of some of the criticisms made by these, and some other writers, on the impossibility of making a wound, with a regular conical cavity, by observing the directions given by Alanson; for, if the knife be carried round the member with its edge turned obliquely upwards towards the bone, it will pass spirally, and, of course, the end of the incision will be considerably higher, than the beginning. But, though Alanson probably never did himself exactly what he has stated, I am sure, that his proposition of making an oblique division of the muscles all round the member, has been the source of great improvement in amputations in general, and is what is usually aimed at by all the best modern surgeons. It is true, they do not actually perform the oblique incision all round the limb, by one stroke, or revolution of the knife round the bone, as Alanson says that he did; but, they accomplish their purpose by repeated, distinct, and suitable applications of the edge of the instrument, turned obliquely upwards towards the bone, or bones.

Amongst others, Mynors found fault with some of Alanson's instructions, and thought every desideratum might be more certainly attained by saving skin enough, and then cutting through the muscles. The first incision, however, he directed obliquely upwards through the integuments, while they were drawn up by an assistant, and he then cut down to the bone. (*Pract. Thoughts onAmputation*, *8vo. Birming.* 1783.) Sprengel considers Mynors's plan merely as a revival of Celsus's method, as it had in view only the preservation of skin, and not the formation of a fleshy cushion. (*Geschichte der Chir. B.* 1. *p.* 426.)

Kirkland endeavoured to improve Mynors's plan, by cutting off a piece of skin at each angle of the stump, so as to keep the integuments from being thrown into folds; and, in opposition to Pott, he defended the sentiments of Bilguer, concerning the successful management of desperate cases, without amputation. (*On the present*

State of Surgery, p. 273, *and Thoughts on Amputation, 8vo. Lond.* 1780.)

B. Bell used to operate very much in the same way as Mynors; and, when it seemed advantageous to make a flap, he did not disapprove of the plans suggested by Ravaton, Verduin, and Alanson. *(Syst. of Surgery.)*

An interesting paper on amputation was some years ago published by Loder; its chief purport was to defend Alanson's method, with some slight modifications. (*Chir. and Medic. Beobacht. B.* 1. *p.* 20. 8vo, 1794.) However, the alterations suggested by Loder, do not seem to Graefe at all adequate to the removal of the difficulties, with which the mode of cutting the flesh exactly after Alanson's directions is complicated. (*Normen für die Abl. grösserer Gliedmassen, p.* 8, *4to. Berlin,* 1812.)

The removal of limbs, without bloodshed, proposed by Guido di Cauliaco in the 14th century, has met with modern defenders in J. Wrabetz and W. G. Plouquet. J. Wrabetz, with a ligature which was daily made tighter, took off an arm above the elbow. In the fissure, he sprinkled a styptic powder. On the fourth day, the flesh was severed down to the bone, which was sawn through. (*Gesehichte eines ohne Messer abgesetzten Oberarms. 8vo. Freyb.* 1782.) Plouquet thought the plan suited to emaciated timid subjects; but not well adapted to the leg, or forearm. (*Von der unblutigen Abnehmung der Glieder. 8vo. Tub.* 1786.)

Some other modes of doing flap-amputations, and, in particular, the suggestions and improvements made by Hey, Chopart, Dupuytren, Larrey, Lisfranc, and other modern practitioners, will be noticed in the description of the amputation of particular members. In the mean time, I shall conclude this section, with mentioning the laudable attempts made, at different periods, to render the patient less sensible of the agony produced by the removal of a limb. Theodoricus, as we have said, administered for this purpose opium and hemlock, and though he was imitated by many of the ancient surgeons, few moderns have deemed the practice worthy of being continued. Guido made the experiment of benumbing the parts with a tight ligature; but a machine, devised a few years ago in England, expressly for the object of stupifying the nerves of a limb previously to amputation, is perhaps not undeserving of further consideration. (See *J. Moore's Method of preventing, or diminishing Pain in several Operations of Surgery, 8vo. Lond.* 1784.) The great reason of the latter plan being given up, is, that some patients have made more complaint of the sufferings occasioned by the process of dulling the sensibility of the nerves, than of the agony of amputation itself, without any such expedient. Yet, daily experience proves, that the pressure, caused on the sciatic nerve by sitting with the pelvis in a certain position, will completely benumb the foot and leg, and this with such an absence of pain, that the person so affected is actually unaware of his foot *being asleep*, as it is termed, until he tries to walk. On the little good done by warming and oiling the cutting instruments, a method recently much commended, (*Faust und Hanold über die Anwendung des Oehls und der Warme, p.* 3-23, *Leipzig,* 1806,) I am sure it is unnecessary for me to comment.

AMPUTATION OF THE THIGH.

The thigh ought always to be amputated as low as the disease will allow, so that as little of the limb may be cut off as possible, the pain may not be greater than necessary, and the surface of the wound have less extent, than would otherwise happen. (*Sabatier, Med. Ob. p.* 350, *t.* 3. *Ed.* 2.) The patient is to be placed on a firm table, with his back properly supported by pillows, and assistants, who are also to hold his hands, and keep him from moving too much during the operation. The ankle of the sound limb is to be fastened, by means of a strong band or garter, to the nearest leg of the table.

Here, however, through an imprudent solicitude to obtain the above advantages, let not the surgeon ever be unmindful of the great axiom in surgical operations, that all the diseased parts should be removed; but, let him be assured of the truth of what Graefe inculcates, that it is more pardonable to cut away too much, than too little. (*Normen für die Ablosung grösserer Gliedm. p.* 60.) At the same time, I do not agree with some modern writers, who deem it necessary to amputate beyond the limits of every abscess and sinus, which may extend very far above a diseased joint, or compound fracture. Many of these suppurations are only like ordinary abscesses, and finally get well, after the main disease or injury is removed, as I have often seen. Were it an invariable rule to cut off a limb, above every collection of matter, sometimes five or six inches more of the thigh would be sacrificed, than circumstances absolutely demanded, and the greater danger of a high, than a low operation, would be encountered. However, in all cases, where the bone is suspected to be unsound, or the muscles are affected with the morbid changes, peculiar to fungus hæmatodes, or other incurable diseases, the operation should be practised sufficiently high to take away all the distempered parts. In secondary amputations, where there has been much suppuration in the limb, and a sinus runs up, Mr. Guthrie says, that if the sinus extend only a short way between the muscles, the membrane lining it may be dissected out; but, if the matter has lain upon the bone, this will have become diseased, and amputation should be done high enough to remove the affected part of it. (*On Gunshot Wounds, p.* 87.)

Many writers disapprove of amputating too close to the knee (*Graefe, Op. cit. p.* 60); and Langenbeck urges one objection to it, not specified by any other author, viz. that, if the operation be done lower down, than two hand-breadths above the knee, the femoral artery shrinks into the aponeurotic sheath, which it here receives from the vastus internus and triceps, and cannot be drawn out with the forceps, so as to be separately tied, without first slitting up that sheath. Hence, he recommends cutting through the muscles at the distance above the knee already mentioned. (*Bibl. für die Chir. B.* 1, p. 571, 12*mo. Gott.* 1806.) But, when I come to look at the breadth of two adult hands, and see how much of the limb would be sacrificed, at all events, only to save a little trouble, I cannot bring my mind to concur with Langenbeck, the remedy being worse than the alleged evil.

The next thing is the application of the tourniquet. (See *Tourniquet.*) The pad should be placed exactly over the femoral artery, in as high a situation as can be conveniently done. When the thigh is to be amputated high up, it is better to let an assistant compress the femoral artery in the groin, with any commodious instrument, furnished with a round blunt end, calculated for making direct pressure on the vessel without injuring the integuments. Some authors indeed give a general preference to this method, whether the thigh be amputated high up, or low down. (*Paroisse, Opuscules de Chir. p.* 188. *Brunninghausen, Erfahr. über die Amp. p.* 273. *Langenbeck, Bibl. Chir. p.* 564. See *also Liston's Obs. in Ed. Med. and Surg. Journ. vol.* 20, *p.* 43.) Were the patient, however, in a debilitated state, and unable to bear loss of blood, as there might, in this way, be some considerable bleeding, by reason of the anastomoses with the branches of the internal iliac artery, I should feel disposed to employ the tourniquet whenever circumstances would admit of its application. In amputations of the thigh, the great objection to the use of this instrument, is, that it impedes the free and immediate retraction of the loose muscles after they have been cut, the consequence of which is, that the surgeon cannot divide so high, as he otherwise could do, the deeper muscles, which are more fixed, and attached to the bone. Yet, in order to have the bone well covered with flesh, and no danger of a sugar-loaf stump, the latter object is one of vast importance. Perhaps, the best general rule is, to abandon the application of the tourniquet in amputations, done as high as the middle of the thigh, except where the patient is remarkably weak, so that he cannot bear the smallest loss of blood, and no steady intelligent assistant is at hand, to whom the compression of the artery in the groin can be prudently confided. When, however, the operation is to be done much higher up, of course the employment of a tourniquet is wholly inadmissible.

Whether the right or left thigh is to be removed, it is customary for the operator to stand on the patient's right side. The great advantage of this situation seems to be, that the surgeon's left hand can be thus more conveniently, and quickly brought into use, than if he were always to stand on the same side, as the limb he is about to amputate. This seems to be the only assignable reason for this habit: for, when the left thigh is to be amputated, it is certainly some inconvenience to have the right limb, between the operator, and the one that is to be removed. But this is found less inconvenient, than not having the left hand next the wound.

Mr. Guthrie, in speaking of amputations on the two lower thirds of the thigh, observes, that "in these cases, the tourniquet should be used;" but in operations high up the thigh, he joins all other surgeons in recommending the inguinal artery to be compressed against the os pubis. (*On Gunshot Wounds, p.* 202.) The utility of slackening the tourniquet completely, however, as soon as the principal vessels are secured, a piece of advice delivered by this excellent surgeon, I presume, cannot be right on the ground, which he specifies, viz. the impediment made by the strap of the instrument to the retraction of the muscles, and the consequent difficulty in high operations of sawing the bone, *because in common practice, the bone is always sawn before any of the vessels are secured;* and loosening the tourniquet entirely, while any arterial branches still require the ligature, must generally be objectionable, if loss of blood be a disadvantage. In flap-amputations, high up the limb, indeed, where the arteries are sometimes tied, before the division of the bone, the employment of a tourniquet at all is quite out of the question.

We know, that it was an opinion of the late Mr. J. Bell, that the flow of blood through a large artery could not be completely stopped by pressure; and the late Mr. Hey adopted a similar notion, in consequence of seeing a case, in which the application of two tourniquets to the thigh did not restrain the hemorrhage from a fungus hæmatodes of the limb. He says, the pressure of the tourniquet does not completely obstruct the passage of blood in the arteries; it only diminishes so much of the force of the current, as to enable the vessels, *in a sound state,* to exert their natural contractile power so effectually as to prevent hemorrhage. (See *Hey's Pract. Ob. p.* 257, 258, *Ed.* 2.) Of the inaccuracy of this doctrine, no man can doubt, who sees the femoral artery with its open mouth on the face of a stump not bleeding, while the tourniquet is tight, or skilful pressure is kept up, but throwing out its blood to a great distance, the instant the pressure is discontinued. Nor, I apprehend, can any surgeon, who has amputated at the shoulder, and seen how completely pressure commands the flow of blood through the open-mouthed axillary artery, join in the sentiment of John Bell and Hey upon this particular point. Here I can speak with confidence, because I have myself amputated at the shoulder, and assisted at this operation several times, and found the statements of the preceding writers perfectly and clearly contradicted. Were any further testimony required, I might cite that of Dr. Hennen, who mentions, amongst other facts, that in a shoulder-joint case, operated upon by Mr. Dease, the amount of blood, lost from the principal artery, was no more than the quantity contained between the point of pressure, and the point of incision through the vessels. (*Principles of Military Surgery, p.* 257, *Ed.* 2.) The same fact presented itself in the example, where I recently assisted Dr. Blicke, in private practice.

Mr. Liston, of Edinburgh, confirms the preceding statement, observing that pressure complete enough, not only to stop the pulsation of an artery in a limb, but also to arrest completely the flow of blood, can be easily applied by means of the fingers only. And, in order to prove the correctness of this remark, he has repeatedly, when no proper assistant was at hand, compressed both the femoral and humeral arteries with the fingers of one hand, whilst, with the other hand, he removed the limb, and this, as he affirms, with the loss of much less blood, than if he had followed the ordinary mode. His common practice, however, is to let the pressure be made by an assistant, and to employ no tourniquet. (See *Ed. Med. and Surg. Journ. vol.* 20, *p.* 44.)

If then the flow of blood through an artery can easily be commanded by pressure, how are we to explain the occasional continuance of bleeding, notwithstanding the pressure of one, or even two tourniquets? Without doubt, by the fact, that the pads of these instruments, when not duly arranged, do more harm than good, by raising the band off the vessel, and perhaps also in Mr. Hey's example, by the additional consideration, that tumors of the fungus hæmatodes kind, include a large quantity of blood, and will bleed profusely, and for a considerable time after the main supply of blood to them is cut off. The same thing happens in the disease, called aneurism by anastomosis, as I have had several opportunities of witnessing, but in no instance more strikingly, than in one, where, some time after Mr. Hodgson had tied the radial and ulnar arteries, Mr. Lawrence divided every part of the finger, excepting the tendons and bone, and yet a considerable bleeding went on from the further side of the wound. (See *Med. Chir. Trans. vol.* 9, *p.* 216.)

The application of the tourniquet is generally left too much to assistants; but, as far as my judgment extends, no operator is justified in commencing his incisions, before he has examined, and fully satisfied himself, that the instrument is correctly applied. Mr. Guthrie candidly tells us, that he once lost an officer, in consequence of hemorrhage during the operation, although the tourniquet was in the charge of a surgeon of ability; and the advice with which he follows this statement is worth recollecting: "In a case of this kind, where it (the tourniquet) is found of little benefit, the surgeon should not continue twisting and turning it, whilst his patient is bleeding, but quit it altogether, and compress the artery against the pubes." This maxim, I think, cannot be too highly commended.

The shape and size of the pad of the tourniquet are matters of importance. At St. Bartholomew's, the pads employed are very firm, being composed of wood, or cork covered with leather, and rather thicker than the thumb, the upper surface being flat, and the lower, which is put against the thigh, being convex. They are about an inch and a half in length. Such pads answer extremely well, as I can affirm from the observation of some hundreds of amputations in that hospital. A common fault formerly was the employment of pads which were too large, and soft, and not judiciously shaped. As Mr. C. Hutchison remarks, the principal objection to a large pad is, that the band of the tourniquet is so much raised by it, that a considerable space is left on each side of it, where no compression is made on the limb, however closely the instrument may be screwed, and thus, there will be a risk of hemorrhage from such vessels as happen to be in these situations. The same gentleman uses a pad, which is not thicker than a finger, and places it obliquely over the artery, so as to preclude the possibility of displacement. (*Pract. Obs. in Surgery*, *p.* 21-23.) Mr. Guthrie says, "the pad should be firm and rather narrow, and carefully held directly over the artery, whilst the ends of the bandage, in which it is contained, are pinned on the thigh. The strap of the tourniquet is then to be put round the limb, the instrument itself being directly over the pad, with the screw entirely free. The strap is then to be drawn tight, and buckled on the outside, so as to prevent its slipping, and not interfere with the screw, which is to be turned until the pressure is sufficiently forcible to stop the circulation. If the screw require to be turned, for more than half its number of turns to effect this, the strap is not sufficiently tight, or the pad has not been well applied; and they must be replaced." (*On Gunshot Wounds*, *p.* 204.)

In two amputations at St. Bartholomew's Hospital, I saw the tourniquet break after the soft parts had been divided, and, as in one of these cases a good deal of blood was lost, because another tourniquet happened not to be in the room, and pressure on the artery in the groin was not immediately adopted, I coincide with such writers as recommend the rule of always having two tourniquets ready. Graefe even goes so far as to advise putting both of them round the limb before the operation commences, (*Normen für die Ablosung grösserer Gliedmassen*, *p.* 48;) but, the frequency of a tourniquet breaking is not so great, I believe, as to demand such precaution, and the plan would be very objectionable in thigh amputations, where it is a material advantage to have plenty of room between the place of the incision and the band which goes round the limb.

An assistant, firmly grasping the thigh with both hands, is to draw up the skin and muscles, while the surgeon, beginning with that part of the edge of the knife which is towards the handle, makes a circular incision, as quickly as possible, through the integuments down to the fascia, or, as Mr. Guthrie and Dr. Hennen recommend, even completely through it. According to Mr. Guthrie, the skin cannot be sufficiently retracted, unless the fascia be divided, which he appears to think ought rather to be drawn up with the integuments than dissected from them. (*On Gunshot Wounds*, *p.* 205. Also *Hennen's Military Surgery*, *p.* 263.) On the contrary, Professor Langenbeck is very particular in enjoining surgeons to avoid cutting through the fascia by the first sweep of the knife, because he finds that the muscles are better held together, and can be more regularly divided, by cutting them and the fascia at the same time. (*Bibl. für die Chir. b.* 1. *p.* 564.) Nor does M. Roux divide the fascia by the first incision. (*Mém. sur la Réunion immediate de la Plaie après l'Amputation circulaire*, *p.* 9. *8vo. Paris*, 1814.) At St. Bartholomew's, the surgeons rarely, or never, cut through the fascia with the integuments, but aim at carrying the knife perfectly down to it all round the limb. This at least ought to be done, without fear of doing rather more; for, as Graefe observes, if the outer layers of the muscles be here and there a little touched, this occasions less pain than the additional strokes of the knife for dividing any portion of the skin and cellular substance not completely cut through in the first instance. Graefe also dissents from Mynors and others, who are advocates for cutting the skin obliquely instead of perpendicularly, because he finds the thin edge of the integuments, thus separated from the subjacent cellular membrane, very apt to slough. (*Normen für die Abl. grösserer Gliedmassen*, *p.* 102.) In a thigh of ordinary dimensions, the first incision should be made four inches below where it is intended to saw the bone. When the thigh is bulky, the large amputation knife will be found the best. Before beginning this first cut, the arm is to be carried under the limb, till the knife reaches almost round to the side on which the operator stands. With one sweep, penetrating at least to the fascia, the knife is then to be brought round to the point where it first touched the skin. Thus, the wound is more likely to be regularly made, than by cutting first on one side, and then on the other, while the patient is saved some degree of pain, in consequence of the uninterrupted quickness with which the incision is made. At the same time, I ought to confess, that the late Sir C. Blicke, and some other surgeons, whom I have seen operate, used to complete the circle by two strokes of the knife so well and expeditiously, that their capricious attachment to this plan could hardly be found fault with.

The next object is the preservation of as much skin as will afterwards, conjointly with the muscles, cut in an oblique direction, cover the end of the stump with the utmost facility. It is rather difficult to lay down any other general principles for the guidance of the surgeon in saving integuments. I am disposed to agree with several modern writers, that the painful dissection of the skin from the muscles has been recommended and practised to a very unnecessary extent; that is to say, unnecessary, if the division of the muscles be performed in the most advantageous manner. Graefe, one of the best surgeons at Berlin, does not dissect the skin from the muscles at all in amputating the thigh, but takes care, after making the cutaneous incision, to have the integuments and subjacent flesh very firmly drawn up before commencing the oblique division of the muscles. This retraction he also strongly advises to be done uniformly and smoothly all round the member, lest, in dividing the muscles, any irregular projection of the skin interfere with the requisite movements of the knife. (*Normen für die Abl. grösserer Gliedmassen*, *p.* 103.) Instead of dissecting back the skin, Dupuytren cuts all the soft parts at once to the bone, which he next removes, after retracting the muscles. (*Symes, in Ed. Med. and Surg. Journal*, *vol.* 14, *p.* 32.) However, Langenbeck, another of the most skilful operators on the continent, prefers detaching the integuments from the fascia for about two finger-breadths, (*Bibl. für die Chir. b.* 1. *p.* 567.) as is perhaps the most common practice in the London hospitals. Some late writers, particularly Mr. Symes, in expressing their preference to muscle as a covering for the end of the bone, seem to forget one fact which I have often noticed; *viz.* that the muscular cushion, though at first thick and good, soon shrinks to a comparatively small mass. This is consonant to a general law in the animal economy, prevailing whenever the natural action of a muscle is lost or prevented. Sir Astley Cooper states, that the covering for the end of the bone must be integuments, and not muscles; for, if muscular fibres are preserved with the integuments, they will contract, and retraction of the skin covering the stump will be the result. (*Lancet*, *vol.* 1, *p.* 148.) Brünninghausen also thinks skin a better and more durable covering for the end of the bone than muscular fibres, which after a time dwindle away, and hence he computes the quantity of integuments which ought to be saved, by the measure of the circumference and diameter of the member.—Thus, when the limb is nine inches in its circumference, the diameter is about three: therefore, one inch and a half of skin on each side is to be saved. (*Erfahr. &c. über die Amp. p.* 75.) But this author cuts the muscles perpendicularly, so that he is obliged to separate much more skin from the flesh than is necessary, when the incision through the muscles is carried obliquely upward. Mr. Hey's method of calculation, which I shall presently notice, appears more adapted to ordinary practice; and he says, "the division of the posterior muscles may be begun at half an inch, and that of the anterior, at three quarters, above the place where the integuments were divided." (*Pract. Obs. in Surgery*, *p.* 528, *Ed.* 2.) With the view of preventing the necessity of dissecting the skin from the fascia, Mr. Guthrie, as already noticed, commends the plan of cutting through the fascia together with the integuments by the first stroke of the knife, and retracting these parts at the same time, instead of detaching them from each other. If this method be found perfectly efficient, and it be not objectionable, as exposing the muscles to be cut unnecessarily, I think the reason specified against it by Langenbeck, and explained in a preceding page, not weighty enough to form a just ground for rejecting a practice, which comes with the alleged advantage of superseding the necessity for all painful dissection of the skin from the muscles. However, in secondary amputations of the thigh, if the integuments be unsound, and will not retract, Mr. Guthrie approves of their being dissected back to an equal distance all round. (*On Gunshot Wounds*, *p.* 205—208.) Dr. Hennen, by giving an oblique direction to all the incisions through the muscles, obviates the necessity for much dissection of the integuments, and, he says, that, in a small limb, he has repeatedly performed the operation with one sweep of the knife, cutting obliquely inwards and upwards at once to the bone. (*Principles of Military Surgery*, *p.* 265. *Ed.* 2.) This author, like Mr. Guthrie, also recommends carrying the knife through the fascia in the first circular incision; and so does Mr. C. Hutchison, who makes no mention of dissecting back the skin, but simply states, that the "integuments and fascia being divided by a circular incision, and retracted upwards, as high as is judged necessary, the superficial muscles should next be divided," &c. (*Pract. Obs. in Surgery*, *p.* 23. *8vo. Lond.* 1816.) We are therefore to conclude, that he joins Graefe and others in thinking the separation of the skin from the fascia unnecessary. My own observations in practice lead me to believe, that the dissection of the integuments from the subjacent parts used formerly to be carried to an extent beyond all moderation and necessity, and that, as it is a most painful proceeding, and hurtful, by forming a large loose pouch for the lodgment of matter, it ought to be abandoned by every surgeon who follows the method of sawing the bone considerably higher than the first cut through the superficial muscles. I am not, however, prepared to assert, that no dissection at all is generally requisite, but am rather disposed to believe the moderate adoption of it, as recommended by Mr. Hey, the most prudent. This gentleman, like Desault, (*Œuvres Chir. T.* 21. *p.* 545.) is an advocate for amputating with a triple incision, and for preserving such a quantity of muscular flesh and integuments as are proportionate to the diameter of the limb. By a *triple* incision, he means first an incision through the integuments alone; secondly, an incision through all the muscles, made somewhat higher than that through the integuments; and thirdly, another incision through that part of the muscular flesh which adheres to the bone, made round that point of the bone where the saw is to be applied. The proper distance of these incisions from each other, he says, must be determined by the thickness of the limb upon which the operation is to be performed; making allowance for the retraction of the integuments, and of those muscles which are not adherent to the bone. Supposing the circumference of the limb to be twelve inches where the bone is to be divided, the diameter is about four inches, and, if no retraction of the integuments were to take place, a sufficient covering of the stump would be afforded by making the first incision at the distance of two inches from the place where the bone is to be sawn, that is, at the distance of the semidiameter of the limb on each side. But, as the integuments, when in a sound state, always recede after they are divided, it is useful to make some allowance for this recession; and to make the first incision, in this case, at least two inches and a half, or three inches below the place where the bone is to be sawn. As the posterior muscles of the thigh retract a great deal in the process of healing, Mr. Hey advises their division to be begun half an inch above the place where the integuments were cut, and the anterior muscles three quarters of an inch. The integuments, says he, will retract a little both above and below the place where they were divided; but, the distance from that place must be computed from the mark left upon the surface of the muscles in dividing the integuments. Thus, in fact, in a common thigh amputation, Mr. Hey deemed it necessary to detach the skin from the muscles merely to the extent of half an inch at the back part of the limb, and of three quarters in front: a very different practice from the old custom of making quite a bag of integuments, and turning them back, like the upper piece of a glove is turned down, or rather as the sleeves of a coat are turned up.

In common amputations of the thigh, Roux strongly disapproves of separating the skin far from the muscles, as a circumstance highly unfavourable to the healing of the wound by adhesion; he divides only a few of the cellular bonds between the integuments and fascia; and occasionally he has imitated M. Louis in cutting through the skin and superficial muscles together. (*Mém. sur la Reunion de la Plaie après l'Amputation, &c. p.* 9.)

I believe the generality of the best modern operators are now convinced of the impropriety of dividing the muscles exactly in the manner directed by Mr. Alanson, *viz.* by letting the knife revolve uninterruptedly all round the bone, with its edge turned obliquely upwards, towards the point where it is intended to apply the saw. It is a topic, indeed, to which I have already called the reader's attention in the foregoing columns. Langenbeck says, that he is perfectly convinced of the impossibility of forming a conical wound with one stroke of a large amputating knife, and joins Mr. Hey in approving of the triple incision. (*Bibl. für die Chir. b.* 1. *p.* 564.) The objections, first urged by Wardenburgh against Alanson's method, are mathematically correct, inasmuch as the course of the edge of the knife, in this gentleman's method, must be spiral, and the end of the incision be considerably higher than the beginning of it. Such must be the result of performing the division of the muscles all round the limb by one continued stroke of the knife, with its edge directed obliquely upwards; for the idea of making the knife revolve in this manner, while its point is confined to an imaginary, regular, determinate circle on the bone, I believe, is now abandoned, as not really practicable. Yet, with the exception of Desault, who confined himself to the triple incision, conducted on the principles of M. Louis, (*Œuvres Chir. T.* 2, *p.* 547,) few experienced surgeons refuse to acknowledge, that, in this operation, immense advantage does proceed from the oblique division of the muscles, the honour of bringing which method into practice, Mr. Alanson still unquestionably merits, however he may have erred in recommending the conical wound to be made with one sweep of the knife. Nor are there many living surgeons who entertain a doubt of the excellence of the principle inculcated by M. Louis, respecting the utility of dividing the loose superficial muscles first, and then such as are deeper and adherent to the bone. In fact, a combination of this last method, with the oblique division of the muscles, not exactly by one, but several strokes of the knife, constitutes the mode of amputating at present most extensively adopted, and sometimes termed, as already mentioned, amputation by a triple incision. Thus, after the skin is cut, and as much of it retracted and saved as is deemed necessary, the operator next cuts through the loose muscles of the thigh, at the edge of the retracted skin, first those on the forepart of the limb, and then such as are situated behind. For this purpose, he makes two or more sweeps of the knife, as may be found necessary, carefully directing them obliquely upwards towards the point, where he means to saw the bone. The oblique division of the muscles does not merely enable the operator to saw the bone higher up than he could otherwise do, and leaves at the same time more muscle for covering its extremity, but it is a preservation of sound undetached integuments, which assuredly form the most efficient and durable covering for the stump. I say this, without precisely coinciding with Brünninghausen, who trusting entirely to skin for covering his stumps, makes an extensive detachment of it from the muscles, and then cuts straight down to the bone. The loose muscles, actually cut through, now retract considerably, leaving those which are deeper and attached to the bone, in a condition to be cut higher up than could have been previously done. Lastly, these are also to be divided with the edge of the knife directed obliquely upwards towards the place where the saw is to be applied. Some operators do more than this; for, after cutting down to the bone, they follow the plan of Celsus, and detach the flesh from its whole circumference upwards with a scalpel, to the extent of about another inch, in order to be enabled to saw the bone still higher up. "*Inter sanam vitiatamque partem incidenda scalpello, caro usque ad os, reducenda ab eo sana caro, et circa* *os subsecanda est, ut eâ quoque parte aliquid ossis nudetur.*" This method, I think, deserves commendation, because it may have considerable effect in hindering a protrusion of the bone, if it does not, in conjunction with the foregoing method of operating, and judicious dressings, render this disagreeable event quite impossible. As long as I live, however, I shall never forget a poor soldier, whose thigh had been amputated in Bergen-op-Zoom, and who was brought about ten days after the operation into the military hospital at Oudenbosch under my care. Not the slightest union of any part of the wound had taken place; abscesses had formed under the fascia on every side of the stump; the loose skin was literally a large bag of purulent matter; the muscles were wasted to almost nothing, and their remains retracted, and shrinking still further away from the extremity of the bone, which protruded at least three inches beyond the soft parts. This unfortunate man had been attacked with chronic tetanus soon after the operation, and probably, it was to the disturbance of the stump by the effects of that disease, and to the strong and continual tendency of the muscles to retract themselves, induced by this state of the system, the deplorable state of the stump was to be attributed. He lingered nearly a fortnight in the hospital before he died, previously to which event large abscesses, communicating with the hollow of the stump, surrounded the greater part of the pelvis. As I had every reason to believe that the operation had been skilfully done, perhaps when I say that the above mode of amputating will make a protrusion of the bone impossible, it is not exactly correct, as the occurrence may sometimes originate from causes, which are quite independent of the particular way, in which the operation has been executed.

The practice of detaching the bone from the circumjacent flesh to the extent of about an inch, after the other principal incisions are completed, as advised by Celsus and Louis, I have sometimes seen done at St. Bartholomew's Hospital, and have practised myself on other occasions, with the decided advantage of letting the bone be sawn higher up, than could otherwise have been effected. Mr. Guthrie, after the incisions down to the bone, even recommends dissecting back the muscles from it "*for the space of two or three inches*, as the size of the limb, or other circumstances, may require;" but, I should be reluctant myself to imitate the practice to this extent, though inclined to think most favourably of it within more moderate limits. If we reckon that three inches of the member lie between the first circular cut in the skin, and the place where the knife arrives at the bone, and then take away two or three inches more of the femur, it is clear that, in many examples, we should be getting very high up the limb, and, if a detachment of the muscles from the bone to the extent of two or three inches were thus made, it would at all events be of no service, unless the bone would admit of being sawn at this great distance from the termination of the oblique division of the muscles. However, if this were truly practicable (a point, which I leave for others to discuss) it would certainly be consonant to the excellent general maxim, laid down by J. L. Petit, that in amputation, as much of the bone, and as little of the flesh, should be taken away as possible (*See Traité des Mal. Chir. T.* 3, *p.* 150). When this final detachment of the deep muscles from the bone is adopted, particular care, as Roux observes, should be taken always to divide the thick aponeurosis, connecting the triceps to the linea aspera. (*Mém. sur la reunion de la Plaie après l'Amputation, p.* 10.)

With respect to Desault's method of amputating the thigh by a circular incision, already mentioned, he considered turning the knife obliquely upwards quite unnecessary: his plan was to cut through the muscles, layer after layer, with the precaution of retracting the first stratum before he divided the second: the latter was then cut through on a level with the flesh that had been previously divided and retracted; and so on down to the bone. This, says he, is the right way of forming a true hollow cone, of which the integuments, which were drawn up before the muscles were cut, form the base, from which are gradually continued the various layers of muscles, and the highest point of which is the bone itself. Desault owns, that this method is somewhat tedious and painful; but, in his opinion, these disadvantages are more than counterbalanced by the benefits procured for the patient. (*Œuvres Chir. de Desault par Bichat, T.* 2, *p.* 547.)

All the muscular fibres, on every side, having been cut down to the bone, a piece of linen, somewhat broader than the diameter of the wound, should be torn at one end, along its middle part, to the extent of about eight or ten inches. This is called a retractor, and is applied by placing the exposed part of the bone in the slit, and drawing the ends of the linen upward on each side of the stump. In this manner, the retractor will obviously keep every part of the surface of the wound out of the way of the saw. Graefe thinks, that, in amputations of parts, where there is only one bone, the unslit portion of the linen should always be applied over the anterior muscles, as these ought constantly to be most evenly kept back, so that no projection of them may interfere with the action of the saw. (*Normen für die Ablosung grösserer Gliedm. p.* 105). This is a preference, however, which may not be of great importance, though I confess, that there appears some reason in what Graefe has stated. That meritorious surgeon, J. L. Petit, whose name I always mention with pleasure, strongly commends the use of the retractor, the ends of which he drew over the anterior muscles: he says, that he has employed this simple and natural means, but, that it did not suit the taste of every body, especially of those, who consider all the merit of an operation to consist in the quickness of its performance, or who think it satisfactory reasoning to say, this is not their way. (*Traité des Mal. Chir. T.* 3, *p.* 152.) I have seen the saw do so much mischief, in consequence of the operator neglecting to use the retractor, that my conscience obliges me to censure such surgeons as neglect to defend the soft parts by this simple contrivance. There are some, who have rejected the use of the retractor, because they have seen it get under the teeth of the saw, and obstruct the action of the instrument; but this very circumstance adduced against the retractor, is, when considered, the strongest one that could possibly be brought forward in its favour, as the surface of the wound itself, and particularly the edges of the skin, would, in all probability, suffer the same fate as the linen, by getting under the teeth of the saw, if no retractor were employed, in attempting to saw the bone high up, as closely as possible to the soft parts. I think no one can urge any, but the most frivolous, objections to the use of the retractor, and I know, that many, who have been with myself eye-witnesses of the mischief, frequently done by the saw in amputations, are deeply impressed with an aversion to the neglect of this bandage. I have often seen the soft parts skilfully divided, and I have, in these same instances, seen the operators, directly afterwards, lose all the praise, which every one was ready to bestow, by their actually sawing through one half of the ends of the muscles together with the bone. Men who have had fortitude not to utter a sigh, nor to let a groan be heard, in their previous sufferings, have now had their involuntary cries extorted from them by unnecessary, unjustifiable torture. But, besides defending the surface of the stump from the teeth of the saw, the retractor will undoubtedly enable the operator to saw the bone higher up, than he could otherwise do.

Mr. Liston, of Edinburgh, endeavours to show, that the saw is the only necessary thing in the case of amputating instruments; and, he adds (alluding, as I suppose, to operations at the joints), that it is seldomer required than might be supposed; and he particularly declares all kinds of retractors superfluous. Here, it should be remembered, that this gentleman's practice is that of flap-amputation, to which he gives the universal preference: a method in which, unquestionably, the retractor may be dispensed with, as, while the saw is acting, one, or both, of the flaps can be effectually held out of the way by an assistant. The same preference also explains, in some measure, this surgeon's rejection of the tourniquet, the application of which is certainly inconvenient in certain flap-amputations. (See *Edinburgh Med. and Surg. Journ. vol.* 20, *p.* 43—45.) Here, however, I am treating of amputation by the circular incision, in which practice, I consider both the tourniquet and the retractor too useful to be commonly relinquished.

Another proceeding, which seems fit for reprobation, and which, indeed, Mr. Alanson very properly condemned, is the practice of scraping up the periosteum with the knife, as far as the muscles will allow. Nothing seems more probable, than that this may be the cause of the exfoliations which occasionally happen after amputations. At all events, it is a superfluous, useless measure, as a sharp saw, such as ought to be employed, will never be impeded by so slender a membrane as the periosteum. All that the operator ought to do, is to take care to cut completely down to the bone, all round its circumference. Thus a circular division of the periosteum will be made, and upon this precise situation, the saw should be placed. This is the method which was approved of by J. L. Petit. (*Traité des Mal. Chir. T.* 3, *p.* 159). It is what I have always done and recommended; yet it must be confessed, that differences of opinion prevail about the necessity, and modes, of dividing the periosteum. Graefe, in common with several others, entertains considerable apprehension of the effects of the periosteum being torn and lacerated by the saw, exfoliations of the bone and abscesses up to the joint being possible consequences of the rude separation and inflammation of this membrane. Hence, he is an advocate for making a circular cut through at the place where the saw is to be applied, and then scraping away all below this point in the direction downwards. (*Normen für die Abl. grösserer Gliedm. p.* 165, and 105.) Perhaps, no very great objection may lie against this mode, which is not uncommonly followed, though I have some doubts of its real utility, as it scarcely seems practicable in the midst of the oozing of blood, to hit with the saw the precise line, at which the remains of the periosteum terminate; and, in confirmation of the safety of Petit's practice, Mr. Guthrie's experience may be adduced, who says, "I have often sawn through the bone, without previously touching the periosteum, and the stumps have been as soon healed, and with as little inconvenience, as any others. (*On Gunshot Wounds, p.* 88.) A very modern author, impressed, like many others, with the fear of tearing the periosteum with the saw, differs from them in thinking it best to scrape the periosteum upwards, by which means, he says, that at least half an inch of this membrane, and a proportionate quantity of muscular fibres, may be preserved for covering the end of the bone, inasmuch as the muscular fibres, adherent to the periosteum, will remain connected with it; an advantage, which this author deems very important while the edges of the bone are sharp. In amputation below the knee, he considers the method highly useful, as the sharp edge of the tibia may be not merely covered with skin, but periosteum and the cellular membrane connected with it. Since his adoption of this practice, he assures us, that he has not for a very long time seen any exfoliation of the tibia, and never any protrusion of the bone of a stump. (*Brünninghausen Erfahr. &c. ueber die Amp. p.* 65, 66, 8*vo. Bamb.* 1818.) Such are the sentiments of a gentleman who has published a valuable tract on amputation, as well as some other works of deserved reputation. His opinion is unquestionably the reverse of what is mostly prevalent in England; and I think his practice liable to the objection, that the disadvantages of scraping the bone at all, and denuding it, may exceed the benefit, supposed to proceed from afterwards bringing down the detached membrane over its sharp margin, even admitting this to be always practicable.

But, in no part of the operation of amputation do operators in general display more awkwardness, than in sawing the bone, though, if we except directing the saw against the flesh, the faults are here less pernicious in their consequences than the errors already noticed. At the time of sawing the bone, much depends upon the assistant who holds the limb. If he elevate the lower portion of the thigh bone too much, the saw becomes so pinched that it cannot work. On the other hand, if he allow the weight of the leg to operate too much, the thigh bone breaks before it is nearly sawn through, and its extremity is splintered. It is one of the most common remarks of such persons, as are in the habit of frequently seeing amputations, that the part of these operations, which a plain carpenter would do well, foils the skill of a consummate surgeon, and few operators acquit themselves well in the management of the saw. Many of them begin the action of this instrument, by moving it in a direction contrary to the inclination of its teeth. Many, seemingly through confusion, endeavour to shorten this part of the operation, by making short, very rapid, and most convulsive strokes, with the saw. Almost all operators fall into the error of bearing too heavily on the instrument. That operator will saw best, who makes the first stroke of the saw, by applying its heel to the bone, and drawing the instrument across the part, towards himself, so as to make a slight groove in the bone, which serves very materially to steady the future operations of the instrument; and who makes long, regular sweeps with the saw, rather slowly than quickly, rather lightly than heavily. But, there is often a fault in the construction of the saw itself, which impedes its action, quite independently of any fault on the part of the surgeon. I allude to the edge of the instrument not being a little broader, than its blade. When the saw is well made, the teeth always make plenty of space for the movement of the rest of the instrument. The instrument, as Mr. Guthrie recommends, should cut with both edges, backwards and forwards, which expedites the operation, and (what is of more consequence) helps to prevent splintering when the bone is nearly divided, because the division can be finished by the backward motions, which are the most gentle. (*On Gunshot Wounds, p.* 89.)

Graefe commends the plan of oiling the saw, for the purpose of facilitating its action; (*Normen für die Abl. grösserer Gliedmassen, p.* 65.) and though the method is innocent enough, the best operators in this metropolis do not consider it sufficiently important for adoption.

If the bone should happen to break before the sawing is finished, the sharp pointed, projecting spiculæ, thus occasioned, must be removed by means of a strong, cutting sort of forceps, termed *bone-nippers.* The perpendicular division of the bone leaves a sharp edge at the extremity of its circumference: it is not the common practice to take any measures for the removal of such sharpness; yet, Graefe recommends filing it away, (*Op. cit. p.* 66,) and Mr. C. Hutchison makes it an invariable rule, whether there be any occasion to use the bone nippers or not, "to take off the asperities, and scrape, or endeavour somewhat to round, the sharp cut edge of the bone with a strong blunt scalpel, in order to prevent the soft parts from being injured, when brought over the end of the bone in forming the stump." (*Pract. Obs. in Surgery, p.* 24.) Though I have not followed this practice, or rather the part of it, which relates to cutting off the edge of the bone, nor seen it adopted in London in amputation of the thigh, I know of no objection to it, unless it be on the score of its inutility, and the delay which it occasions. All projecting points of bone, it is the ordinary custom to remove.

After the removal of the limb, the femoral artery is to be immediately taken hold of with a pair of forceps, and tied with a firm round small ligature, the best being that kind which is recommended and used by my friend Mr. Lawrence. (See *Ligature.*) Care is to be taken to leave the accompanying branches of the anterior crural nerve out of the noose. None of the surrounding flesh ought to be tied, though the ligature should undoubtedly be placed round the artery, just where it emerges from its lateral connexions. The late Mr. Hey was accustomed to tie the femoral artery twice, leaving a small space between the ligatures. Some reasons against this plan will be found in the article (*Hemorrhage*). The other arteries are usually taken up with a tenaculum. After tying as many vessels as require it, one half of each ligature is to be cut off, near the knot on the surface of the stump. One portion is quite sufficient for withdrawing the ligature when this becomes loose, and the other being only an extraneous body, and productive of irritation and suppuration, should never be allowed to remain.

My friend, Dr. Hennen, in his excellent publication, ascribes the improvement of removing one half of the ligature to Mr. James Veitch, a naval surgeon, who, in April, 1806, published some valuable precepts relative to the mode of tying the arteries in amputation. (See *Edinb. Med. and Surgical Journal, Vol.* 2, *p.* 176.) But highly as I approve of the tenor of the anonymous paper here referred to, it is impossible for me to suppose Mr. Veitch could be the first, or nearly the first, who suggested such improvement. When I went as an apprentice to St. Bartholomew's hospital, in 1797, no surgeon of that hospital ever followed any other mode, and the practice was then so far from being new there, that gentlemen, who were at the hospital seven years before myself, had seen one half of each ligature regularly cut off, the first time they went into the operating theatre of that munificent institution. The use of very broad ligatures, and the inclusion of a considerable quantity of flesh in the noose together with the vessel, were also practices quite exploded at St. Bartholomew's at the very beginning of my apprenticeship. Mr. Veitch, however, seems to merit the honor of having been perhaps the first to set the example of *tying every vessel, the femoral, as well as the smaller arteries, with a single silk thread*, taking care to include, as far as was possible, nothing but the artery; and when this had been done, he took off one half of each ligature, as near as possible to the knot, "so that the foreign matter introduced was a mere trifle, compared with what I had been accustomed to see." (*Edinb. Med. and Surg. Journ. Vol.* 2, *p.* 178.) The use of a *single silk thread*, therefore, was the part of these improvements, probably originating with Mr. Veitch, though the principles, which led to this innovation, were unquestionably first established by Dr. Jones.

Mr. Alanson directs the ends of the ligatures to be left hanging out at the two extremities of the wound, according as their nearness may point out as best. But when a ligature is situated in the centre of the wound, it is best to bring it out between the strips of adhesive plaster, at the nearest part of the surface; otherwise its running across one half the wound to get at either angle, would create a great deal of unnecessary irritation and suppuration. The advantages of this method of placing the ends of the ligatures were well explained by Mr. Veitch, but, his practice, like the innovation of cutting off the half of each ligature, has been common in the London hospitals, and at St. Bartholomew's in particular, many years earlier, I presume, than the case referred to by this gentleman, since it has been familiarly adopted in those institutions ever since 1797, as I can testify from my own personal observation. These remarks are offered, without the slightest intention of detracting from the merits of the above-mentioned paper, which is replete with valuable advice; nor am I influenced by any design of throwing honor on the memory or character of any other individual at the expense of Mr. Veitch, being at this time unacquainted with the exact periods, when either this improvement, or that of removing the half of each ligature, commenced. M. Roux is one of the few remaining modern surgeons, who declare their preference to the method of bringing out all the ligatures at the lower angle of the wound, the benefit of having them brought out thus low, so as to keep up a drain for any pus that may form, being in his opinion greater, than that of arranging them at the points of the wound nearest to them. (*Mém. sur la Réunion de la Plaie après l'Amp. p.* 12.)

As Dr. Hennen observes, the reducing the immoderate size of ligatures, the separating the threads of which they were composed, and placing them at convenient points along the face of the stump, or wound, and the actual removal of one half of each ligature, were amendments very slowly made; but, (says he,) "an improvement, which appears to me of great consequence, was the last of introduction, and is now the slowest of adoption, although the artery once secured, and the value of adhesion duly acknowledged, it is the most obvious of all. I allude to the plan of removing the ends of the ligature altogether, and thus leaving to an extensive wound the greatest possible chance of immediate union." The first printed mention of this practice, as far as Dr. Hennen's investigations have discovered, was in a letter written by Mr. Haire, dated Southminster, Essex, Nov. 1786. "The ligatures," says this gentleman, "sometimes became troublesome and retarded the cure. An intimate friend of mine, a surgeon of great abilities, proposed to cut the ends of them off close to the knot, and thus leave them to themselves. *By following this plan, we have seen stumps healed in the course of ten days. The short ligature thus left in, commonly made its way out by a small opening in a short time, without any trouble, or the patient being sensible of pain.*" (See *Lond. Med. Journ. Vol.* 7.) Certainly, considering the thickness of the ligatures in use at the above period, this testimony of the success of the method, as Dr. Hennen remarks, is very satisfactory. (*Principles of Military Surgery, p.* 181, *Ed.* 2.) In a letter received by me from Mr. Dunn, surgeon at Scarborough, and dated June 3, 1819, he tells me, "My predecessor, Mr. J. Wilson, the late partner of Mr. Travis, amputated a limb in 1792, or 93, and cut off the ligatures close to the arteries, and no trouble ensued. He did this at the recommendation of Dr. Balcombe, of York, who had seen the method practised on the continent." In September, 1813, Dr. Hennen, who was serving with the army in Spain, began the adoption of this plan, which, he expected, would not only prove useful in promoting immediate union, but in obviating any accidental violence to the ligatures, and the wrong interference of the younger dressers in trying to pull them away. Between September and January, thirty-four cases were treated in this way, without any inconvenience following, or the small particles of silk left behind giving rise to any apparent irritation. Dr. Hennen also presented to Sir J. M'Grigor some of the small circles of silk, a part of which had come away with the dressings, while others had floated out on opening the little pustules, which formed over the face of the stump at the points, where the arteries had been tied. Some few of the ligatures never made their appearance, and the patients complained of no uneasiness whatever. Convinced of the utility of the method, Dr. Hennen afterwards published an account of it. (See *Lond. Med. Repository, Vol.* 3, *p.* 177, and *Vol.* 5, *p.* 221.) This gentleman subsequently found, that Dr. Maxwell of Dumfries had adopted the plan as far back as 1798; and Dr. Ferguson, who was at Stockholm during the peace of Amiens, saw it also then followed by some of the surgeons of that city, without any ill effects. (*Hennen's Military Surgery, p.* 175-178, *Ed.* 2.) In July, 1814, Mr. Lawrence communicated to the Medical and Chirurgical Society of London, some cases and observations highly in favour of the practice; and the particularity, which he lays much stress upon, is using for the purpose minute firm ligatures, composed of what is called dentist's silk. (See *Med. Chir. Trans. Vol.* 6, *p.* 156.) And, in a paper of later date, he says, his further experience had confirmed the usefulness of the method, "that this plan, by diminishing irritation and inflammation, and simplifying the process of dressing, very materially promotes the comfort of the patient, and the convenience of the surgeon, while it has not produced ill consequences, or any unpleasant effect, in the cases, which have come under his own observation." According to Mr. Lawrence, the small knots of silk generally separate early, and come away with the discharge; that where the integuments have united by the first intention, the ligatures often come out rather later, with very trifling suppuration, and that, in some instances, they remain quietly in the part. (*Op. cit. Vol.* 8, *p.* 490.)

After the battle of Waterloo, it was tried in many cases both by Mr. Collier, and myself, though our ligatures were certainly not so minute and eligible as those employed by my friend Mr. Lawrence, whose plan essentially requires the use of minute ligatures made of dentist's silk. As I joined the army in the field after nine days, and was therefore obliged to leave my patients at Brussels to the care of others, I lost the opportunity of witnessing the effects of this method. But, from Mr. Collier, I afterwards learned, that the new plan and the common one appeared in his' judgment to answer about equally well, which report, considering that we did not use the smallest ligatures, must be regarded as favourable. When the plan is tried, single strong threads and silks, or rather the kind of ligature, which will be described in another place, (See *Ligature*) should be employed: for, otherwise, the knots would be large, and likely to create suppuration and future trouble. The practice has likewise been tried by Delpech at Montpelier; but, it is not explained whether he used single threads, or silks, or whether any inconveniences resulted from the method. (See *Relation d'un Voyage fait à Londres en* 1814, *ou Parallèle de la Chirurgie Angloise avec la Chirurgie Françoise by P. J. Roux*, 8*vo*. 1815.) Yet, candour requires me to state, that the method is not generally adopted, and that one well informed writer, as I shall hereafter notice, (See *Hemorrhage*) has recited a case and some experiments, which are unfavourable to the practice. (*Cross, in Lond. Med. Repository, Vol.* 7, *p.* 355.) By Sir Astley Cooper, the practice has been found to occasion suppuration, and he has therefore given it up. (*Lancet, Vol.* 1, *p.* 149.) Mr. Guthrie, in two or three instances, has also seen some ill-looking abscesses arise from the presence of the bits of ligature, though he approves of the plan where the wound will not unite by the first intention, which, however, can rarely be known beforehand. (*On Gunshot Wounds, p.* 941.) On this subject, it merits particular attention, that no cases can be regarded as fair trials of Mr. Lawrence's method, unless precisely such ligatures as he himself employs be used.

Sometimes, the sawn surface of the bone itself bleeds rather profusely. When this happens, it is an excellent plan, which I have often seen my late master Mr. Ramsden and others adopt with the greatest success, to hold a compress of lint over the end of the bone, during the time requisite for securing the rest of the vessels. At the end of this period, the compress may generally be taken away, the bleeding from the bone having entirely ceased. As Monro remarks, the surgeon ought not to content himself with tying only such vessels, as he observes throwing out blood, while the patient is faint with pain; he should endeavour to rouse him from that faintish state by a cordial, and then wiping off the coagulated blood with a sponge, wet in warm water, he should examine narrowly all the surface of the stump, for otherwise he may expect to be obliged by a fresh hemorrhage to undo all the dressings. (*On Amputation of the Larger Extremities, p.* 475, *Monro's Works.*)

When there is merely an oozing from small vessels, Bromfield's advice to loosen the tourniquet completely, is highly proper, as this measure and washing the stump with a little cold water, will put an entire stop to such bleeding, without any occasion for more ligatures. A good deal of blood is sometimes lost from the mouths of the larger veins, and where they bleed much in debilitated subjects, I think Dr. Hennen is right in recommending them to be tied. (*On Military Surgery, p.* 264.) There is no necessity for doing so, however, in ordinary cases, nor should I be disposed to imitate Mr. Hey, who, in consequence of having seen a few instances of bleeding from the femoral vein, generally inclosed that vessel in the ligature along with the artery. (*Practical Obs. in Surgery, p.* 530, *Ed.* 2.) This method was sanctioned by the eminent Desault, who says, that if the vein be left open, and the bandage at the upper part of the limb be too tight, the flood regurgitates downwards, and hemorrhage takes place, as this surgeon assures us, he has often seen. When the vein and artery lie close together, as often happens, one branch of the forceps is to be introduced into the artery, and the other into the vein, which being done, the two vessels are to be drawn out together, and included in one ligature, but, if they are not so near together, they must be tied separately. (*Œuvres Chir. de Desault par Bichat, T.* 2, *p.* 550, 8*vo. Paris*, 1801.) At St. Bartholomew's, it is not the usual practice to tie the femoral vein, and, except in particular cases, I consider the custom wrong, because a ligature on a large vein sometimes excites a dangerous and fatal inflammation within the vessel, while the intervention of the vein between the one side of the circle of the ligature and the artery, must rather tend to hinder the thread from operating in the most desirable manner upon the latter vessel.

The wound is now to be evenly closed with strips of sticking plaster so that the edges of the skin may form a straight line across the face of the stump. This was the mode commended by Alanson, and is what is preferred by the generality of surgeons in this country. It is also advised by Graefe. (*Normen für die Abl. grösserer Gliedm. p.* 106. *Guthrie on Gunshot Wounds, p.* 208.) Over these plasters and the ends of the ligatures, it is best to place some pieces of lint, spread with the unguentum cetaceum, in order to keep such lint from sticking, which becomes an exceedingly troublesome circumstance, when the dressings are to be removed. I am decidedly averse to the general plan of loading the stump with a large mass of plasters, pledgets, compresses, flannels, &c.; and I see no reason, why the strips of adhesive plaster, and a pledget of simple ointment, should not suffice, when supported by two cross bandages, and a common linen roller, applied spirally round the limb, from above downward. The first turn of the roller, indeed, should be fixed round the pelvis, while the lower circles secure the cross bandages, often called the Malta-cross, over the end of the stump. It is also an excellent method to leave some little interspaces between the plasters, and in summer to keep the linen bandages constantly wet with cold water. In this way, any discharge will readily escape, and the parts, being kept cool, will be less disposed to hemorrhage and inflammation.

Sir Astley Cooper states, that he has seldom succeeded with his stumps above the elbow or knee, when a roller was not employed, which, he says, prevents retraction of the muscles and extensive suppuration. After applying the roller, and bringing the integuments together, he merely puts three strips of adhesive plaster over the wound, and one round the stump to keep the ends of the plaster in their place: in hot weather he applies a lotion of spirit of wine and water. (*Lancet, vol.* 1, *p.* 150.)

I am completely of opinion with Mr. Alanson, that the elastic woollen cap, commonly placed over all the bandages and dressings, if not put on with a great deal of care, has a tendency to push the skin backward from the extremities of the stump, and as it must also heat the part, its employment should be discontinued.

If possible, the dressings should never be removed before the fourth day, not reckoning the one on which the amputation is performed; and Sir Astley Cooper even prefers the sixth, or eighth day, merely removing on the fourth one strip of plaster, in order to let out any confined matter. (*See Lancet, vol.* 1, *p.* 150.) Monro also set down the fifth, sixth, or seventh day, as generally soon enough for the change of the dressings. He allows, however, that, if the smell of the wound should become offensive, the outer dressings may be removed sooner. Even when the dressings are to be taken away, it will frequently be found useful not to remove one strip of plaster; but, the stump must be made clean, and any discharge washed away. These, and other valuable precepts, derived from the eminent Dr. A. Monro senior, are worthy their great source, and the correctness of them promises to be acknowledged for ever.

The manner of renewing the dressings of stumps, is indeed a very important business, which should never be entrusted to mere novices; for, in taking off the straps of sticking plaster, if great care be not taken, the slight and newly formed adhesions may be torn asunder. Thus, as Mr. A. C. Hutchison has remarked, if the strap be pulled off by holding one end of it at nearly a right angle with the adhering part, the flap will be raised up with it, and thus a separation of the newly united parts will be produced. "My plan (says he) is to reflect the raised end of the strap close down upon the adhering part, and to bring it gently forward with one hand, while the removing part of the strap is followed by two fingers of the other placed upon the skin, &c. and when one end is detached from its adhesion, as far as the line of incision on the face of the stump, in like manner the other end is brought down and wholly removed." (*Pract. Obs. p.* 46.)

In order to facilitate the removal of the plasters, and save the patient a great deal of pain, I have always followed the plan of letting warmish water drop over them from a sponge for a few minutes previously to the attempt to remove them. In the early part of the treatment, it is also a valuable rule never to let every strap of plaster be off at once, so as to leave the flesh quite unsupported. Some skill and care are also invariably necessary, to avoid pulling away the ligatures with the dressings.

At the end of five or six days, the surgeon may begin to try, in a very gentle manner, whether any of the ligatures are loose; observing rather to twist, than suddenly pull them directly outward. However, he should not use the smallest force, nor persist if the trial create pain. One would hardly try, whether the ligature on the main artery were loose, before the eighth or ninth day. If minute ligatures made of dentist's silk be employed, and both their ends cut off close to the knot, of course, this delicate business of trying to get rid of the irritation of these foreign bodies is entirely superseded.

Though, in the above account, I have directed the edges of the wound, after the amputation of the thigh, to be brought together in such a way, that the wound shall appear as a line across the face of the stump, yet there are instances, in which the bone seems most easily and conveniently covered, by making the line of the wound in a perpendicular direction.

Mr. B. Bell, indeed, generally approved of it, as affording a ready outlet for matter; it is likewise directed by Mr. C. Bell, (*Op. Surgery, Vol.* 1;) by Roux (*Mém. sur la Réunion immédiate de la Plaie, après l'Amp. p.* 11;) and by Dr. Hennen (*On Military Surgery, p.* 265, *Ed.* 2.)

On the other hand, Mr. C. Hutchison objects to it, because it seems to him, that when a stump, thus put up, is laid on a pillow, the pressure tends to separate and open the lower part of the wound. (*Pract. Obs. on Surgery, p.* 37.)

It is curious to remark, however, that the thing, which leads this gentleman to disapprove of the plan, is one which would be urged in its favour by Roux and some other surgeons, who actually take the precaution of never closing the lower angle of the wound, in order that whatever discharge occurs may find a ready outlet. (*Mém. cit. p.* 14.)

Mr. Alanson objected to this method, asserting that the cicatrix afterwards became situated immediately over the end of the bone, the pressure of which was very likely to make the part ulcerate. However, in St. Bartholomew's Hospital I have seen the edges of the wound occasionally brought together in the perpendicular direction, and capital stumps made in this manner. In a case, in which I assisted Mr. Ramsden at Christ's Hospital, when an attempt was made to put up the wound in the common manner, the bone seemed to make considerable pressure against the skin, which did not happen, when the line of the wound was made in the other direction, which of course was immediately adopted. Mr. Hey has noticed this subject as follows: the integuments and muscles may be brought into contact by pressing either the anterior and posterior parts, or the sides of the thigh, together. The former method, by the gradual retraction of the posterior muscles, causes the integuments of the anterior part of the stump to cover more completely the extremity of the bone. The latter method causes the integuments and muscles to meet each other the more readily, and therefore, is to be preferred, when the quantity of soft parts preserved is somewhat deficient. (*Pract. Obs. on Surgery, p.* 533, *Edit.* 2.)

From the observations of another modern writer, who disapproves of making the line of the stump perpendicular, the difficulty of covering the end of the bone sometimes arises from not duly relaxing the posterior muscles of the thigh, and therefore he condemns laying the stump on too high a pillow. (*A. C. Hutchison, Pract. Obs. p.* 41.)

The plan of bringing the edges of the wound together, after amputation, so that they may unite by the first intention, has received, for many years past, the universal approbation of British surgeons. It is their general practice in the treatment of all incised wounds. It may be said to be the pride of English surgery; for, in nothing does she display more convincingly her superiority. Baron Larrey, however, in cases of amputation, disapproves of the attempt to unite the wound by the first intention, and merely brings forward its edges somewhat towards each other with a piece of linen, that covers the whole of the wound, and has small holes cut in it for the passage of the discharge. (*Mém. de Chir. Mil. T.* 3, *p.* 379.) This piece of linen is supported with a moderately tight roller.

M. Roux, on his arrival in this country, wondered to see British surgeons so prejudiced in favour of union by the first intention, as to adopt it after all amputations. "*C'est pareillement abuser de la réunion immédiate que de l'appliquer en toute circonstance à la plaie qui résulte de l'amputation des membres. J'entends parler de l'amputation dans la continuité des membres et plus particulièrement encore de l'amputation circulaire.*" (P. 128. *Parallèle de la Chirurgie Anglaise avec la Chirurgie Française*, 8*vo. Paris*, 1815.) But, M. Roux has curiously omitted to explain in his book, what are the advantages of not bringing the edges of the wound together, and why he calls prejudice the partiality to a method, the superior efficacy of which is continually demonstrated in every hospital of London. He does not indeed presume to condemn the practice altogether; on the contrary, he allows it to be proper in certain cases; yet, he contends that it ought to be confined within particular limits. (P. 130. See, also, *Mém. et Obs. sur la Réunion immédiate de la Plaie après l'Amputation, &c.* 8*vo. Paris*, 1814.)

In this tract, which is well drawn up, Roux proves most convincingly the benefits of union by the first intention, after amputation of the thigh by the circular incision; but, strangely enough, his prejudices hinder him from advising the practice to be extended to other amputations. He does not positively condemn it in the arm, though he thinks the method less necessary, because amputation there is less dangerous than in the thigh, &c. (P. 45.) To such futile reasoning is this author reduced by the unsoundness of his doctrine. He also deems the attempt at union by the first intention counterindicated, where limbs are amputated for injuries, which violently contuse and crush the parts (P. 48,) and where the limb is much wasted. (P. 50.) In the latter condition, however, he thinks Desault's flap amputation may be done, and an effort made to heal the wound by adhesion. In one case, he did this with success (P. 51.)

Richerand informs us, that Dubois at Paris follows the plan with a success equal to that of the London surgeons. For some years past, he has himself also constantly endeavoured to accomplish union by the first intention, after all the amputations which he has had occasion to practise, and he succeeds at least in three out of four. "The method is preferable (says he) to the old one, in whatever point of view it is considered. This union is more expeditious, a few days being sufficient for its completion. A woman, whose thigh I took off in 1810, was very well in a week, &c. Besides the advantage of a quick cure, and such quickness is especially of great importance, where the patient has been much reduced, so that he would hardly be able to bear a long suppuration, union by the first intention has the recommendation of saving the patient from a great deal of pain, the flap of integuments, with which the bleeding surface of the stump is covered, being much less irritating to the flesh, than the softest charpie would be, &c. Three years have elapsed since the publication of the third edition of this book. During this interval, I have performed more than a hundred and fifty amputations, and the utility of immediate union has been more and more proved to me." (*Nosographie Chirurg. p.* 475. 477, *edit.* 4.)

But, notwithstanding these and other encomiums on the practice, Richerand, like other French surgeons, is not an advocate for it in certain cases, as, for instance, limbs shattered by gunshot-wounds, or affected with hospital gangrene. Here, he maintains, that it hardly ever succeeds. (P. 478.) But, though it be true that amputations after gunshot-wounds do not generally heal so well, as many other cases, it cannot be denied that they do sometimes unite more or less by the first intention, and why should not the chance be taken? It is productive of no danger; there is nothing better to be tried; and, if it fail, what is the harm? Why, the wound will then heal by suppuration, and the granulating process, just as soon, as if the hollow of the stump had been filled with charpie, or left open; it will in fact heal in a way, which is less advantageous, than union by the first intention, but which is the best which can now happen.

From what has been said, it appears, that the practice of healing the wound by the first intention after amputation is less general in France, than it is in England; a circumstance which may perhaps be explained by the fact of its being much newer to the French, than to us. Every improvement must encounter for a time the opposition of prejudice; but, one so important as that which we are considering, must at length prevail and meet with universal adoption. Our extraordinary partiality to union by the first intention arises from a conviction of its superior efficacy, and is a decisive proof of the goodness of English surgery in respect to wounds. The observations of Roux and Richerand tend to prove, that they are not altogether unaware of its advantages, and they therefore recommend it for certain cases; but, their backwardness to extend it to all amputations, without exception, is little in favour of the comparison, which they are so fond of making of French with English surgery. Even the justly eminent Dupuytren still fills the hollow of the stump with charpie. (*Symes, in Edinb. Med. and Surgical Journ. No.* 78, *p.* 32.)

However, that stumps may fall into a state, in which the pressure of all plasters and bandages whatever should be most carefully avoided, and emollient poultices used, is a truth of which every surgeon of experience must be fully convinced. This happens, whenever the parts are affected with considerable tension, inflammation and swelling, or painful acute abscesses. There is also no utility in keeping the edges of the wound very closely compressed together, when all chance of adhesion is past, and the parts must heal by the granulating process. My friend, Mr. Guthrie, after amputations, performed from necessity in parts not in a healthy state, as in most secondary amputations after compound fractures of the thigh, does not insist upon the edges of the wound being brought into close contact by sticking plaster, compress, and bandage. In these cases, he also recommends the bone to be sawn an inch shorter than usual, or than would be necessary under other circumstances, in order to prevent its protrusion, and the ligatures to be cut off close to the knots, so as to lessen irritation. The integuments and muscles are to be brought forward, and retained so by a moderately tight roller, but not laid down against the bone. Some fine lint, smeared with cerate, or oil, is to be put between the edges of the wound; and a piece of linen and a Malta-cross over it, supported by a few light turns of the roller. " In some cases (says Mr. Guthrie) I have put one, and even two straps of plaster over the stump to keep the edges approximated, without being in contact; and, where the parts are but little diseased, this may be attempted; but, if the stump becomes uneasy, they should be cut, and a poultice applied. When only a part of the stump has appeared to slough, I have found the spiritus camphoræ alone, or diluted with a watery solution of opium, applied with the lint, very useful." (*On Gunshot Wounds*, *p.* 104.)

The reasons, which led Mr. Guthrie to incline to the plan of not bringing together the edges of the wound, in cases of this description, must be learned by reference to his own valuable work. His cases and arguments are entitled to serious consideration, and though they, as well as the observations of Roux, (*Mém. sur la Réunion immédiate de la Plaie après l'Amputation*, 8*vo. Paris*, 1814,) leave me unconvinced of the usefulness of not bringing the edges of the wound together, immediately after the amputation of bad compound fractures, there are some of his observations, respecting the injurious effects of too much pressure in certain conditions of the stump, perfectly agreeing with my own sentiments. At present, I have never seen any case of amputation, in which I should not have thought the surgeon wrong, had he not brought the sides of the wound together directly after the operation, so as to afford the chance of union by the first intention.

HEMORRHAGE AFTER AMPUTATION.

Bleeding, after the operation, is of two kinds, in regard to the time, when it occurs. The first takes place within twenty-four hours after the operation. Hence, an assistant should always be left with the patient, with direction scarefully and repeatedly to look at the stump, and if any bleeding should arise, to apply the tourniquet, until further aid be obtained. In case no assistant can be spared for this purpose, as must frequently happen in country practice, the tourniquet should be left slackly round the limb, and the nurse, or patient himself, directed to turn the screw of the instrument, in order to tighten it in case of need. A slack tourniquet, left round the limb after amputation, cannot do harm, and its not having been ready in this way, has cost many patients their lives, as I have known instances of.

This kind of hemorrhage has often been known to arise from the pressure of a tight bandage round the stump. As Monro observes, the circular turns of the bandage, when tight, must stop the return of blood in the cutaneous veins, and thus by making a greater resistance to the blood in the arteries, which anastomose with them, occasion the contracting power of the heart and arteries to dilate, and force more blood into their other branches; but, these being cut in the amputation, will pour out their blood, and so hemorrhage is brought on. Making much pressure round the stump is highly deserving of reprobation, and whenever there is an universal oozing of blood, I would recommend the operator to be sure, that the circulation in the superficial veins is not impeded by the tightness of any bandage or tourniquet.

If the bleeding should not be from an artery of consequence, the application of linen, dipped in cold water, will sometimes check it, and the disagreeable necessity for removing the dressings and opening the wound, may thus be avoided.

But, it often happens, that the wound must be opened, and the bleeding vessel tied. This is a very painful proceeding, and when the dressings have been applied some hours, so that the stump has had time to inflame, nothing can exceed the suffering, to which the patient is now subjected. Here we see the prudence of being particularly careful at first to tie every suspicious vessel.

The second sort of hemorrhage, after amputation, arises from ulceration of the large arteries, and may occur a month after the operation, when the ligatures are all away, and the patient seems nearly well.

Two such cases are related by Mr. Bromfield (Vol. I. p.307.) Now that the plan of covering the stump with sound skin is adopted, this kind of bleeding is less common than formerly. When the bleeding vessel is large, there is no chance of putting the patient out of danger, except by cutting down to the vessel, and tying it. The trunk of the vessel, however, may sometimes be more conveniently tied, than the bleeding branch itself.

Mr. Hey makes mention of a particular sort of hemorrhage, after the operation: " I have seen (says he) a few instances of the integuments becoming so contracted after the operation, as to compress the veins just above the extremity of the stump, and bring on after some hours a copious hemorrhage. When it has appeared clear to me, that the hemorrhage was venous, I have made a division of the integuments, on one side of the thigh, sufficient to remove the stricture, and this method has immediately suppressed the hemorrhage." (*P.* 530, *edit.* 2.)

I have never yet met with a case, in which a hemorrhage was unequivocally produced by a contraction of the integuments. Dr. Hennen says, that he has seen only one example, and it was successfully treated by loosening the bandage, and moistening the dressings with cold water: (*On Military Surgery*, *p.* 264, *Ed.* 2.) Doubts may therefore be entertained, whether the cause was the pressure of the integuments or of the roller, on the veins.

In Mr. Guthrie's truly practical work, there are some excellent remarks on the hemorrhages, which, in an irritable and sloughing state of a stump, frequently take place from the small branches, or from the main trunks of the arteries, in consequence of ulceration. It is (says he) not always easy to discover the bleeding vessel, or, when discovered, to secure it on the face of the stump; for, as the ulcerative process has not ceased, and the end of the artery, which is to be secured, is not sound, no healthy action takes place. The ligature very soon cuts its way through, or is thrown off, and the hemorrhage returns; or, some other branch is opened, and another ligature is required, which is equally uncertain; and under this succession of ligatures and hemorrhages, the patient dies. Here, cutting down to the principal artery, in preference to another amputation, has often succeeded; but, under certain circumstances, it fails, and amputation becomes ultimately necessary. At the same time, it is allowed, that this operation may also fail. On the whole, Mr. Guthrie professes himself to be an advocate in most cases for tying the artery in the first instance; and if this proceeding should not answer, he would then amputate. However, the practice of taking up the artery in these cases, he thinks, should not be adopted indiscriminately, the doctrines of aneurism not being here applicable, because there is a wounded vessel, with an external opening. "In the thigh, the operation is less certain, than in the arm, and especially, if it is not the main artery that bleeds; for, the branch, from which the hemorrhage proceeds may come from the profunda, and tying the artery in the groin on such opinion would be doing a serious operation, and one, which probably would not succeed; for, the anastomosing branches would restore the circulation in the stump in a short time, and again establish the bleeding. If it is the femoral artery that bleeds, and the ligature is applied high, it is very liable to a return of hemorrhage. To obviate these difficulties, the part from which the bleeding comes should be well studied, and the shortest distance from the stump carefully noted, at which compression on the artery commands the bleeding; and, at this spot, the ligature should be applied, provided it is not within the sphere of the inflammation of the stump." (*On Gunshot Wounds*, *p.* 105-106.) Thus far the advice seems to me correct and valuable; but, where the hemorrhage could be restrained by taking up the artery in the groin, though not lower down, I doubt the propriety of preferring amputation to this other far less severe operation, admitting that the efficiency of a ligature above the profunda, has been proved in the manner judiciously recommended by Mr. Guthrie, viz. by means of pressure.

The following is the counsel offered by Mr. Hey in a case of this nature.

"When we are under the necessity of amputating a limb, that has suffered great contusion, though the operation is performed upon a part apparently sound, the wound sometimes becomes sloughy and ill conditioned. No good granulations arise to cover the extremities of the arteries; but the ligatures cut through these vessels, or becoming loose, cease to make a sufficient pressure upon them, and hence repeated hemorrhages ensue. This is a dangerous state for a patient; for, if the vessels are taken up afresh with the needle, the hemorrhage will now and then return in the course of two or three days. In such cases, the application of dry sponge, cut transversely, as directed by Mr. White, (*Cases in Surgery*), has been found singularly useful, and has saved the life of the patient. But, a constant pressure must be kept upon the pieces of sponge, by the fingers of a succession of assistants, till granulations begin to arise upon the stump, and the prospect of future hemorrhage disappears. This method is of the greatest importance after amputation on the thigh, or leg, where the great vessels are deeply seated. In the arm, above the elbow, where the vessels are more superficial, the great artery may be taken up, with a portion of muscular flesh, above the surface of the stump, by making first an incision through the integuments. My colleague, Mr. Logan, has done this twice within the last year, with complete success, when repeated ligatures, applied in the usual way, had failed.

"In the morbid sloughy state of the stump, above-mentioned, the application of lint, soaked in a liquid, composed of equal quantities of lemon-juice and rectified spirit of wine, has been found very advantageous, and has caused it to put on soon a healthy aspect." (*P.* 536, 537, *edit.* 2.)

ON PROTRUSION OF THE BONE.

It is clearly proved by the observations of M. Louis, that this disagreeable consequence may be generally prevented by taking care to divide the loose muscles first, and (after their complete retraction, which will be favoured by no band, nor tourniquet, being applied round the limb), by observing to divide with a bistoury the muscles which adhere to the bone; for instance, the crural muscle, and the point of adhesion of the vasti and triceps at the posterior spine of the femur. By this method, the bone may be sawn three finger breadths higher than it can be, if no attention be paid to beginning with the division of the loose muscles, and concluding with that of such as are more attached to the bone.

The protrusion of the bones will never take place, so long as they are immediately encompassed, with the fleshy substance of the muscles: this proposition is incontestable. The state of the skin, whether longer or shorter, conduces nothing to this protrusion; nor will the inconvenience be prevented by drawing the skin upward, and preserving as much of it as possible. (See *Mém. sur la Saille de l'Os après l'amputation in Mém. de l'Acad. de Chirurgie*, *tom.* 5, *p.* 273, *edit. in* 12*mo.*)

As Mr. Guthrie has correctly observed, a protrusion of the bone, after sloughing of the stump, or other accidental circumstances, will sometimes happen, without any fault on the part of the operator; but, he thinks, it may almost always be prevented by attention to the following rules: 1. To leave the integuments attached to the muscles, instead of turning them back. 2. When the muscles are cut through in a slanting direction, upwards and inwards, or even directly downwards, to separate them from the bone, so that it may appear at the bottom of the cone as a depressed point; 3. To cut the bone short, and to keep the thigh constantly bandaged from the trunk during the cure, so as to prevent the retraction of the muscles. If, says Mr. Guthrie, a surgeon find directly after the operation, that the bone cannot be well covered, he should immediately saw off as much more of it, as will reduce it to its proper length. The error may be remedied at this moment with very little inconvenience in comparison with what must afterwards be encountered, if the opportunity be neglected. (*On Gunshot Wounds*, *p.* 109.) For some very useful directions how to bandage and support the soft parts with adhesive plasters, with the view of counteracting the tendency of the bone to protrude, I refer to some observations by Mr. Wright. (See *Bromfield's Chir. Cases*, *&c. Vol.* 1, *p.* 177.)

Having explained, that the surest way of preventing the evil is to save a sufficiency of muscle, especially of that muscular substance which is naturally most near and adherent to the bone, we shall next speak of the mode of relief.

When the end of the thigh-bone protrudes, it of course hinders cicatrization, and becomes itself affected with necrosis. By the process of exfoliation, the dead portion of bone is sometimes thrown off, and a cure follows. But, in general, this desirable change is extremely tedious, and the result uncertain, because it frequently happens, that, after the piece of bone has separated, the rest yet projects too much, and the stump still continues too conical to heal firmly enough to be capable of bearing the pressure of a wooden leg. When, however, the end of the bone forms only a slight projection, and the stump is not too conical, it is always best to leave nature to throw off the redundant exfoliating portion. In the opposite circumstances, the removal of all such part of it as cannot be covered by the integuments, is the best practice, and, if well executed, will effect a cure.

This second operation is exceedingly unpleasant to the surgeon, because patients are apt to suspect, and not without reason, that the first was not properly managed. Let me therefore repeat, that the surest way of avoiding the evil, is to cut the deep muscles, rather higher than the superficial ones, as inculcated by M. Louis, by which means, the bone will certainly lie within the level of the surface of the divided flesh. The advice delivered by my friend, Mr. Guthrie, I also consider valuable.

The second performance of amputation is a still more severe and unpleasant operation; yet, as Dr. Hennen has explained, it sometimes becomes necessary from osteosarcoma, extensive necrosis, abscesses of the medulla, unsuspected fissure, phagedena, or great protrusion of bone, with an extensively diseased periosteum, where the powers of nature are inadequate to the cure. "If the general health is not impaired, and the flesh does not peel off from the bone, as if it were boiled, the efforts of nature may be trusted to, aided by proper bandaging, and, in some cases, by the employment of the saw; but, when restless nights, intense pain, flushings, and irregular bowels, with great tumefaction and hardness of the stump, take place, indicating approaching hectic, and there is evidence of an irregular action of the parts, osseous matter becoming deposited, and forming a distinct tumour around the stump, our best plan will be to operate again near the trunk." (*Principles of Military Surgery*, *p.* 266, *Ed.* 2.) Sometimes amputation has been considered necessary a second time, in consequence of a morbid protuberance, or ganglion of the nerves of the stump, always attended with excruciating pain and great irritability of the part, and sometimes with retraction of the skin, and protrusion of the bone. Sir Astley Cooper, in his lectures, relates one instance of such a stump high up the arm, where, upon examination of the part near the axilla, a tumour was felt, which, when touched, made the patient jump, as if he had been electrified. In this case, as the bone protruded, amputation at the shoulder was performed. In another example, where a leg-stump was in a painful irritable state from a similar cause, Sir Astley Cooper effectually relieved the patient by removing the diseased end of the posterior tibial nerve. In a third instance, amputation was repeated at the patient's desire, and the nerves were found enlarged, forming a ganglion which partly rested upon the extremity of the bone. Such a degree of irritation had been produced by it, that no part of the stump could be touched without exciting a kind of electric shock. In a case that occurred in the Middlesex Hospital, amputation of the thigh was performed a second time, in consequence of the first stump being thus diseased. A complete ganglion, or plexus of nerves was found closely adhering to the removed portion of bone, having almost the appearance of cartilage. The os femoris was of an unusually small size, but the linea aspera larger than natural. (See *Lancet*, *Vol.* 1, *p.* 115; *Vol.* 2, *p.* 192.)

The following works are particularly recommended by Dr. Hennen, for information on diseases of the bones of stumps: *Bonn, Thesaurus Ossium Morborum, Amst.* 1788; *Weidmann de Necrosi Ossium, Francof.* 1798; *Macdonald, de Necrosi ac Callo, Edinb.* 1799; *the above-mentioned Essays of M. Louis*; *Levéillé sur les Mal. des Os après l'Amputation, Mém. de la Société, d'Emulation, T.* 1, *p.* 148; *Von Hoorn De iis, quæ in partibus membri, præsertim osseis amputatione vulneratis, notanda sunt*; *Lugd.* 1803. *Roux, de la resection des Os Malades, Paris,* 1812; *and Mém de Physiologie, &c. par Scarpa, et Lévéillé, Paris,* 1804.)

SPASMS OF THE STUMP.

Spasmodic contractions of the muscles of the stump is another very afflicting occurrence. Such spasms put the patient to the greatest agony, tend to cause a protrusion of the bone, or sugar-loaf stump, and, in some cases, increase, affect the whole body, and ultimately prove fatal. But, this unfortunate affection, which was rather frequent after amputations performed in the ancient manner, is infinitely less so, after the modern improved plans of operating, tying the vessels, and dressing the wound. When, however, it does occur, the stump must be kept from starting, by fastening it to the pillow and bedding, on which it lies, the flesh is to be properly supported with a bandage applied from the pelvis downwards, and opium, and the camphor mixture should be liberally exhibited. (*Encyclopédie Méthodique*, *Partie Chir. T.* 1, *p.* 93. *Latta's Surgery*, *Vol. III. &c.*)

FLAP-AMPUTATION OF THE THIGH.

Although I concur with the majority of surgeons in regarding the operation by a circular incision the most eligible under ordinary circumstances, no doubt can exist about the preference, which should be given to amputating with a flap, in particular examples. This method, I believe, has the important advantage of being least exposed to the danger of a protrusion of the bone, and, hence, I think it may be advisable, whenever any reasons exist in the state of the parts, or the constitution, for apprehending that disagreeable occurrence. An experienced military surgeon informs us, that, in the first years of his practice, he performed several amputations by the double incision, strictly according to the precepts of Sabatier, Desault, Pelletan, and Pott, but had the mortification to have three cases, in which the bone protruded, though the greatest circumspection was used in the operation and after-treatment. Hence, he was induced to make trial of the flap-amputation, and although he imitates O'Halloran in not attempting to bring the flaps close together for the first six or eight days, he reports, that the stump is generally healed in twenty or thirty days, and exfoliations rarely happen, on account of the bone being so well covered. In short, he says, that this method is to be preferred to all others. (*J. B. Paroisse Opusc. de Chir. p.* 185-203. *Paris,* 1806.)

Mr. Symes also informs us, that, though the flap-amputations seen by him have been very numerous, he has never met with an instance of the bone protruding, or exfoliating after them. (*Ed. Journ. vol.* 14. *p.* 38.)

A description of Desault's or rather Vermale's mode of operating, being given in the 4th Ed. of the First Lines of the Practice of Surgery, Vol. 2, I need not here repeat it, nor say, by how many respectable names the practice is sanctioned. The operation is sometimes adopted by my friend Mr. Vincent in St. Bartholomew's Hospital, who showed me some time ago a capital stump, which he had made in this manner, and which healed with great expedition.

By Mr. Guthrie, the flap-operation is considered preferable to the circular incision at the upper part of the thigh, "as it permits the head of the bone to be removed, if found necessary, allows it to be examined and cut shorter with greater ease, and makes a much better covering afterwards." (*On Gunshot Wounds, p.* 200.)

In military surgery, flap-amputation of the thigh is often advantageous, because all the flesh on one side of the limb is frequently torn away, or left in so terribly a mangled state, as to be unfit for making a covering for the end of the bone. Here a flap, sufficient to cover the whole face of the stump, should be saved from the sound flesh on the other side of the limb. When the surgeon chooses the flap-amputation, not from necessity, as under these last circumstances, and the flesh is sound all round the member, the best way is to save a flap on each side of the limb, by making two semicircular cuts, the convexities of which extend in a parallel manner forwards, and the terminations of which meet at the upper and lower surfaces of the limb. The skin is not to be at all dissected from the muscles, which are to be obliquely divided as high as the base of the flap on each side. However, though this is the best plan, particular cases may require a flap to be made from the anterior, or even the posterior side of the thigh. The latter method should never be followed, but from necessity. (*See Hey's Pract. Obs. in Surgery, p.* 531, *Ed.* 2.)

According to Mr. Guthrie, the difference between the flap-operation, at the upper part of the thigh, and that at the hip, consists in its being done lower down, and in the flaps being saved more immediately from the external and internal sides of the thigh, the inner flap being the largest, in order to prevent the inconvenience, which might arise from the external one being tightly stretched over the end of the bone. For the same reason, Mr. Guthrie also recommends the bone to be sawn off close to the lesser trochanter, even when the nature of the injury would allow of its being left an inch longer. (*On Gunshot Wounds, p.* 200.)

Flap-amputation of the thigh, after the manner of Vermale, is now preferred by Klein, one of the best operating surgeons in Germany, and by Messrs. Liston and Symes, two surgeons of great merit in Edinburgh. (See *Edinb. Med. and Surg. Journ. Vol.* 14, *p.* 36-46, *&c.*) Of seven cases, in which Klein adopted this method, the greater number were healed in ten days, and the rest in three weeks; and this success determined him in future always to practise it. After this mode, he finds there is no danger of the muscles retracting themselves, and leaving the end of the bone protruding, even though the patient be transported from one place to another. With respect to the occasional difficulty of taking up the obliquely cut vessels, Klein admits this objection, but thinks that it equally applies to Alanson's method. He lays great stress on the utility of giving due support to the flaps with compresses and a roller. (*See Practische Ansichten der bedeutendsten chirurgischen Operationen, p.* 35-38, *4to. Stuttgart,* 1816.)

In one instance, where a ball had broken the upper third of the femur, and mortification had spread so far towards the great trochanter and buttock, that it was impossible to operate, except by the flap-operation, or by taking the head of the bone out of the joint, Klein made a broad flap six inches long at the inner and upper part of the thigh, and then he cut the soft parts straight across just below the great trochanter, so as to make this wound meet the termination of the incision, by which the inner flap was formed. This patient got perfectly well in three weeks; (*Op. cit. p.* 39.) and so did another very similar case operated upon by the same gentleman. (P. 43.) Where the bleeding is considerable, the femoral artery and profunda should be tied previously to sawing the bone; but, if the vessels are well commanded by the pressure, the sawing ought to be first completed.

At the middle of the thigh, Lisfranc also prefers amputating with two lateral flaps; pressure is made on the femoral artery as it passes over the brim of the pelvis; and the vessel is tied immediately the inner flap is formed. Lisfranc makes the flaps with a very long narrow two-edged knife, which he introduces through the limb on each side, and then cuts obliquely outward and downward with it; but, I think Mr. Symes is right in recommending the knife used by Mr. Liston, and the back of which is thin and blunt except for an inch from the point. (*Ed. Med. Surg. Journ. Vol.* 14, *p.* 37.) Mr. Hey also preferred a knife with a blunt back, lest the vessels should be cut with it in a way that would render the securing of them troublesome.

AMPUTATION BELOW THE KNEE.

In treating of amputation of the thigh, I have remarked, that as much of the limb as possible should be preserved. The longer it is after the operation, the stronger and more useful will it be found. But, when the leg is to be amputated, writers commonly advise the operation to be performed a little way below the knee, even though the disease, for which the limb is removed, may be situated in the foot, or ankle, and would allow the operation to be done much further down. The common practice is to make the incision through the integuments, just low enough to enable the operator to saw the bones, about four inches below the lowest part of the patella. About six inches below this point is generally an eligible place for the first circular cut through the skin. This degree of lowness is usually deemed necessary, in order not to deprive the stump of that power of motion, which arises from the flexor tendons of the leg continuing undivided. It is alleged also, as a reason for this mode of proceeding, that it is quite sufficient to preserve a few inches of the leg, in order to afford the body a proper surface of support, in walking with a wooden leg, whereas if a larger portion were saved, the superfluous part would be a great inconvenience both in walking, and sitting down, without being of the smallest utility, in any respect whatever. However, as I shall presently notice, experience proves, that, where according to these maxims, an injury, or disease would dictate the performance of amputation above the knee, the practice of amputating below this joint, but much higher than is generally sanctioned, may be followed with advantage.

The tourniquet should be applied to the femoral artery, about two thirds of the way down the thigh, just before the vessel perforates the tendon of the triceps muscle. This place is much more convenient than the ham, where it is very difficult to compress the vessel against the bone. The patient is to be placed upon a firm table, as in the amputation of the thigh, and the leg being properly held by one assistant, while the integuments are drawn upward by another, the surgeon, with one quick stroke of the knife, is to make a circular incision through the integuments all round the limb. Some recommend the operator to stand on the inside of the leg, in order that he may be able to saw both bones at once. No reflections could ever make me perceive, that any real advantage ought strictly to be imputed to this plan. Many suppose, that it diminishes the chance of the fibula being splintered, this bone being completely divided rather sooner, than the tibia. But splintering the bones generally arises from the assistant depressing the limb too much, or else not supporting it enough. If the assistant were to be guilty of this mismanagement, it would be difficult to explain, why, the tibia should not be splintered, instead of the fibula, when a certain thickness of it had been sawn through. At the same time, it must be admitted, that if the surgeon prefer standing on the inside of the limb, there is no objection to it at the time of using the saw; but, before this period, in amputating the right leg, there is great convenience in having the left hand next to the wound, as is the case, when the surgeon stands on the outside of the right limb. Hence I have seen many hospital surgeons, in amputating the right leg, cut the soft parts, while they stood on the outside of the limb, and having done this part of the operation, they proceeded to the other side of the member for the purpose of applying the saw. I have only to repeat, that, I do not think any particular reason exists against sawing the two bones together, yet, in such manner as to let the fibula be divided entirely through first; and, the advantage of fixing this bone against the tibia by the pressure of the hands of the assistants, while the surgeon is sawing it, is another circumstance, which influences a great many writers to commend the latter plan. Graefe, who, as already mentioned, prefers the true flap-operation, does not think it advisable for the surgeon to stand on the inside of the limb in his method of operating, because when the knife is introduced through the muscles of the calf, its point would be apt to go between the two bones. (*Normen für die Abl. grösserer Gliedm. p.* 130.)

A circular cut having been made through the integuments, about two inches below the place where it is intended to saw the bones, the next object is to preserve skin enough to cover the front of the tibia, and the part of the stump, corresponding to the situation of the tibialis anticus, extensor longus pollicis pedis, and other muscles, between the tibia and fibula, and those covering the latter bone. Throughout this extent, there are no bulky muscles which can be made very serviceable in covering the end of the stump, and consequently, the operator must take care to preserve sufficient skin in this situation, by dissecting it from the parts beneath, and turning it up.

On the back part of the leg, on the contrary, the skin should never be uselessly detached to a great extent from the large gastrocnemius muscle, which, with the soleus, will here form a sufficient mass for covering the stump. However, the experience which I had in the army, taught me the truth of a remark made by Graefe, that, in forming the posterior flap of muscle, it is a matter of the highest importance to let the integuments be somewhat longer than it; for, otherwise, when it is turned forward, as it must be for the purpose of covering the ends of the bones, its front edge will be left uncovered by integuments, which, being the outermost, describe a greater circumference, than the deeper muscular flap. (*Normen für die Abl. grösserer Glied. p.* 131.) I was fully convinced of the truth of this observation, by two amputations which were done by myself, one in the neighbourhood of Antwerp, in 1814, and the other at Brussels, the day after the battle of Waterloo. Yet Graefe, who performs the flap-amputation, strictly so called, (that is to say, the operation in which a flap of skin, corresponding in shape to the flap of muscle, is preserved) does not himself detach the skin from the muscles of the calf at all, but, at the time of making the incision in that situation, directs one assistant to pull up the integuments, while another bends the foot as much as possible, which manœuvres have the effect of letting the muscles be cut rather shorter than the skin. Unfortunately, however, in many cases, the very nature of the disease, or injury, for which the operation is performed, would not admit of these proceedings. Nor, in a very muscular limb, would they be likely to suffice, as Graefe himself confesses, since, in such cases, he recommends the use of a knife bent laterally, for the purpose of excavating, as it were, as the incision is made, the thick muscular flap. (*Op. cit. p.* 134.) In the common method, with the circular incision, I am disposed to think it best, therefore, to let a small quantity of skin be detached and saved at the back part of the leg, so that there may be a certainty of having enough to cover well the extremity of the divided muscles of the calf. As soon as the skin has been separated in front, and on the outside of the leg, the surgeon is to detach the skin from the calf for about an inch, and having reflected or drawn this preserved portion out of the way, he is to place the edge of the knife close to the edge of the retracted or reflected skin at the back of the limb, and cut obliquely upwards through the muscles of the calf, from the inner edge of the tibia quite across the fibula, supposing the operator to be on the outside of the right leg, and that it is this member, which is undergoing removal. In performing this last incision, as M. Louis well observes, it is essential to incline the edge of the knife obliquely upwards. In this manner the skin will be longer than the muscles, and the cure considerably accelerated. (*Mém. de l'Acad. de Chir. T.* 5. *edit. in* 12*mo.*)

In the leg, the necessity of dissecting the skin from the subjacent parts, is acknowledged to be greater, than in the thigh: thus, Mr. Guthrie says, "as the attachment of the skin to the bone will not readily allow of its retraction, it must be dissected back all round, and separated from the fascia, the division of which in the first incision would avail nothing, from its strong attachment to the parts beneath." (*On Gunshot Wounds, p.* 220.) In dissecting the skin, however, a much greater detachment of it should be made at the front and outer part of the limb, than at the opposite points, as already explained.

The flap, formed of the integuments, and muscles of the calf, is then to be held back by one of the assistants, while the surgeon completes the division of the rest of the muscles, together with that of the interosseous ligament, by means of the catling, a kind of long, narrow, double-edged knife.

In amputating below the knee, very particular care must be taken to cut every fasciculus of muscular fibres, before the saw is used. Every part, except the bones, being divided, the soft parts are next to be protected from the teeth of the saw by a linen retractor, made with two slits to receive the two bones, care being taken to let the unslit part be applied to the muscles of the calf, as particularly advised by Graefe. (*Op. cit. p.* 136.)

In the leg, there are only three principal arteries, requiring ligatures, viz. the anterior and posterior tibial, and the peroneal or fibular arteries. In addition to these, however, the surgeon is sometimes obliged to tie large muscular branches. The anterior tibial artery will be found in front of the interosseous membrane, and between the extremities of the bones; the fibular artery behind the fibula; and the posterior tibial, situated more inwardly than the last, amongst the fibres of the soleus, near the tibia. (*C. Bell, Oper. Surgery, vol.* 1. *p.* 385.)

When the soft parts have been cut in the preceding way, the bones sawn, and the arteries tied, the wound is to be closed by bringing the flap of skin over the front and external part of the stump, so as to meet the flap composed of the gastrocnemius, soleus, and integuments on the opposite side. This should be done without letting any tight strap of plaster press the skin against the sharp edge of the tibia, a serious and hurtful practice, which has often occasioned ulceration and sloughing of the integuments, and protrusion and necrosis of the bone. It is this danger which leads Mr. Guthrie to prefer closing the wound vertically, or nearly so, and applying the adhesive straps from side to side. (*On Gunshot Wounds, p.* 221.) I think, however, the above mode of operating almost necessarily requires the wound to be closed, so as to form a line, extending in a direction from the tibia to the fibula. But, where a great deal of skin is saved all round the limb, and the muscles of the calf are not chiefly calculated upon for covering the bones, the perpendicular line of the wound will answer very well.

Many surgeons, however, operate differently. They first make the circular incision through the skin, two inches below where they mean to saw the bones. They next detach the skin from the muscles and bones equally all round the limb to the extent of about a couple of inches. The integuments are then turned up, and a division of the muscles made all round down to the bones, on a level with the line where the detachment of the skin has terminated. The parts between the bones are afterwards cut through, &c. The hemorrhage having been stopped, the integuments are drawn down over the stump, and the line of the wound made perpendicular.

In the army, the practice has sometimes been adopted of sawing off the sharp upper ridge of the tibia; but I can offer no exact judgment on the merits of the innovation, which has made but slow progress. It has been done a few times at St. Bartholomew's, and I should have no objection to giving it a fair trial, especially as it has the sanction of Mr. Guthrie, who says, that, in thin persons, where the spine of the tibia is very sharp, this part should be removed with the saw. (*P.* 222.)

Occasionally, surgeons have also removed the small remnant of the fibula, and such was sometimes the practice of Larrey, when he amputated nearer the knee than common. (*Mém. de Chir. Mil. T.* 3. *p.* 389.)

Whether the above plan of amputating the leg so high up, when the foot or ankle is the part diseased or injured, be on the whole most advantageous, I cannot presume to determine. By some clever men the practice has been condemned; and though we see it pursued by the best surgeons in this metropolis, and my own sentiments incline me to believe they are right, I will not say, that the matter is so settled as not to require further consideration.

Mr. White of Manchester, in a paper dated 1769 (*Med. Obs. and Inq. vol.* 4.), informs us, that he took the hint to amputate a little above the ankle, from seeing a case, in which this had been done by a simple incision, with such success, that the patient could walk extremely well, though with a machine that was very badly constructed. After this, Mr. White began to operate above the ankle with the double incision; and he invented a machine much better calculated for the patient to walk upon.

In 1773, Mr. Bromfield published his *Chirurgical Cases and Observations*, wherein he mentions his having begun about the year 1740 to amputate above the ankle, in a case of gangrene of this part of the leg. The patient walked so well, with the aid of a very simple machine, both along a level surface, and in going up and down stairs, that it was difficult to perceive he had lost his foot. Mr. Bromfield was persuaded, however, to give up this practice, until he learned that, in 1754, a Mr. Wright had thrice amputated in this way with success, when he again had recourse to it, without the least unpleasant consequences. (See *Chir. Cases and Obs. vol.* 1. *p.* 189, *&c.*)

The advantage of amputating a little below the knee, is, that the pressure in walking with a wooden leg is entirely confined to the front of the limb, and the cicatrix itself not being subjected to irritation. After amputating at the ankle, the pressure in walking operates directly on the cicatrix. According to Sabatier, this last plan has been extensively tried in France, but not found to answer, the stump being incapable of bearing pressure, and not continuing healed. (*Médécine Opératoire, T.* 3. *p.* 377. *edit.* 2.) Baron Larrey also speaks of it as an objectionable operation, not merely because some patients, as for instance, soldiers, have not the means of providing themselves with artificial legs, of the above description, but because it is almost always followed by bad symptoms, owing to the small quantity of cellular substance and flesh, and the thickness of the bone at this part of the leg, whereby cicatrization is impeded. A nervous irritation is more apt to be produced by this, than the common mode of operating, and the suppuration, which is always sanious, takes place with difficulty. "I have (says Larrey) seen many amputations done at this part, but nearly all the patients died of nervous fever, or tetanus." (*Mém. de Chir. Mil. t.* 3. *p.* 394.)

In the foregoing columns, I have given some account of the flap-amputation of the leg, as done by Lowdham, Verduin, Garengeot, Vermale, and others, and, in particular, the practice of O'Halloran has been touched upon, whose chief peculiarity, viz. that of not laying down the flap until ten or twelve days had elapsed, was unquestionably his greatest error, though the idea may have been admired and followed by a few speculators in modern times. (See *Paroisse, Opusc. de Chir. p.* 196, *&c. Paris*, 1806.) This last author, who is a general approver of flap-amputations, leaves the stump unclosed for some days after the removal of the limb; but what surprises me is, to hear, that, in one of the finest hospitals in this metropolis, three or four trials were made, about three years ago, of a modification of this absurd practice, after amputation by the circular incision. Instead of bringing the sides of the wound together, the stumps were only partially closed, and kept for a day or two covered with wet linen. The last patient, whom I heard of as having been treated in this manner, died a few days after the operation; and it gives me pleasure to hear, that all further intention of subjecting more patients to the experiment, in the hospital alluded to, is given up.

In flap-amputations below the knee, Alanson and Lucas conjectured, that the cure might be rendered more safe, easy, and expeditious, by applying the flap, with the view of uniting it by the first intention.

The following case explains Mr. Alanson's flap-operation. The disease was in the left leg, the patient, therefore, lay on his right side, upon a table of convenient height, so as to turn the part to be first cut fully into view. The intended line, where the knife was to pass in forming the flap, had been previously marked out with ink. A longitudinal incision was made with a common scalpel, about the middle of the side of the leg; first on the outside, then on the inside, and across the tendo Achillis: hence, the intended flap was formed, first by incisions through the skin and adipose membrane, and then completed by pushing a catling through the muscular parts in the upper incised point, and afterwards carrying it out below, in the direction of the line already mentioned. The flap was thick, containing the whole substance of the tendo Achillis. The usual double incision was made; the retractor applied to defend the soft parts; and the bone divided, as high as possible, with the saw.

The flap was placed in contact with the naked stump, and retained there, at first, by three superficial stitches, between which adhesive plasters were used. Notwithstanding the patient caught an infectious fever a few days afterwards, the stump healed in three weeks, except half an inch at the inner angle, where the principal vent had been. In another week, the wound was reduced to a spongy substance, about the size of a split-pea. This, being touched with caustic, healed in a few days. The man was soon able to use an artificial leg, with which he walked remarkably well. He went several voyages to sea, and did his business with great activity. He bore the pressure of the machine totally upon the end of the stump, and was not troubled with the least excoriation or soreness.

In the next instance, in which Mr. Alanson operated, he formed the flap by pushing a double-edged knife through the leg, and passing it downwards and then outwards, in a line, first marked out for the direction of the knife. In this way, the flap was more quickly made.

The leg should be completely extended during the operation; and kept in that posture till the wound is perfectly healed.

We shall next notice Mr. Hey's method. He was satisfied, that very near the ankle is not the most proper place for this kind of amputation.

Some cases occurring, in which, from a scrophulous habit, the wound at the stump would not heal completely, nor remain healed, Mr. Hey determined to try whether amputation, in a more muscular part, would not secure a complete healing, and give the patient an opportunity of resting his knee on the common wooden leg, or using a socket, as he might find most convenient. Mr. Hey latterly preferred this method, which he reduced to certain measures.

It had been customary, at the Leeds Infirmary, to make the length of the flap equal to one-third of the circumference of the leg. This was determined by the eye of the operator, who usually pushed the catling through the leg, near the posterior part of the fibula. Mr. Hey, finding the flap was not always of the proper breadth, began to determine this by measure, and then operated as follows; to ascertain the place where the bones are to be sawn, together with the length and breadth of the flap, he draws upon the limb five lines, three circular, and two longitudinal ones. He first measures the length of the leg from the highest part of the tibia to the middle of the inferior protuberance of the fibula. At the mid-point, between the knee and ankle, he makes the first or highest circular mark upon the leg. Here the bones are to be sawn. Here Mr. Hey also measures the circumference of the leg, and thence determines the length and breadth of the flap, each of which is to be equal to one-third of the circumference. In measuring the circumference of the limb, Mr. Hey employs a piece of marked tape, or riband, and places one end of it on the front edge of the tibia. Supposing the circumference to be twelve inches, he makes a dot in the circular mark on each side of the leg, four inches from the anterior edge of the tibia. These dots must, of course, be four inches apart behind. From each of these dots Mr. Hey draws a straight line downwards, four inches in length, and parallel to the front edge of the tibia. These lines show the direction which the catling is to take in making the flap. At the termination of these lines, Mr. Hey makes a second mark round the limb, to show the place where the flap is to end. Lastly, a third circular mark is to be made, an inch below the upper one, first made for the purpose of directing the circular cut through the integuments, in front of the limb. The catling, for making the flap, should be longer than those commonly employed in amputations. Mr. Hey uses one which is seven inches long in the blade, and blunt at the back, to avoid making any longitudinal wound of the arteries, which is very difficult to close with a ligature; and, for the same reason, he pushes the catling through the leg a little below the place where such muscles are to be divided, as are not included in the flap. The limb being nearly horizontal, and the fibula upward, he pushes the catling through the leg, where the dot was made, and carries it downward along the longitudinal mark, till it approaches the lowest circular mark, a little below which the instrument is brought out. The flap being held back, Mr. Hey divides the integuments on the front of the limb along the course of the second circular mark. The muscles not included in the flap are then divided a little below the place where the bones are to be sawn. No great quantity of these muscles can be saved, nor is it necessary, as the flap contains a sufficient portion of the gastrocnemius and soleus muscles, to make a cushion for the ends of the bones. After sawing the bones, Mr. Hey advises a little of the end of the tendon of the gastrocnemius to be cut off, as it is apt to project beyond the skin, when the flap is put down; and he recommends the large crural nerve, when found on the inner surface of the flap, to be dissected out, lest it should suffer compression.

As strips of adhesive plaster cause great pressure on the end of the stump, Mr. Hey prefers sutures for keeping the flap applied; small strips of court plaster being put between the ligatures. The sutures may be cut out on the eighth or ninth day, and the flap supported by plasters.

Mr. C. Bell describes another sort of flap-amputation. The operation is not to be done so low, as there will not be a sufficiency of muscle to cover the end of the bones. An oblique cut is to be made, with the large amputating knife, upward, through the skin of the back part of the leg. The assistant is to draw up the skin, and the knife is to be again applied to the upper margin of the wound, and carried obliquely upward till it reaches the bones. The knife, without being withdrawn, is next to be carried, in a circular direction, over the tibia and fascia, covering the tibialis anticus, until it meets the angle of the first incision on the outside of the limb. The surgeon is then to pierce the interosseous membrane, &c. The sawing being completed, and the arteries secured, the flap is to be laid down, and the integuments of the two sides of the wound will be found to meet. (*Operative Surgery, vol.* 1.) Langenbeck disapproves of the plan of pushing the knife through the calf of the leg, as practised by Alanson, Hey, Graefe, Liston, Lisfranc, Symes, &c. because an inexperienced surgeon may run the point between the two bones, and in this way the wound is never made evenly. His manner of forming the flap is very similar to Mr. C. Bell's, except that he first makes three cuts in the integuments, two longitudinal and one transverse, by which the shape of the flap of skin is determined. (*Bibl. für die Chir. B.* 1. *p.* 571.)

The regular flap-amputation of the leg, I mean that operation in which the circular incision is abandoned, and a semi-circular flap both of skin and muscle preserved, is often considered more painful than the common method. Yet, when we come to see what respectable names are recorded in its favour, how soon the stump generally heals, how well the ends of the bones are covered, and how all dissection of the integuments from the fascia is avoided in this mode of operating, at least as far as the flap extends, the method must be allowed to possess weighty recommendations. Indeed in its present improved state, and with the peculiar fitness of such a stump for adhesion, this operation, I think, is again rather rising in the estimation of the profession. In 1816, Klein had performed flap-amputation of the leg, about twenty times. If the flap should happen to be made too large, he particularly dwells on the propriety of removing part of it at once; and, when it is too short, he enjoins carrying the incision a little further upwards without delay. He confesses that the plan is attended with some little trouble in securing the interosseous arteries, which are apt to retract considerably, but, such has been the success of his practice, that out of twenty cases, seventeen got well, and most of them very soon, without the least exfoliation; and the other three died of typhus. (*Practische Ansichten der bedeutendsten Chir. Op.* 1*tes Heft. p.* 47.) In the same work, this experienced surgeon, convinced how much more quickly and certainly the wound heals after amputations with two flaps, than those with one, has suggested a plan of amputating below the knee, so as to form two lateral flaps. I regret that my limits prevent me from entering into a description of it.

I have already specified the principal reasons, which have established the common custom of amputating the leg, about four inches below the patella, and, if the disease or injury will not admit of the operation being done thus low, of removing the limb above the knee joint. In the Egyptian campaign, however, Baron Larrey performed two amputations very near the knee joint, almost on a level with the head of the fibula, which he judged proper to extirpate. The successful result of these operations dispelled the fear, which this experienced surgeon previously entertained about amputating in the thick part of the upper head of the tibia; for, no caries of this spongy portion of the bone, no bad effects on the knee-joint, and no anchylosis of the stump ensued; and, with the difference of a few days, the wound healed as readily, as that made in the common place of election, viz. three or four finger-breadths below the tuberosity of the tibia. Since the above mentioned campaign, Larrey has adopted this practice in many cases, where it was impossible to have operated at the usual place, and he assures us, the success fully equalled what attends operations done at the ordinary distance from the knee. In 1806, another French military surgeon, who had tried this method himself, published a dissertation, in which he commended operating, where circumstances required it, much higher than the point allowed by generally received rules. Larrey differs, however, from Garrigues, in forbidding amputation higher than the level of the tuberosity of the tibia, the thick portion of which may be sawn, but not above the insertion of the tendon of the patella. A transverse line, drawn from this point, usually passes below the articulation of the fibula, and over the lower portion of the uppermost part of the condyles of the tibia; but, as the relative positions of the heads of the two bones to each other differ somewhat in different individuals, Larrey makes the tuberosity of the tibia the point, above which the bone should never be sawn. By cutting higher, the ligament of the patella is separated from its insertion; the bursa mucosa, situated underneath it, is wounded; and the ligaments at the sides of the joint are injured; whence arise retraction of the patella, effusion of the synovia, and such disease of the knee joint, as may render another amputation indispensable. By making the division on a level with the tuberosity of the tibia, the attachment of the ligament of the patella is preserved, as well as that of the flexor tendons of the leg, which are requisite for the motion of the stump. The bursa mucosa is left untouched; and the head of the bone is sawn low enough to avoid creating a risk of caries. But, says Larrey, if this mode of amputating below the knee be compared with amputation of the thigh, as recommended by authors for the cases in which the new method is proposed, the advantages of the latter are considerable. In the first place, life is less endangered, because a smaller portion of the body is removed. The operation is as easy in one situation as the other. The stumps heal with equal facility. Larrey has never seen the spongy part of the tibia become carious, nor perceptibly exfoliate. When the remaining portion of the fibula is very short, as usually happens, it ought to be taken away, as it is an useless body, inconvenient for the employment of a wooden leg. Larrey directs as much skin as possible to be preserved, and making a perpendicular incision, through that part of it, which covers the tibia, in order to hinder the bone from making its way through it by ulceration.

With a stump, thus formed, comprising the knee and one or two finger-breadths of the leg, the patient has a firm point of support, on which he can securely walk without a stick. The stump admits also of an artificial leg of the natural shape being worn, the knee being always bent, provided the length of the stump do not exceed the diameter of the calf of the artificial limb. (*Mém. de Chir. militaire, T.* 3. *p.* 386—394.) From a passage, quoted by Mr. Guthrie, it would seem, that Mr. Bromfield, (*Chir. Obs. &c. Cases, vol.* 1. *p,* 185.) advised amputating as near to the knee as could be done, without risk of cutting the ligament of the patella, so that the stump might not extend beyond the wooden leg. On the whole, Mr. Guthrie's own observations are very favourable to this practice; but he candidly acknowledges his belief, that "it would not succeed when indiscriminately done in the hospitals of large cities," though it may frequently be practised in the army with advantage, provided the surgeon saw through the tibia below its tuberosity. (*On Gunshot Wounds, p.* 223, *and* 227.) Upon looking over the details of the cases recorded by Larrey in confirmation of the above statement, I was struck with one important fact, which does not justify a part of his commendations; viz. most of the stumps were above four months in healing; and that which healed most quickly was not well before the sixty-eighth day. (*See Mém. de Chir. Mil. T.* 3, *p.* 57, 397, 398, *&c.*) Hence, unless it be supposed, that the wounds produced by amputation below the knee in the ordinary manner, are generally thus long in healing, as treated by the French surgeons, the inference is rather unfavourable to the method so highly commended by Larrey, though I am far from wishing to assert that, even if the stumps cannot usually be healed in less time, more than a full compensation for this disadvantage is not obtained by some of the benefits above enumerated. However, in order to be able to pronounce any positive judgment on the merits of this mode of operating, it would be requisite not only to see two or three successful cases just after their cure, but to examine the state of a tolerable number of stumps, some time after they had been subjected to the pressure of an artificial leg.

AMPUTATION OF THE ARM.

The structure of the arm is very analagous to that of the thigh: like the latter it contains only one bone, round which the muscles are arranged. The interior muscles are attached to the os brachii, while the more superficial ones extend along the limb, without being at all adherent. The first consist of the brachialis internus, and the two short heads of the triceps: the second, of the biceps, and long head of the triceps. Hence, amputation is here to be done in the same way as in the thigh, unless when we are necessitated to amputate very high up, above the insertion of the deltoid muscle. In the arm, says Graefe, the incisions through the muscles should even be made more obliquely upwards than in the thigh, where the muscles are more bulky, by which means two inches of muscle may be saved, besides the retracted integuments; an abundance for covering the stump, were the arm full ten inches in circumference. (*Normen fur die Abl. grösserer Gliedm. p.* 109.)

The patient being properly seated, the arm is to be raised from the side, and, if the disease will allow it, into a horizontal position. As I have seen some inconveniences produced by the patient's fainting in the midst of the operation, I join Graefe and some other practitioners in thinking that the patient, if circumstances will allow, should be placed upon a table in the recumbent position. (*Normen für die Ablosung grösserer, Gliedm. p.* 108.) The surgeon is to stand on the outside of the limb, apply the tourniquet as high as possible, and let the skin and muscles which he is about to divide, be made tense by the hands of an assistant. The soft parts are next to be divided, as much of the limb being preserved as possible. The retractor is to be applied, the bone sawn with the usual precautions, and the bleeding stopped in the ordinary way, care being taken to leave the radial nerve out of the ligature, which is put round the brachial artery. The wound is then to be closed so as to form a transverse line, the dressings are to be applied, and the patient put to bed, with the wound a little elevated from the surface of the bedding.

In taking off the arm, I entirely coincide with Mr. Guthrie, with regard to the uselessness of dissecting back the integuments, a plan long ago renounced by the celebrated Dupuytren, their effectual retraction by an assistant, after their complete division, being quite enough; (*On Gunshot Wounds, p.* 354.) but, as I have invariably imitated Graefe and others, in making the incisions through the muscles, with the edge of the knife turned very obliquely upwards, it has not appeared to me necessary, after cutting down to the bone in this manner, to clear away the muscles from it to the extent of an inch and a half, or two inches higher. Instead also of attempting to perform the circular oblique incision through the muscles with one stroke of the knife, the objections to which have been noticed in the description of amputation of the thigh, I have made it a rule to divide the loose biceps muscle, as soon as the integuments had been cut and retracted, and of letting it fully recede, before the division of the rest of the soft parts was begun.

If the disease should require the arm to be taken off at its upper part, there would be no room for the application of the tourniquet. Here instead of putting a compress in the axilla, and having it held firmly upon the artery by a bystander, as advised by Sabatier, it is more eligible to make pressure on the artery as it passes over the first rib, of which method I shall speak in treating of amputation at the shoulder-joint. With a straight bistoury, the surgeon is now to make a transverse incision down to the bone, a little above the lower extremity of the deltoid muscle. Two other longitudinal incisions made along the front and back edge of this muscle, now form a flap, which must be detached, and reflected. Lastly, the rest of the soft parts of the limb are to be divided by a circular cut, made on a level with the base of the flap, and the operation finished like a common amputation. (*Sabatier, Médecine Opératoire, t.* 3, *p.* 375, *&c. ed.* 2.)

As a matter of choice, and not at all of necessity, the arm may be amputated with two flaps; one, anterior; the other, posterior. The first should be formed of the skin and biceps, and be three or four inches in length; the other is to be of the same size, and composed of the triceps and integuments. The muscular flesh, close to the bone, is now to be divided all round, and the saw used. Of late Klein has preferred this to the common method, and adopted it in nine cases. So well is the end of the bone always covered, that a protrusion of it is impossible. (*Practische Ansichten der Chirurgischen Operationen, p.* 44.)

When the arm is injured very high up, Baron Larrey prefers amputation at the shoulder joint to preserving a short stump, containing the upper end of the humerus; for, says he, if this bone cannot be divided at least on a level with the tendinous insertion of the deltoid, the stump is retracted towards the arm-pit by the pectoralis major and latissimus dorsi; the ligatures on the vessels irritate the brachial plexus of nerves; great pain, and nervous twitchings, often ending in tetanus, are produced; the stump continues swelled; and, in the end, the humerus is fixed by anchylosis to the shoulder, so that this portion of the arm remains altogether useless, and renders the patient liable to accidents. "I have seen (says Larrey) many officers and soldiers, who, on these accounts, were sorry that they had not undergone amputation at the shoulder." (*Mém. de Chir. Mil. T.* 3, *p.* 53, 400.)

Mr. Guthrie also states, that when amputation by the circular incision is attempted at the insertion of the pectoralis major, the bone will generally protrude after a few dressings. However, he entirely dissents from Larrey, respecting the necessity of taking off the limb at the shoulder, and prefers doing it from half an inch to an inch and a half below the tuberosities of the humerus, as the state of the injury may require. Two incisions are to commence, one or two finger-breadths below the acromion; and the inner one is to be extended directly across the under side of the limb, till it meets the lower point of the outer wound. Thus the under part of the arm is cut by a circular incision; the upper in the same manner as it sometimes is in removing the limb at the shoulder joint. Without detaching the skin from the muscles, these are cut through; the soft parts are held out of the way of the saw; the bone is sawn; the vessels secured; and the flaps brought together, so as to form a line from the acromion downwards. (*Gunshot Wounds, p.* 337, *&c.*) I am decidedly of opinion, that, in the description of cases referred to, either this method, or Sabatier's operation, should be preferred to the removal of the whole limb at the shoulder-joint.

Dupuytren sometimes amputates at the elbow-joint; but, as the stump is not more useful, than when the operation is done a little higher up, and the wound is frequently long in healing, the method appears hardly to merit a description.

AMPUTATION OF THE FORE-ARM.

The wisest maxim, with respect to the place for making the incision, is to cut off as little of the limb as possible. This fact is perfectly established, though it is true, that Larrey, in consequence of his mode of dressing the stump, has not experienced success in his amputations done in the tendinous part of the fore-arm. The fore-arm is to be held by two assistants, one of whom is to take hold of the elbow, the other of the wrist. The tourniquet is to be applied to the lower part of the arm, and the assistant holding the elbow should draw up the integuments, so as to make them tense. The circular incision is then to be made down to the fascia; from this as much skin is to be detached, reflected and saved, as is necessary for covering the ends of the bones, and the muscles are to be cut on a level with the reflected skin, the knife being at the same time directed obliquely upward. As many of the muscles are deeply situated between the two bones of the fore-arm, too much attention cannot be paid to dividing all of them, with a double-edged knife introduced between the radius and ulna.

The soft parts are to be protected from the saw by a linen retractor. It is generally recommended to saw the two bones together, for which purpose the fore-arm should be placed in the utmost state of pronation. As the radius at the lower part of the fore-arm is larger than the ulna, it should perhaps be sawn through first, the latter bone, in consequence of its connexion with the humerus, being better adapted to bear the weight of the saw. (*Averill's Op. Surgery, p.* 124.)

The ulnar, radial, and two interosseous arteries, are those, which usually require a ligature.

Graefe removes the fore-arm by making a flap from the flesh in front of the limb, and then extending the wound quite round the member. (*Normen für die Ablosung grösserer Gliedm, p.* 138, *&c. 4to. Berlin,* 1812.) Mr. Guthrie makes two flaps, one in front, the other on the back of the fore-arm; but, above the middle of this part of the limb, he prefers the circular incision. (*On Gunshot Wounds, p.* 373, 374.) Dr. Hennen also expresses his approbation of amputating the fore-arm, so as to make two semilunar flaps: (*Principles of Military Surgery, p.* 265. *edit.* 2;) which is the method recommended and practised by Klein. (*Practische Ansichten bedeutendsten Operationem Heft,* 1. *p.* 45.) Lisfranc also operates in this way at the lower third of the fore-arm. These flap-operations of the fore-arm are rather proceedings of choice, than of necessity; for, I have seen this part of the limb removed in numberless instances by the circular incision, and can hardly remember a case, in which the stump turned out badly. In making the inner flap, the radial and ulnar arteries must obviously be in danger of being wounded higher up, than the point, where they are quite cut through, as Mr. Guthrie candidly acknowledges; an accident which I think might give rise to a great deal of trouble.

With respect to Larrey's preference to amputating in the fleshy part of the fore-arm, though the case would admit of the operation being done much lower, I need only say, he would find no reason for this choice, were he to practise union by the first intention, at every opportunity, as is the custom in England.

The hand may be amputated at the joint of the wrist, whenever the disease does not extend too high, and a flap can be made of the integuments of the back of the hand. Richerand thinks such an operation sometimes preferable to amputation above the joint. (*Nosogr. Chirurg. T.* 4, *p.* 506, *edit.* 4.) Lisfranc saves the flap from the palm. The circumstances of the case should of course frequently determine the choice. The amputation may also be done by the circular incision.

AMPUTATION AT THE HIP-JOINT.

The very idea of this formidable operation, for a long while, checked the hand even of the most ready advocate for the use of the amputating knife, and every mind shuddered at so extensive a mutilation. Still, it could not be denied, that the chance of saving life occasionally depended upon a submission to the greatest temporary suffering, and that, without the most cruel of sacrifices, the preservation of the patient was totally impossible. Dreadful as amputation at the hip appeared, both in respect to the magnitude of the part of the body to be removed, and the extent of the wound caused by such removal, the desperate nature of some cases at length began to incline surgeons to view more dispassionately a scheme, at which the mind at first naturally revolted. Morand is the earliest practitioner, who made this severe operation the subject of considerable attention, (*Opuscules de Chir. T.* 1, *p.* 176, *8vo.* 1768,) and in the year 1739, two essays on the same topic were communicated to the Royal Academy of Surgery at Paris, by two of his pupils, Volner and Puthod. In 1743, Ravaton wished to have performed amputation at the hip-joint in a case of gunshot fracture of the trochanter major, and neck of the thigh bone, but was prevented by the opposition of other surgeons. (*Chir. d'Arm. p.* 323, *&c.*) In 1748, the propriety of attempting the operation was urged by l'Alouette. (*Disp. Chir. Halleri, t.* 5, *p.* 265.) At length, the Royal Academy of Surgery at Paris thought the subject highly deserving of further investigation, as it appeared to several of its members, that there were circumstances under which its performance might be advisable. In the year 1756, they therefore proposed the following question, as the grand prize subject; *In the case, in which amputation of the hip-joint should appear to be the only resource for saving the patient's life, to determine whether this operation ought to be practised, and what would be the best way of performing it?* No satisfactory memoirs having been presented, the same subject was proposed in 1759. The approbation of the Academy was now conferred on a paper written by Barbet, in which the propriety of amputating at the hip-joint was defended, and some of the cases demanding the operation specified. If, for instance, a cannon ball, or any other violently contusing cause, had carried off or crushed the thigh, so as to leave only a few parts to be cut to make the separation complete, he thought a surgeon ought not to hesitate about doing it. The same author conceived that a sphacelus, extending to the circumference of the joint, and destroying the greatest part of the surrounding flesh, might also render the operation equally necessary and easy. (*See Sabatier, Med. Opératoire, t.* 3, *p.* 271, *&c.*) Cases were also adduced, where the surgeon completed the separation of the dead parts with a knife. However, this cannot be considered as amputation at the hip-joint. Dividing a few dead fibres was a thing of no importance, in regard to the likelihood of its creating any bad symptoms. The proceeding, in fact, seems to me to have no analogy at all to the bloody operation of taking the thigh bone out of the socket. It is quite a different thing, when the operator has to cut through parts, which bleed profusely, and are endued with life and sensibility.

In addition to the memoir by Barbet, thirty-three other essays were offered to the academy, the majority of which were filled with arguments in favour of the operation; and, besides these productions, two other memoirs were published at Paris, one by Goursaud in 1758, explaining a new method of operating, and another by Moublet, (See *Journ. de Médée. an.* 1759.) in which, says Professor Thomson, the operation is very ably considered in all its different relations. (*Obs. made in the Mil. Hospitals in Belgium, p.* 260-63.)

Some of the first modern surgeons condemn the proceeding. The following are Mr. Pott's sentiments: "M. Bilguer, and M. Tissot, are the only people whom I have met with, or heard of, in the profession, who speak of an amputation in the joint of the hip, as an advisable thing, or as being preferable to the same operation in the thigh." After a quotation or two, he continues; "that amputation in the joint of the hip is not an impracticable operation (although it be a dreadful one) I very well know. I cannot say, that I have ever done it, *but I have seen it done*, and am now very sure I shall never do it, unless it be on a dead body. The parallel which is drawn between this operation and that in the shoulder will not hold. In the latter, it sometimes happens, that the caries is confined to the head of the os humeri, and that the scapula is perfectly sound and unaffected. In the case of a carious hip-joint, this never is the fact; the acetabulum ischii, and parts about, are always, more or less, in the same state, or at least in a distempered one, and so indeed most frequently are the parts within the pelvis," &c. (*Pott on Amputation.*) Callisen has difficulty in supposing any circumstances in which the operation could be undertaken with hopes of success. (*Syst. Chir. Hod. p.* 418, *T.* 2, *edit.* 1800.) And Richerand thinks, that, unless the limb be nearly separated by the disease, or accident, a prudent surgeon should decline making the attempt. (*Nosogr. Chir. T.* 4. *p.* 519. *edit.* 4.)

As Professor Thomson has justly observed, it is a remarkable fact in the history of surgery, that an operation, which had been invented in France, and concerning which so much had been written in that country, should have been first actually put in practice in England. "I have been informed, (says he) that the operation was performed in London by the late Mr. H. Thomson, surgeon to the London Hospital, and imagine, that it must have been his operation, to which Mr. Pott alludes." (*Obs. made in the Mil. Hospitals in Belgium, p.* 264.) At all events, whether this was the identical case which Mr. Pott saw, or not, the example referred to by this distinguished surgeon is the earliest instance of the operation being actually performed. It was even repeated in this country before it was ever practised on the continent, as far as can be made out from the records of the profession; for, it was performed by Mr. Kerr, of Northampton, on a girl, between eleven and twelve years of age, in a case of diseased hip; a case, in which I am now completely satisfied that it ought never to be attempted, for the reason laid down by Mr. Pott. In fact, Mr. Kerr, after removing the limb, found the acetabulum, and all the adjacent parts of the ossa innominata, carious. But, the experiment was here rendered still more hopeless, by the patient being consumptive. Yet, with all these disadvantages, the girl lived till the eighteenth day from the operation, and, after death, her lungs were found to be a complete mass of disease, one of them being totally reduced to matter. (See *Duncan's Med. Commentaries, vol.* 6, *p.* 337, *8vo. Lond.* 1779.) Larrey performed this operation twice in Egypt; and once, while he was serving with the French army on the Rhine. He was encouraged to make these attempts to save his patients by the consideration, that he had already preserved some lives by amputating either both thighs, both legs, or both arms, or removing the humerus at the shoulder joint. Larrey has also the true merit of having first done the operation in the only description of cases, in which perhaps (with the exception of bad examples of necrosis of the higher part of the femur) it ought ever to be performed; viz. gunshot injuries of the head, neck, and upper part of the femur, with, or without injury of the femoral artery, or where the limb had been carried away by a shell, or cannon-ball, too high up to admit of amputation in the ordinary manner. However, he also regards as fit occasions for amputation at the hip joint, circumstances in which, from gunshot violence, the limb is seized, or threatened with gangrene, nearly up to the hip. (*Mém. de Chir. Mil. t.* 2, *p.* 185.)

Severe as the operation is, Larrey contends, that it is an act of humanity, if it ever is the means of saving lives, which are in danger, and, he argues, that it is justifiable by the old maxim of Hippocrates, "Ad extremos morbos extrema remedia." To the chief objections, which have been made to it, he replies, 1st, That the wound is more alarming than dangerous. The Cæsarean operation (says he) has been successfully performed on the living female, and is still recommended by many practitioners. L'Aumonier, principal surgeon of the Rouen Hospital, has successfully removed a scirrhous ovary of considerable size. Examples are recorded of the arm and scapula being torn away, and the patients soon recovering. Besides, the surgeon has it in his power to lessen the wound, produced by the operation. 2dly. The dangers of hemorrhage may be obviated by the assistants temporarily placing their fingers on the mouths of the cut vessels, until ligatures can be applied.

In confirmation of his sentiments, concerning the propriety of the operation, Larrey adverts to a fact reported by Morand, where a soldier had both his legs amputated very high up, and also both his arms so near the shoulders, that he could hold nothing in his armpits. Yet, mutilated as he was, he enjoyed good health. (*Opuscules de Chir. p.* 183.) And, Larrey, in his own work, has recorded several instances, in which the whole of a limb was removed, or more than the halves of both the upper or lower extremities of the same subject, without any fatal constitutional disturbance. (*Mém. de Chir. Mil. t.* 2, *p.* 182-184.) One of his patients above alluded to, survived the operation a week, at the end of which he was carried off by the plague; and the others died, after being conveyed, in a very uneasy manner, during a precipitate march of the army. (See *Relation de l'Expédition de l'Armée d'Orient en Egypte, &c. p.* 319, *8vo. Paris,* 1803.) At the battle of Wagram, Larrey operated at the hip-joint on two soldiers of the imperial guard, under very unfavourable circumstances; and the events were fatal in a few hours. (*Mém. de Chir. Mil. T.* 3, *p.* 349.)

Larrey used to operate as follows: he began with making an incision in the track of the inguinal artery in the bend of the groin, and, after carefully excluding the nerve, which is more externally situated, he tied this vessel, with the aid of a semicircular curved needle, as closely as possible to Poupart's ligament, in order that the ligature, which was placed above the origin of the circumflex arteries and the profunda, might obviate all inconvenience from the bleeding, which might otherwise happen from their numerous branches. This being done, a straight knife was perpendicularly plunged between the tendons of the muscles attached to the trochanter minor and the base of the neck of the femur, so as to bring out its point at the back part of the limb, or in a diametrically opposite situation to its first entrance; and now by directing the knife obliquely inwards and downwards, a flap, which was not to be too large, was made of the soft parts at the inner and upper portion of the limb. This flap was now drawn towards the scrotum by an assistant, and the articulation was brought into view. The obturator artery, and some branches of the pudendal, wounded by making the flap, were immediately tied. The thigh was now put into the state of abduction; the inner part of the orbicular ligament, made tense by this position, was divided, and the joint opened. The ligamentum teres was then cut, and the bone dislocated. The knife was next brought to the outside of the great trochanter, and an external flap formed of the soft parts, calculated to meet that which had been made at the inside of the limb. In proceeding through the operation, Larrey secured, as soon as they were divided, the obturator arteries, and several branches of the pudendal, gluteal, and ischiatic arteries. The two flaps were brought together, and kept in this position, with strips of adhesive plaster, and a woollen spica bandage. (See *Mém. de Chir. Mil. t.* 2, *p.* 186-188.)

In the Russian campaign, Larrey had two more opportunities of amputating at the hip-joint. In the first instance, he operated upon a Russian at Witepsk, whose thigh bone was broken to pieces up to the trochanter, and the soft parts of two-thirds of the thickness of the limb destroyed. This man went on as favourably as possible until the 25th day from the operation, the parts being healed except at two points, where the ligatures had been brought out; but, unfortunately, a scarcity of provisions now occurred from some neglect, or another; and the patient on the 29th or 30th day, fell a victim. The second operation, was done on a French dragoon after the battle of Mozaïsk, who was afterwards seen perfectly cured by the surgeon-major, at Orcha, who received him there, and made a report of the fact to Larrey by letter. (See *Mém. de Chir. Mil. T.* 4, *p.* 26-50-51, *8vo. Paris,* 1817.)

In 1812, M. Baffos, surgeon to the Hôpital des Enfans Malades at Paris, amputated at the hip nearly in the manner of Larrey, except that he only compressed the artery in the groin, and did not begin with tying it, a method, to which Larrey himself now gives the preference. (See *Mém. de Chir. Mil. T.* 4, *p.* 434.) The patient was a child, seven years old, and the case a diseased hip. The patient got well of the wound; but died of scrofula, three months afterwards. The cotyloid cavity was found full of fungous flesh, and the os innominatum carious. As the latter state always exists in the diseased hip-joint, the whole of the disease does not admit of removal by amputation, and consequently the attempt ought never to be made. (See *Joints, Diseases of.*)

The plan of operating, adopted by Baffos, is considered, I believe, by all surgeons of the present day, better than that formerly advised by Larrey, inasmuch as the objectionable and unnecessary preliminary measure of taking up the artery in the groin, instead of simply compressing it against the os pubis, was rejected. Cutting down to the artery as a precaution against hemorrhage, is doing a double operation, and putting the patient to needless suffering: it was the earliest method, having been proposed by Volther and Puthod. Who was the first proposer to press the artery against the os pubis, instead of cutting down to the vessel, I am not at present aware; but, I know that it has been publicly recommended by Mr. Abernethy, in his anatomical lectures for the last thirty years: it is twenty-seven years since I began to attend his courses, and, in the exhibition of this operation, by the circular incision upon the dead subject, compression of the artery in the groin was then advised, and, as I have stated, not for the first time. Lisfranc is said to complete amputation at the hip-joint upon the dead subject in ten seconds: the following is his method as described by a modern writer:—The nates of the patient resting on the edge of the table, and the limb being supported by an assistant, the operator draws a line, an inch in length, from the anterior and superior spinous process of the ilium, straight down the thigh. From this point, he marks another inwards towards the pubes, of half an inch, so as to form a right angle. On the inner extremity of the last, he places the point of a long-bladed catling, and pushes it perpendicularly downwards, till it strikes against the head of the femur. Then passing it on the outer side of the bone, he thrusts it onwards till it protrudes at about an inch from the margin of the anus. He now cuts outwards, for near an inch, in order to clear the great trochanter, and forms the external flap, four or five inches in length, by cutting down the limb between the muscles and bone. The femoral artery, which may now be seen, is to be compressed between the fingers and thumb of an assistant, while the operator thrusts the knife in and out at the same points, as before; but, carrying it on the inner side of the head of the bone, he forms a smaller flap on that side of the extremity. He then, with the point of his knife, cuts through the capsular ligament, dislocates the bone, and removes the limb by dividing the round ligament, &c. (See *Averill's Operative Surgery, Lond.* 1823, *p.* 158, *&c.*) It is obvious (says Mr. Symes) that as long as the surgeon merely cuts downwards, and keeps close by the bone, he will not injure the femoral artery; which cannot be divided till the knife is carried outwards. This is one great excellence referred by Lisfranc to his operation; for, before the surgeon cuts the artery, the assistant can introduce his fingers at the solution of continuity and compress the vessel.

The disarticulation is accomplished as follows: the surgeon, seizing the limb with his left hand, while the assistant holds aside the flaps, makes a cut half round the margin of the acetabulum at its forepart. The limb is then put in the posture of abduction, the bone starts from its socket, the knife is carried round its head, and the triangular and what remains of the capsular ligament are divided. (See *Ed. Med. Surg. Journ. No.* 78, *p.* 41.)

This method was preferred by Mr. Symes in the very interesting case, in which he lately amputated at the hip-joint for an extensive necrosis of the femur, where the neck of the bone was itself diseased. Unfortunately, when the wound was nearly healed, the patient became dropsical, and died at the beginning of the eighth week from the period when his limb was taken off. (*Op. cit. p.* 25.)

When serving with the army in Holland in 1814, I assisted Dr. Cole in the performance of this operation. The plan adopted by him, is the same as that which has been taught by Mr. Abernethy, in his lectures, for more than thirty years. The flow of blood through the femoral artery was stopped by compressing the vessel in the groin with the handle of a key covered with lint. The thigh was then amputated as high as possible, close below the trochanters. The femoral artery was immediately secured, and afterwards every other vessel requiring ligature. An incision was now made directly on the acetabulum, and the head of the bone removed with the utmost facility and expedition. The patient lost even less blood, than in an ordinary amputation, and the wound admitted of being brought together with adhesive plaster in the best manner possible, so as to represent a transverse line. I am sorry to add, that the patient lived only till the following day. In one dreadful case of fracture of the upper part of the femur by a grape shot, when the operation had been delayed too long, the whole limb being inundated with matter, and the upper end of the lower portion of the bone projecting through the flesh backward, I ventured to perform the same operation at Oudenbosch in Holland, a few days after the assault on Bergen-op-Zoom; and, here happened, what must often occur; immediately the soft parts had been divided, as the bone was broken to pieces, the limb came off, leaving the head of the bone, the trochanters, and a small piece below them projecting. Had not the man appeared in a very bad way by the time the vessels had been secured, I should now have removed the head of the bone; but, the shock of the operation was such, that he survived it but a few minutes, though scarcely any blood was lost. The mode of operating by the circular incision is preferred by Graefe, who unknowingly considers it as a new method. (*Normen, für die Abl. grösserer Gliedm. p.* 118.) It has also been proposed by Mr. Veitch, with the modification of leaving an inch or two of the bone projecting, which is done, without giving any additional pain, by dissecting off the soft parts below the first incisions down to the bone. This projecting piece is intended to serve as a lever, with which the head of the bone is to be got out of the acetabulum. (*Edinb. Med. and Surg. Journ. vol.* 3, *p.* 129.) Ingenious as this suggestion may be, I do not regard it as an important practical improvement; 1st, because in almost all cases, where the operation is necessary, the bone is so fractured, that its division is already made by the injury: 2dly, because the scheme is unnecessary; for in Dr. Cole's case, where I assisted, the head of the femur was removed from the acetabulum with the utmost facility by merely making an incision over that cavity, cutting the ligaments, and availing ourselves of the small piece of bone accidentally projecting. In fact, in all gunshot injuries, requiring this operation, excepting a few instances of spreading gangrene from wounds, the bone is usually broken too high for Mr. Veitch's method to be practicable. With the same view of facilitating the exit of the head of the bone from the acetabulum, Graefe (*p.* 123.) recommends dividing the transverse ligament completing the brim of the anterior and inferior side of the socket. From my having once seen one of the first anatomists in London, with a powerful young assistant, and the whole length of the unbroken femur for a lever, baffled for nearly half an hour before he could dislocate the head of the bone, I suppose Graefe's maxim worth recollecting.

Sir Astley Cooper commenced his operation by making an incision just below Poupart's ligament, a little on the outside of the femoral artery. The wound was then carried obliquely downwards and outwards to the back of the thigh, about one third of the way down it, from which point the knife was carried in the opposite direction, obliquely upwards and inwards to meet the first incision, so as to form an elliptical curve. The femoral artery being now divided was immediately tied. The muscles were next cut through, another artery secured, and the bone taken out of its socket. Only about twelve ounces of blood were lost. (See *Lancet, vol.* 2, *p.* 95, *&c.*)

I am acquainted with only four cases, in which amputation at the hip-joint proved successful. The first operation was that done by Mr. Brownrigg, surgeon to the forces, on the 12th of December, 1812. The upper part of the thigh bone had been broken by a gunshot near Merida, in Spain, the 29th of December, 1811. Some time ago, the man was living at Spalding in Lincolnshire in perfect health.

The second successful operation was that performed by Larrey at Witepsk.

The third was done by Mr. Guthrie in the Netherlands on a French prisoner of war, who completely recovered. And the fourth is the recent example, in which Sir Astley Cooper amputated at the hip on account of a disease of the higher part of the femur. As the patient had formerly suffered amputation of the thigh, it was certainly not the sudden removal of nearly a quarter of him, but, I cannot presume to say, what difference in the chances of success, and whether any, would be connected with the circumstance.

On the other hand, the failures of this operation are numerous, though undertaken by surgeons of reputation and ability. Mr. Guthrie, Dr. Emery, Mr. Brownrigg, Baron Larrey, Mr. Brodie, Drs. Blick and Cole, and many other military practitioners, have had opportunities of amputating at the hip without success.

No one can expect, however, this operation not to fail in a large proportion of the cases, in which it is attempted: this must always happen, let it be done in the most skilful manner possible. Yet, as there are unquestionably some descriptions of injury, where life must inevitably be lost, if this proceeding be rejected, and experience proves, that it sometimes answers, an important consideration is, what cases are most proper for it? Here I am decidedly of opinion, with Professor Thomson, that the examples, in which it is particularly called for, and where no delay should be suffered, are those, in which the head or neck of the thigh bone has been fractured by a musket ball, grape shot, or small piece of shell. Eight or ten such cases, where amputation ought to have been done in the first instance, were brought in waggons several days after the assault on Bergen-op-Zoom into the hospital superintended by myself at Oudenbosch, and not one of these patients lived ten days after their removal. In the whole course of my professional life, I have never elsewhere witnessed so much suffering, or suppuration in such profusion. From each limb, I should guess, that at least three, or four pints of matter were discharged daily. Had amputation at the hip been performed at first, some of these patients might possibly have been saved; at all events, I am certain, that it was their only chance.

Larrey, as I have stated, thinks the operation proper, where the thigh has been shot off high up, or where the femur and soft parts near the hip have been broken, and extensively lacerated by a cannon ball or pieces of shell. Here the operation (though perhaps the only chance) must almost always fail, because, as Professor Thomson observes, these injuries occasion a shock to the constitution, of which the patient mostly sinks either immediately, or in a few hours. (*Obs. made in the Mil. Hosp. in Belgium*, *p.* 274.) The truth of this observation I saw exemplified at Merxham, near Antwerp, at the bombardment of the French fleet in that port: a shell burst between the thighs of one of the guards; tore and lacerated two thirds of the thickness of the upper part of the right thigh; broke the ascending ramus of the ischium; lacerated the perineum and scrotum; and fractured the higher part of the femur. There was no hemorrhage of consequence; but the exposed lacerated surface of the soft parts was immense, and the unfortunate patient, who lay with his hairs standing erect, and bereft of his intellectual faculties, sunk in the course of a quarter of an hour into a state of insensibility, and was quite dead in twenty minutes. However, there are numerous cases, in which the patients, after dreadful injuries of the upper part of the thigh, are less depressed and overcome, and live several weeks; facts clearly proving, that the operation ought to be attempted. Many instances of this kind are related by Mr. Guthrie. (*On Gunshot Wounds*, *p.* 134, *&c.*) Bad and incurable disease of the upper part of the femur (not the scrophulous hip, nor any other example in which the pelvis is also affected), may also require the performance of amputation at the hip-joint, as was recently illustrated in the practice of Mr. Symes of Edinburgh, and in that of Sir Astley Cooper. The case, in which Mr. Carmichael amputated at the hip was, what is termed, an osteosarcoma: the patient, a girl 19 years of age, died on the fifth day. (See *Trans. of the King's and Queen's College of Physicians, Ireland, vol.* 2, *p.* 357, *&c.*) Mr. Guthrie's work, and Baron Larrey's Mémoir. de Chir. Mil. contain the most valuable information respecting this operation. The propriety of the operation in desperate cases, is now perfectly established; and beginning to be acknowledged by the best surgeons in Europe; Walther (*Abh. aus dem Gebicte der Practischen Med. &c.*) Paroisse (*Opusc. de Chir. p.* 208;) Graefe (*Normen*, *&c.* 4*to. Berlin*, 1812.) The sentiments of these three surgeons, however, are not founded upon any cases of their own, in which the operation was performed; yet as being men of considerable experience and talents, their sanction may be proper, as a counterbalance to the opinions of some other men of eminence, who, without any personal experience of their own, have condemned the proceeding as unfit to be attempted.

AMPUTATION AT THE SHOULDER JOINT.

H. F. Le Dran performed the first operation of this kind, of which the particulars are recorded. It was in a case of caries and exostosis, reaching from the middle to the neck of the humerus. Le Dran began with rendering himself master of the bleeding, for which purpose he introduced a straight needle, and a strong ligature under the artery. This was passed from the front to the back part of the arm, as closely to the axilla and bone as possible. The ligature, then including the vessels, the flesh surrounding them, and the skin covering them, was tightened over a compress. Le Dran, with a straight narrow knife, then made a transverse incision through the skin and deltoid muscle down to the joint, and through the ligament surrounding the head of the humerus. An assistant now raised the arm, and dislocated the head of the bone from the cavity of the scapula. This allowed the knife to be passed with ease between the bone and the flesh. Le Dran then carried the knife downward, keeping its edge always somewhat inclined towards the bone. In this manner, he gradually cut through all the parts, as far as a little below the ligature. As there was a large flap, Le Dran made a second ligature with a curved needle, which ligature included a great deal of flesh, the redundant portion of which was cut off together with the first ligature, which had become useless. The cure was completed in about ten weeks. (*Obs. de Chir. T.* 1, *p.* 315, *Paris* 1731; *and Traité de Opér. p.* 365.) Le Dran (the son) who published this memorable case, does not state, that the operation was a new one, and it appears, from the *Récherches Critiques sur l'Origine*, *&c. de la Chirurgie en France*, and from La Faye's notes on Dionis, that it had been previously practised by Morand, the father.

Garengeot thought that the ligature might be applied by means of a curved needle, with sharp edges, and, in order to lessen the wound, he directs the incision to begin two or three finger-breadths below the acromion, across the deltoid muscle, so as to form one flap, then a lower one was made in the axilla; and after the second ligature had been applied, the two flaps were brought into contact. (*Traité des Opér. de Chir. t.* 3, *p.* 350, *Mém. de Acad. de Chir. T.* 2, *p.* 261.)

La Faye extended the improvements further. After placing the patient in a chair, and bringing the arm into a horizontal position, he made, with a common bistoury, a transverse incision into the deltoid muscle down to the bone, four finger-breadths below the acromion. Two other incisions, one in front, the other behind, descended perpendicularly to this first, and made a large flap of the figure of a trapezium, which was detached and turned up towards the top of the shoulder. The two heads of the biceps, the tendons of the supra-spinatus, infra-spinatus, teres minor and subscapularis, and the capsular ligament, were next divided. Now, when the assistant, who held the lower part of the limb, made the bone describe the motion of a lever upward, the head of the bone was easily dislocated. La Faye next carried his incision downward, along the inner part of the arm, until he was able to feel the vessels, which he tied as near the axilla as possible. The separation of the limb was then completed a finger's breadth below the ligature. The flap was then brought down over the glenoid cavity, and the wound dressed. (See *Nouvelle Méthode pour faire l'Opération de l'Amputation dans l'Articulation du Bras avec l'Omoplate, par M. La Faye, in Mém. de l'Acad. de Chirurgie, Tom.* 5, *p.* 195, *Edit. in* 12*mo.*) With respect to La Faye, it is curious to remark a coincidence between him and Larrey: the latter, though generally averse to the attempt of uniting stumps by the first intention, is an advocate for this practice after hip-joint amputations; so La Faye, who was fearful of laying down the flap, after amputation of the leg, had no such apprehension at the shoulder.

La Faye's method is yet regarded as one of the most approved, where the state of the soft parts will admit of it. But, it is absurd to think of applying any one plan to all the various states, in which the injured or diseased limb may present itself. It is advised by Larrey himself, when a wound extends through the upper part of the arm, breaking the bone, and injuring the soft parts. Here, says he, it would be impossible to form an anterior and a posterior flap, for the soft parts in these situations have been destroyed. On the contrary, when the deltoid is shot away, La Faye's plan is inadmissible. (*Mém. de Chir. Mil. T.* 2, *p.* 167.)

The advantages of La Faye's plan are obvious. As only one ligature was applied, the patient was saved a great deal of pain; the flap connected with the acromion was capable of covering the whole surface of the wound, and was more easily applied and kept on the stump, than the lowermost of the two flaps which Garengeot recommended; and the discharge found a ready outlet downwards.

Mr. S. Sharp recommended the following plan. "The patient's arm being held horizontally, make an incision through the membrana adiposa, from the upper part of the shoulder across the pectoral muscle, down to the arm-pit; then turning the knife with its edge upwards, divide that muscle and part of the deltoid, all which may be done without danger of wounding the great vessels, which will become exposed by these openings. If they be not, cut still more of the deltoid muscle, and carry the arm backward. Then with a strong ligature, having tied the artery and vein, pursue the circular incision through the joint, and carefully divide the vessels at a considerable distance below the ligature; the other small vessels are to be stopped, as in other cases.

"In doing this operation, regard should be had to the saving as much skin as possible, and to the situation of the processus acromion, which, projecting considerably beyond the joint, an unwary operator would be apt to cut upon." (*Operations of Surgery.*)

Bromfield used to press the artery against the first rib. His incision began on the inside of the arm, by the edge of the deltoid muscle, as high up as where the pectoralis goes over the axilla, to its insertion into the humerus. Cutting through the integuments and muscles, he continued his incision obliquely downwards, and outwards, as far as a little below the termination of the deltoid muscle. Then carrying on the incision transversely for a small space in a semicircular direction, the wound was next extended to the external part of the arm, as high up as the fold of the integuments in the axilla. The flap, thus shaped, when raised from the humerus, was intended to fill up the axilla, after the removal of the limb. Bromfield's next incision began at the acromion, and, being carried through the skin and deltoid down to the bone, terminated in the semicircular incision above described, and it was so guided, that it left the outer portion of the divided flap larger than the inner one. Bromfield then passed his knife under the lower edge of the internal half-flap, and dissected it up as high as possible. The tendon of the pectoral muscle was thus exposed, under which he now passed his left forefinger, which served as a conductor to a probe-pointed curved bistoury. With this, he now divided the attachment of that muscle to the humerus. If the vessels were not now sufficiently brought into view, he cut through the outer head of the biceps, and tied them (artery and vein) each with two strong ligatures about half an inch apart. The vessels were then cut through in the interspace, and the nerve was divided much higher, than the artery. The external flap was now raised sufficiently to expose the joint; and the muscles and capsular ligament having been cut through in the superior and lateral parts, the humerus slipped out of the glenoid cavity immediately the arm was carried a little backward. Lastly, the ligatures and vessels being held out of the way, the soft parts towards the axilla were divided in a semicircular direction. (*Chir. Obs. and Cases, vol.* 1. *p.* 249—252. 8*vo. London,* 1773.) The unnecessary tediousness, and, I may add, severity of Bromfield's method, have long withdrawn from it the approbation of modern operators. The division of the flap into two portions; its extraordinary length; and the painful dissection practised to get at the artery; were serious faults in the operation.

In 1774, Alanson amputated at the shoulder-joint, as follows: the subclavian artery was compressed by the fingers of an assistant. An incision was made about a hand's breadth below the acromion, and carried through the integuments all round the limb. The deltoid and posterior muscles were then obliquely divided up to the capsular ligament. The tendon of the biceps, and the capsular ligament upon the anterior and posterior part of the joint, were now cut through. One of the circumflex arteries, which bled a good deal, was next tied. The great pectoral muscle, the rest of the capsule, and all the other parts, except the vessels and nerves, were then divided, but previously to cutting the vessels, a temporary ligature was put round them. Thus the separation of the limb was completed. The mouths of the vessels were drawn out, and tied, and the temporary ligature taken away. Lastly, the sides of the wound were brought together, so as to make a transverse line. Graefe seeming not to recollect that amputation by the circular incision directed obliquely upwards had been practised by Alanson, mentions it as a new proposition. In one case, after operating in this manner, his patient was quite well in three weeks; and, with the particular sort of knife which he uses, and which is broadest towards its point, he pretends to be able to make the oblique incision through the muscles all round the limb with one sweep. Of course, he is very careful to make pressure on the artery, both with Mohrenheim's compressor applied under the clavicle, and the fingers of an assistant above it. (See *Normen für die Abl. grösserer Gliedm.*, *p.* 110, *&c.*) In proof of the possibility of making the oblique incision quite evenly with one stroke of his particular knife, he injected a female subject, did the operation, and caused the stump to be drawn from nature. (See *Plate 2. of his Work.*)

In 1760, P. H. Dahl published at Göttingen a dissertation on amputation at the shoulder. In this tract, a tourniquet was proposed, the pad of which was calculated to press upon the subclavian artery under the clavicle, and enabled the operator to dispense with tying the vessels in the first instance. Camper had observed, that if the scapula were pushed backward, and the axillary artery pressed with the finger between the clavicle, coracoid process, and great pectoral muscle, the pulse at the wrist might be instantly stopped.

Dahl's tourniquet was obviously constructed, in consequence of what Camper had observed. It is made of a curved, elastic plate of steel, to the shortest end of which a pad is attached, capable of projecting further by means of a screw. The instrument embraces the shoulder from behind forward, while the pad presses on the hollow under the clavicle, between the margins of the deltoid and pectoral muscles. The long extremity of the steel plate, which descends behind the shoulder, is fixed to the body by a sort of belt. The pad is depressed, until the pulsation of the axillary artery is stopped.

Further experiments have proved, however, that this tourniquet may be dispensed with, and the flow of blood in the axillary artery commanded, by properly compressing this vessel with a pad, or even the fingers alone, as some operators prefer, at the place where it emerges from between the scaleni muscles, above the middle part of the clavicle. Thus the artery is pressed between the pad or fingers and the first rib, across which it runs. In some plans of operation, hereafter to be described, all compression of the artery, either above or below the clavicle, is dispensed with.

Some practitioners, forgetful of the horizontal posture in which the patient is usually placed after the operation, have feared that, in La Faye's method, the lower flap may sometimes confine the discharge. In order to avoid this inconvenience, Desault recommended the formation of two flaps, one of which was anterior, the other posterior. The axillary artery was compressed from above the clavicle, at its coming out from between the scaleni muscles, while the integuments and flesh of the upper and internal part of the arm were pushed away from the humerus. A knife was plunged between these and the other soft parts behind, to make the anterior flap. The arm being inclined backward and outward, the humeral artery was tied, the articulation opened, and the head of the bone dislocated. The knife was then carried downward and backward, so as to form the posterior flap; the incisions meeting in the axilla. (See *Sabatier's Médécine Opératoire*, *t.* 3. *p.* 393—399. *edit.* 2.)

Larrey, who has had frequent opportunities of amputating at the shoulder-joint, has aimed at the same object which Desault did, but, in his earlier operations, he was in the habit of beginning with the formation of the external, or posterior flap, for the following reason: by proceeding in this way, the surgeon can tie the humeral artery more safely, because the ligature is applied after the operation is entirely finished, and consequently at a time when there is nothing to be attended to but the hemorrhage. Thus, the patient being placed on a stool, and well supported, the arm is to be raised from the side, and the axillary artery compressed from above the clavicle. The integuments and other soft parts of the upper and outer parts of the arm are then to be pushed away from the humerus, and the external flap formed. It is now very easy to cut the tendons of the infra-spinatus, and teres minor, and open the outside of the joint. The limb is to be carried inward, and luxated backward. The tendons of the supra-spinatus and biceps are to be divided, and as soon as the head of the bone is out of the glenoid cavity, the knife is to be carried along the internal part of the head and neck of the humerus, with its edge close to the bone. An internal flap, equal to the external one, is to be formed, consisting of a portion of the deltoid, great pectoral, biceps, and coraco-brachialis, muscles, and including the brachial vessels and nerves. The artery is to be taken hold of with a pair of forceps, and tied. Any other vessels which require a ligature, are also now to be secured. Larrey puts some charpie betwixt the flaps, and brings them towards each other by the usual means. (See *Mém. de Chir. Militaire*, *t.* 2. *p.* 170.) Of this method of putting charpie to prevent union by the first intention, I entertain the most unfavourable opinion.

When Larrey published his campaign in Egypt he had operated in this way on nineteen patients, thirteen of whom recovered. But, at a subsequent period, he and his colleagues had amputated at the shoulder, in the above manner, in upwards of a hundred cases, more than ninety of which recovered. (*Mém. de Chir. Mil. t.* 4. *p.* 432. *8vo. Paris*, 1817.)

In his latter operations, he has adopted the innovation of first making a longitudinal incision from the acromion to about an inch below the neck of the humerus, down to the bone, so as to divide the fleshy part of the deltoid into two even parts. This cut, he says, facilitates and renders more exact the rest of the operation. From this wound, the incisions for the flaps are continued. Having made the foregoing incision, "I direct an assistant to draw up the skin of the arm towards the shoulder, and I form the anterior and posterior flaps by two oblique strokes of the knife made from within outwards and downwards, so as to cut through the tendons of the pectoralis major and latissimus dorsi. There is no risk of injuring the axillary vessels, as they are out of the reach of the point of the knife. The cellular connexions of these two flaps are to be divided, and the flaps themselves raised by an assistant, who, at the same time, is to compress the two divided circumflex arteries. The whole joint is now exposed. By a third sweep of the knife, carried circularly over the head of the humerus, the capsule and tendons running near the articulation are cut; and the head of the bone being inclined a little outwards, the knife is to be carried along its posterior part, in order to finish the section of the tendinous and ligamentous attachments in that direction. The assistant now applies his forefingers over the brachial plexus, for the purpose of compressing the artery, and commanding the current of blood through it. Lastly, the edge of the knife is turned backwards, and the whole fasciculus of axillary vessels is cut through, on a level with the lower angles of the two flaps, and in front of the assistant's fingers. The patient does not lose a drop of blood; and ere the compression is remitted, the extremity of the axillary artery is readily seen, taken up with a pair of forceps, and tied. The circumflex arteries are next secured, which completes the operation." (*Mém. de Chir. Mil. t.* 4. *p.* 428. *Paris*, 1817.) In addition to these important deviations from his earlier method, he now brings the flaps together with two or three straps of adhesive plaster, and interposes no charpie. (*P.* 429.) It should be observed, also, that he lays no stress on first making the outer flap; though, from the description, it does not exactly appear which flap he now begins with. He has changed, likewise, on another point of importance; viz. instead of preferring La Faye's plan, in certain examples already specified, he affirms, that the above described way of operating is applicable to almost every case met with in military practice. First, because all gunshot wounds, generally, which mutilate the arm, so as to create the necessity for the operation, partly or entirely destroy the centre of the deltoid, while there is always enough flesh left at the sides for making the two flaps. Secondly, because, in the very rare instances, where the lateral parts of the shoulder are destroyed, and the middle untouched, no advantage would be gained by operating in La Faye's manner, as Larrey conceives that the detached flap would slough, or become, as he terms it, disorganized. He now prefers dividing the middle piece of flesh, and giving the flaps the same shape as if they were uninjured. He even asserts, that the operation, done without any flaps at all, answers better, than any method, in which the surgeon preserves flaps not naturally intended for the part. Thus, when all the flesh of the shoulder has been shot away, he has seen surgeons cover the glenoid cavity with a flap, saved from the soft parts of the axilla; but such flaps invariably sloughed, hemorrhages ensued, and the patients died. (*P.* 430—431.) Some of these latter observations are, clearly enough, the result of great partiality to a particular method of operating; because who can doubt, when the lateral parts of the shoulder are injured, as they frequently are (and not very rarely, as Larrey asserts), by the passage of a musket-ball through the shoulder, from before backwards, that the right method is that of La Faye; or the same operation, with the slight difference of making the flap of a semicircular shape? It was for cases of this description that Mr. Collier and I operated after La Faye's plan, with perfect success, after the battle of Waterloo; and a poor fellow of the rifle brigade, who was brought in too late for operation, and died of sloughing, had his shoulder injured in the same way, the middle of the deltoid being untouched, and shot-holes behind, and in front of, the articulation. But, if it required any further arguments to prove, that Larrey is wrong in wishing to extend his, or rather Desault's method, to all cases, I might criticise his assertions about the sloughing of the flap, when it is not cut into two portions, and its preservation by the singular expedient of making a division of it, and, of course, injuring it still more, than it may have been injured underneath by the bullet. The cases, however, which have fallen under my own personal observation, and numerous others on record, furnish an adequate proof, that, excellent as Larrey's method is for many cases, La Faye's answers very well in others. Thus, in an example where a Prussian hussar had had his arm amputated, and a projection of the bone took place, to the extent of three inches, with hospital gangrene commencing in the stump, Klein felt obliged to remove the limb at the shoulder. He operated in La Faye's manner; the separation was finished in one minute; and, on the eighteenth day, the stump was perfectly healed. (See *Practische Ansichte Chir. op. h.* 1. *p.* 1—10. *4to. Stuttgart*, 1816.) The same practitioner had five other secondary amputations of the same kind; but one patient was afterwards carried off by hemorrhage, and another by hospital gangrene. Klein, however, in common with the majority of army surgeons, considers the idea of applying any one plan of operating to different cases, totally absurd. (*P.*12.) After the storming of St. Sebastian's, nine shoulder-joint amputations were done with success: seven of them by raising the deltoid as a flap. (See *Guthrie on Gunshot Wounds*, *p.* 108.)

After the battle of Waterloo, I adopted La Faye's plan; but, with this difference, that I did not cut the brachial artery till I made the last stroke of the knife, which separated the limb, and consequently I did not tie the vessel till the time when I had nothing but the hemorrhage to occupy my attention. The circumflex arteries, however, I tied as soon as the external flap was made. The modification of thrusting a knife under the deltoid, quite across the shoulder, and making the flap by cutting downwards, until the instrument comes out again through the skin, is practised by some surgeons of eminence (*Klein, Lisfranc*, &c.)

When the state of the integuments will permit the choice, Mr. Guthrie thinks their preservation best effected by Larrey's first method; but he particularly insists upon the advantage of raising the shattered arm, or stump, to nearly a right angle with the body, before the operation begins, and even before the assistant makes pressure on the subclavian artery, as some change in the mode of accomplishing the latter object might be rendered necessary by elevating the limb during the operation itself. Mr. Guthrie commences the first incision immediately below the acromion, and, with a gentle curve, extends it downwards and inwards, through the integuments only, a little below the anterior fold of the armpit. The second incision outwards is made after the same manner, but is carried rather further down, so as to expose the long head of the triceps at the under edge of the deltoid. The third incision, commencing at the same spot as the first, but following the margin of the retracted skin, divides the deltoid on that side down to the bone, and exposes the insertion of the pectoralis major, which must be cut through. This flap is now to be raised, so as to expose the head of the bone. The fourth incision outwards divides the deltoid muscle down to the bone, when the posterior flap is to be well turned back, so as to bring into view the teres minor and infra-spinatus passing from the scapula to the great tuberosity of the humerus. The outer and inner flap being now raised, the head of the bone may be rolled a little outwards, the teres minor and infra-spinatus cut, and an opening made into the joint. The capsular ligament, supra-spinatus, and long head of the biceps are then divided. The inner side of the capsule is now cut through, together with the subscapularis muscle, as it approaches its insertion into the lesser tuberosity of the humerus. The long head of the triceps is next divided, and, lastly, with one sweep of the knife, the rest of the soft parts are cut, together with the axillary artery, veins, and nerve. (*On Gunshot Wounds*, *p.* 274—276.) The doubtful part of this method seems to be, that of cutting the circumflex arteries twice, which, when they bleed much, ought to be secured without any delay, more especially in secondary operations, where every drop of blood is of consequence. The principle laid down by Desault, that, in the generality of operations, all important vessels should be tied, if possible, ere other things are done, is one of the most valuable maxims which can be inculcated. On this point I should more strongly differ from Larrey, who, in his latest method, takes no measures in the first stage of the operation for commanding the flow of blood, as the assistant merely presses the axillary artery between his fingers just before it is divided.

Some of the modern French surgeons were earlier than Larrey, in dispensing with the compression of the axillary artery, and following a method which renders it unnecessary. Richerand, for instance, describes nearly the same plan as that advised by La Faye; but, after making the deltoid flap, cutting the tendons, and dislocating the bone, he dissects down close to the inside of the humerus, so as to enable an intelligent assistant to put his thumb on the cut surface behind the artery, which, with the aid of the fingers, applied to the skin of the axilla, can then be grasped and compressed, so as to command the flow of blood through the vessel. The operator now, fearless of hemorrhage, completes the internal or inferior flap. (*Richerand, Nosographie Chir. t.* 4. *p.* 509—511. *edit.* 4.)

Baron Dupuytren amputates at the shoulder, in a manner, which seems principally commendable on account of its celerity. The arm being raised and held at a right angle with the trunk, Dupuytren stands at the inside of the limb, with one hand grasps and elevates the mass of the deltoid muscle, and plunges under it a two-edged knife, from before backward, on a level with the end of the acromion. Cutting in this way close to the head of the humerus, he continues the incision downward between this bone and the deltoid, and at length bringing out the knife completes the external or superior flap. The rest of the operation does not essentially differ from Richerand's, except that Dupuytren takes hold of the lower flap itself, before dividing it, and compresses the artery, until he has cut through it and tied it.

Dupuytren's plan would be difficult on the left side, unless the surgeon were an ambidexter; but, in other respects, it cannot be found much fault with. This surgeon has also proposed making one flap in front, and the other behind, in order to prevent the lodgment of matter. Richerand justly observes, however, that frequently a good deal of the wound unites by the first intention, and that as the patient after the operation lies in the recumbent posture on an oblique plane, he cannot see what advantage one way of making the flaps has over another, in regard to affording a ready issue to the discharge. (*Op. cit. p.* 515.)

For the sake of celerity, of which the French are rightly admirers in all capital operations, another plan of amputating at the shoulder has been proposed by Lisfranc. Supposing the left extremity is to be removed, the patient is placed on an elevated seat, one assistant pressing the artery against the first rib, whilst another draws the arm forwards: the operator, standing behind the patient with a long bladed catling, pierces the integuments on the inner edge of the latissimus dorsi muscle, opposite the middle of the axilla, and pushes it obliquely upwards and forwards, till its point strikes against the under surface of the acromion; then, by raising the handle of the knife, its point is lowered, and protruded just in front of the clavicle at its junction with the acromion. By cutting downwards and outwards, he then forms a flap from the superior and posterior part of the arm including the whole breadth of the deltoid muscle, and a part of the latissimus dorsi. This being held back by the assistant, the joint is cut through from behind forwards, and a corresponding flap is formed by cutting downwards and outwards, between the muscles and bone, on the inner side of the arm. When the operation is on the right side, the patient should be seated on a low chair, and the catling thrust from above downwards, from the part just in front of the point where the clavicle is connected with the acromion, the surgeon raising his hand as the instrument proceeds downwards and backwards, until its point has come out at the inner edge of the latissimus dorsi, when the flap is to be made, and the operation finished as above directed. (*See Averill's Operative Surgery*, *p.* 135.)

Speaking of this mode of operating, Richerand remarks; "en l'employant, on parvient à désarticuler l'humérus, et à séparer le bras en aussi peu de temps qu'en met un habile découpeur à détacher l'aile d'un perdrix." (*P.* 514.)

When the scapula is shattered, of course the loose fragments should be taken away, and, if the acromion be broken, and the remnant of it pointed and irregular, this sharp rough portion should be sawn off, as was practised long ago by M. Faure. (See *Mém. de l'Acad. de Chir. t.* 6. *p.* 114.) In one case, indeed, Larrey found it necessary to take away more than two thirds of the scapula, and the humeral end of the clavicle. (*Mém. de Chir. Mil. t.* 4. *p.* 432.) Sawing off part of the acromion, and coracoid process, as a general rule, seems to me quite unnecessary (See *Fraser on the Shoulder-joint Operation, 8vo. Lond.* 1813), and improper, not only as producing delay, but wounding other parts which should not be at all disturbed. (See *Guthrie on Gunshot Wounds, p.* 285, 286, &c.) The practice of scraping away the cartilage of the glenoid cavity, except when it is diseased, is not of greater value.

Amputation at the shoulder has been partly superseded by a preferable operation, even in cases in which it would formerly have been deemed quite indispensable, such as considerable gunshot-fractures of the head of the humerus; a caries of the substance of this part, &c. Boucher, in 1753, proved, that considerable wounds, extending into the shoulder-joint, might be successfully treated, by extracting the fragments and splinters of bone. (*Mém. de l'Acad. de Chir. t.* 2, *p.* 287 *et* 461.) Instances are also recorded, in which when the head and neck of the humerus in children had been totally disunited from the body of that bone, a cure was accomplished by making such incisions as allowed the portions of bone, now become extraneous bodies, to be taken away. The earliest case of this kind on record is that, in which M. Thomas, a surgeon at Pezenas in Languedoc, removed the separated head of the humerus in 1740, which, in a child four years of age, presented itself loose in an incision, which had been previously made for the extraction of some sequestra. The particulars may be read in Guthrie's valuable work. (*On Gunshot Wounds, p.* 215, *&c.*) Mr. White, of Manchester, proceeded further, for he made a deep incision at the upper part of the arm, dislocated the head of the humerus, which he knew was carious, and, pushing it through the wound, took it off with a saw. He began an incision at the orifice of a sinus situated just below the processus acromion, and extended the wound down to the middle of the humerus, by which all the subjacent bone was brought into view. He then took hold of the patient's elbow, and easily forcing the upper head of the humerus out of its socket, he brought it so entirely out of the wound, that he readily grasped it in his left hand, and held it there till he had sawn it off with a common amputation saw, having first applied a pasteboard card betwixt the bone and the skin. The patient did not lose more than two ounces of blood, only a small artery, which partly surrounded the joint, being wounded, which was easily secured.

In about five or six weeks, the part from which the bone had been taken, had acquired a considerable degree of firmness, and the boy was able to lift a pretty heavy weight. At the end of two months, a large piece of the whole substance of the humerus was ready to separate from the sound bone, and with a pair of forceps it was easily removed. After this exfoliation the wound healed very fast, and, in four months after the operation, the boy was discharged perfectly cured. On comparing this arm with the other, it was not quite an inch shorter; the boy had the perfect use of it, and could not only elevate his arm to any height, but perform the rotary motion as well as ever. The figure of the arm was not at all altered. Mr. White did not make use of any splints, machine, or bandage, during the cure, in order to confine the limb strictly in one certain situation, nor was the patient's arm ever dressed in bed, but while he was sitting in a chair, and as soon as he could bear it, standing up. To this method, Mr. White attributed the preservation of the motion of the joint.

"As this is the first operation of the kind that has been performed, or at least made public, (says Mr. White) I thought the relation of it might possibly conduce to the improvement of the art. That ingenious surgeon, Mr. Gooch, has indeed related three instances of the heads of bones being sawn off in compound luxations. In one of these cases, the lower heads of the tibia and fibula were sawn off; in another, that of the radius; and, in the third, that of the second bone of the thumb; but these were in many respects different from the present case. I believe it will seldom happen, that this operation will not be greatly preferable to amputation of the arm at the scapula, as this last is generally performed for a caries of the upper head of the os humeri, and as the preservation of a limb is always of the utmost consequence, and what every surgeon of the least humanity would at all times wish for, but particularly where, as in this case, the whole limb, and its actions, are preserved entire, the cure no ways protracted, and the danger of the operation most undoubtedly less. For though amputation is often indispensably necessary, and frequently attended with little danger or inconvenience when only part of a limb is removed, yet when the whole is lost, the danger is greatly increased, and the loss irreparable." Mr. White concludes, with suggesting an analogous operation for removing the head of the femur, in lieu of amputation at the hip. Something of this kind is indeed reported to have been actually done on a girl with success. (See *Joannis Mulder Oratio de Meritis P. Camperi, &c. p.* 81. *Cases in Surgery, by C. White, p.* 57. *or Phil. Trans. vol.* 59. *for* 1769.)

Here, however, the acetabulum and ossa innominata being always, or generally, more diseased than the head of the femur, neither of these operations, I think, ought to be attempted. Long after the publication of White's case, viz. in 1767, an example, in which Vigaroux adopted the same practice, in 1788, was communicated to the profession: the result, however, was unfortunate, the patient, a lad seventeen years of age, having died soon after the experiment. (See *Œuvres de Chir. Prat. par I. M. I. Vigaroux (fils), Montp.* 1812.)

Mr. Bent, of Newcastle, inserted a similar case to Mr. White's in the 64th vol. of the Philosophical Transactions. White made only one incision, from the vicinity of the acromion down to the middle of the arm. Bent, not being able to get at the head of the bone through the wound which he had made, from the clavicle to the attachment of the pectoral muscle, detached a portion of the deltoid, where it is connected with the clavicle, and another part, where it is adherent to the humerus. A third successful case is also reported in the 69th vol. of the same work, p. 6. Afterwards, Bromfield published some directions for the guidance of the surgeon in such operations. (*Chir. Obs. and Cases.*) Sabatier proposed making two cuts at the upper part of the arm, which meet below like the letter V, extirpating the flap, dividing the inner head of the biceps, and capsular ligament; dislocating the head of the bone, and sawing it off. (*Médecine Operatoire*, *t.* 3.)

I think the cases, recorded by White and Bent, are truly important, inasmuch as they are the earliest models of a practice, which may sometimes supersede all occasion for one of the most formidable and mutilating operations of surgery. To military and naval surgeons, these cases cannot fail to be highly interesting, as they must have frequent opportunities of availing themselves of the instruction which they afford. Larrey, who was surgeon-general to the French army in Egypt, employed the practice, with the greatest success, in cases of gunshot wounds. He thereby saved limbs, which, according to ordinary precepts and opinions, would have been a just ground for amputating at the shoulder; and, when it is considered, not only that a most dangerous operation is avoided, but that an upper extremity is saved, for which no substitute can be applied, we must allow that the plan, first suggested and practised by Mr. White, cannot be too highly appreciated. When the arm was fractured near its upper extremity by a musket-ball, most surgeons formerly deemed it necessary to amputate the limb. Here, says Larrey, it would be useless to dilate the entrance and exit of the ball, because a sufficient opening could not be prudently made in this way for the extraction of the head of the bone. Yet this body is now an extraneous substance, having lost its connexion with the body of the humerus, and its presence exciting irritation and inflammation of the joint, abscesses, necrosis, &c. Here Larrey seems to imply, that the detached head of the bone cannot unite again; an assertion which, I have no doubt, is quite incorrect, as I have attended several cases in which the humerus was broken very high up, yet united without difficulty. The bad symptoms, which he so emphatically attributes to the detachment of the head from the body of the bone, are in reality the effects of the gunshot violence itself. If, therefore, the head of the bone were merely broken off, and it and the neighbouring part of the bone not splintered, nor the flesh not more extensively injured than would arise from the passage of a musket-ball, and the joint itself not involved, I should question the propriety of having recourse, at once, either to the extraction of the head of the bone, or amputation at the shoulder. When the bone is shattered, the case is often very different, and Larrey's practice is then commendable. In confirmation of these sentiments, I may mention Mr. Guthrie's opinion, who, in reference to the extraction of the head of the bone, says, he does not consider a perfect fracture of the humerus, an inch below its head (although there be evident separation), as demanding even this operation, as he has known such cases do well, when treated as other compound fractures, except that the motion of the joint was nearly lost. (*On Gunshot Wounds*, *p.* 329.) However, it is fair to mention, that Mr. Guthrie inclines to amputation at the shoulder when the body of the bone is splintered, or has long fissures in it, in which sentiment he is probably right. The other operation seems principally calculated for cases, in which the damage is restricted to the head and uppermost portion of the bone.

According to Mr. Guthrie, when the ball passes out with little injury to the bone, and the openings already made are not sufficient to admit of a moderate examination with the point of the finger, the wound should be enlarged. However, others might argue, that such dilatation should be made only when the bone is felt to be seriously broken, and the fragments will probably require immediate removal. But whatever course be adopted, the most rigorous antiphlogistic treatment will be proper; and, if abscesses form, depending openings should be made for the discharge.

Larrey says, "I have had the good fortune, on ten different occasions, to supersede the necessity for amputation at the shoulder, by the complete and immediate extraction of the head of the humerus, or its splinters, without delay. I perform the operation in the following manner: I make an incision in the centre of the deltoid muscle, and parallel to its fibres, carrying the incision as low down as possible. I get the edges of the wound drawn asunder, in order to lay bare the articulation, of which the capsule is generally opened by the first incision, and by means of a probe-pointed bistoury, I detach with the greatest ease from their insertions the tendons of the supra and infra spinati, of the teres minor, of the subscapularis, and of the long head of the biceps; then I disengage the head of the humerus, and remove it through the wound in the deltoid by means of my fingers, or of an elevator. I bring the humerus up to the shoulder, and fix it in a proper position with the aid of a sling and a bandage. Such is the operation, which I performed on ten patients, in extirpating the head of the humerus; one of these died of the hospital fever, two of the scurvy, at Alexandria, and the fourth, after he was cured, died of the plague on our return to Syria. The rest returned to France in good health. In some, the arm became anchylosed to the shoulder, and in others, an artificial joint, allowing of motion, was formed." (See *Mém. de Chir. Militaire*, *t.* 2, *p.* 175.) Another successful case, of the same kind, has been more recently published by Mr. Morel. (See *Medico-Chirurg. Trans. vol.* 7, *p.* 161.)

Mr. Guthrie thinks it not sufficient to make a simple incision through the deltoid muscle into the capsular ligament, and take away the fragments of bone, but urges the removal at the same time of a considerable part of the capsular ligament, lest disease still go on in the joint. Also, as it is impossible to know, beforehand, in what state the bone may be below the fracture (that is, with respect to fissures running more or less down it), he advises the incision, designed for the extraction of the splintered head of the bone, to be made in a situation where, if amputation at the joint be found indispensable, it will be of advantage. Mr. Guthrie likewise describes the manner of turning out the head of the bone in these cases, and sawing it off; the necessity of which, however, I do not clearly comprehend, unless the taking away of any sharp spicula of the upper end of the body of the bone be implied, which may be right. (*On Gunshot Wounds, p.* 333—335.) My ideas, however, chiefly extend to the removal of loose fragments, and splinters, and, with respect to sawing off the head of the bone, this is a proceeding, I suppose, necessarily limited to the kind of case reported by Mr. White.

AMPUTATION OF THE HEADS OF BONES.

In a letter to Mr. Pott, dated 1782, Mr. Park, surgeon to the Liverpool Hospital, made the proposal of totally extirpating many diseased joints, by which the limbs might be preserved, with a share of motion that would still allow them to be very useful.

Mr. Park's scheme, in short, was to remove entirely the extremities of all the bones, which form the diseased joint, with the whole, or as much as possible, of the capsular ligament; and to obtain a cure by means of callus, or by uniting the femur to the tibia, when the operation was done on the knee; and the humerus to the radius and ulna, when it was done on the elbow; so as to have no moveable articulation in those situations.

In order to learn whether the popliteal vessels could be avoided, without much difficulty, in the excision of the knee, Mr. Park made an experiment on the dead subject. An incision was made, beginning about two inches above the upper end of the patella, and extending about as far below its lower part. Another one was made across this at right angles, immediately above the patella down to the bone, and nearly half round the limb, the leg being in an extended state. The lower angles formed by these incisions were raised, so as to lay bare the capsular ligament; the patella was then taken out; the upper angles were raised, so as fairly to denude the head of the femur, and to allow a small catling to be passed across the posterior flat part of the bone, immediately above the condyles, care being taken to keep one of the flat sides of the point of the instrument quite close to the bone all the way. The catling being withdrawn, an elastic spatula was introduced in its place, to guard the soft parts, while the femur was sawn. The head of the bone, thus separated, was carefully dissected out; the head of the tibia was then with ease turned out, and sawn off, and as much as possible of the capsular ligament dissected away, leaving only the posterior part covering the vessels, which, on examination, had been in very little danger of being wounded.

The next attempt was on the elbow: a simple longitudinal incision was made from about two inches above, to the same distance below, the point of the olecranon. The integuments having been raised, an attempt was made to divide the lateral ligaments, and dislocate the joint; but this being found difficult, the olecranon was sawn off, after which the joint could be easily dislocated, without any transverse incision, the lower extremity of the os humeri sawn off, and afterwards the heads of the radius and ulna. This appeared an easy work; but Mr. Park conceives the case will be difficult in a diseased state of the parts, and that a crucial incision would be requisite, as well as dividing the humerus above the condyles, in the way done with respect to the thigh-bone.

Mr. Park first operated, July 2, 1781, on a strong, robust sailor, aged 33, who had a diseased knee, of ten years standing. The man's sufferings were daily increasing, and his health declining. Mr. Park, in the operation, wished to avoid making the transverse incision, thinking that after removing the patella, he could effect his object by the longitudinal one; but it was found, that the difference between a healthy and diseased state of parts, deceived him in this expectation. Hence, the idea was relinquished, and the transverse incision made. The operation was finished exactly as the one on the dead subject related above. The quantity of bone removed was very little more, than two inches of the femur, and rather more, than one inch of the tibia. The only artery divided was one on the front of the knee, and it ceased to bleed before the operation was concluded, but the ends of the bones bled very freely. In order to keep the redundant integuments from falling inwards, and the edges of the wounds in tolerable contact, a few sutures were used. The dressings were light and superficial, and the limb was put in a tin-case, sufficiently long to receive the whole of it, from the ankle to the insertion of the glutæus muscle.

I shall not follow Mr. Park throughout the treatment. Suffice it to remark, that the case gave him a great deal of trouble, and that it was attended with many embarrassing circumstances, arising chiefly from the difficulty of keeping the limb in a fixed position, the great depth of the wound, and the abscesses and sinuses, which formed in the part. On the other hand, however, the first symptoms were not at all dangerous. But the patient was obliged to keep his bed nine or ten weeks, and it was many months more before the cure was complete. The man afterwards went to sea, and did his duty very well.

Subsequently to the publication of the letter to Mr. Pott, another excision of the knee was done by Mr. Park, on the 22d of June, but the event was unsuccessful, as the patient lingered till the 13th of October, and then died.

About the same time that Mr. Park made his proposal, P. F. Moreau, a French surgeon, wrote in favour of a similar method. It only seems necessary to notice here the difference in Moreau's plan of operating from that adopted by our countryman. Moreau, the son, who has published the account, observes, that the multiplicity of flaps is unnecessary, as two answer every purpose; and he deems Mr. Park's direction to remove the olecranon, if this be free from caries, at least useless. Moreau, junior, operated on the elbow as follows: with a dissecting scalpel he cut down to the sharp edge, or spine of the inner condyle of the os humeri, about two inches above its tuberosity; and, directed by the spine, he carried the incision down to the joint.

He did the same on the other side, and then connected the two wounds by a transverse incision, which divided the skin and the tendon of the triceps, immediately above the olecranon. The flap was dissected from the bone, and held out of the way, by an assistant.

The flesh, which adhered to the front of the bone, above the condyles, was now separated, care being taken to guide the point of the instrument with the fore finger of the left hand, and when the handle of the scalpel could be passed through between the flesh and the bone, M. Moreau allowed it to remain there, and sawed the bone through upon it. The removal of the piece of bone was next finished, by detaching it from all its adhesions. The removal of the heads of the radius and ulna, remaining to be done, was more difficult, and the first flap being insufficient, it became necessary to make another. The lateral incision, at the outer side of the arm, was extended downwards, along the external border of the upper part of the radius. The head of the radius was separated from the surrounding parts; its connexion with the ulna destroyed, and a strap of linen was introduced between the bones, in order to keep the flesh out of the way of the saw. The radius was sawn through, near the insertion of the biceps, which was fortunately preserved. Some remaining medullary cells, filled with pus, were removed with a gouge. The ulna was now exposed, by extending the lateral incision on the inner side of the arm. Thus another flap was made, and detached from the back part of the forearm, and that portion of the bone which it was wished to remove. The bone, being separated from every thing that adhered to it, and a strap of linen put round it to protect the flesh, about an inch and a half of it was sawn off, measuring from the tip of the olecranon, downwards. A few diseased medullary cells were taken away with the gouge. Two or three vessels were tied, and the flaps were brought together with sutures. In a fortnight this man became so well, that he was allowed to go wherever he pleased, with his arm supported in a case. The arm was at first powerless, but it slowly regained its strength, and the man could ultimately thrash corn and hold the plough with it, &c.

Seven months after another operation, performed in the same way as the preceding one, by Moreau the father, the patient was completely cured, and two years after this period, the flexion of the forearm on the arm was very distinct. In another case, only one longitudinal incision, and a transverse one, were made, the flap being of course triangular. The patient got well in six weeks, and in three months more joined his regiment.

In all Moreau's cases, the flexion and extension of the forearm were preserved, which circumstance, no doubt, depended very much on the insertion of the biceps not being destroyed. After the excision of the knee, however, the bones grew together.

Moreau junior's method of operating differed from his father's, inasmuch as the patient was in a recumbent, instead of a sitting, posture, and the os humeri sawn before it was dislocated.

In a knee-case, Moreau the father operated as follows:—He made a longitudinal incision on each side of the thigh, between the vasti and the flexors of the leg, down to the bone. These incisions began about two inches above the condyles of the femur, and were carried down along the sides of the joint, till they reached the tibia. They were united by a transverse cut, which passed below the patella, down to the bone.

The flap was raised; but the patella attached to it being diseased, was dissected out. The limb was then bent, so as to bring the condyles of the femur into view. As it was desired to cut them from the body of the bone, before dislocating them, every thing adhering to them behind, where they joined the body of the bone, was separated, and, at that place the fore finger of the left hand was passed through, in order to press back the flesh from the bone, while the saw was used. The knee having been bent, Moreau drew the cut piece towards him, and easily detached it from the flesh and ligaments.

The head of the tibia was laid bare by an incision, nearly eighteen lines long, made on the spine of that bone. The first lateral incision on the outer side of the knee, was extended nearly as far down on the head of the fibula. Thus were obtained one flap, which adhered to the flesh filling up the interosseous space, and another triangular flap, formed of the skin, covering the inner surface of the tibia, which bone was of necessity exposed, before the saw could be applied.

Upon raising the outer flap, the head of the fibula came into view, and, after being separated from its attachments, was cut off with a small saw. The inner flap was then raised, and the head of the tibia, having been separated from the muscles behind, was sawn off.

It does not appear necessary to insert in this work the account of cutting out the ankle joint; an operation which will never be extensively adopted; nor shall I add any thing more concerning the mode of removing, in a similar way, the shoulder joint. In treating of amputation in this situation, I have already said enough, and whoever wishes for further information, respecting this practice, must refer to Dr. Jeffray's Work, entitled "*Cases of Excision of Carious Joints.*" This publication contains all that is known on the subject. Dr. Jeffray has recommended a particular, and, indeed, a very ingenious, saw, for facilitating the above operation. The saw alluded to is constructed with joints, like the chain of a watch, so as to allow itself to be drawn through behind a bone, by means of a crooked needle, like a thread, and to cut the bone from behind forward, without injuring the soft parts. An instrument of this kind was executed in London, by Mr. Richards, who was assisted in making it by his nephew, the present Mr. Richards, of Brick-lane. In placing the saw under a bone, its cutting edge is to be turned away from the flesh. Handles are afterwards hooked on the instrument.

According to my notions of the treatment of diseased joints, as long as the patient's strength is not subdued by the irritation of the local disease, humanity dictates the propriety of persevering in an attempt to save the affected limb, &c. Will a patient, greatly reduced by hectic symptoms, be able to recover from so bold and bloody an operation, as the dissection of the whole of the knee-joint out of the limb? If some few should escape, with life and limb preserved, would the bulk of persons, treated in this manner, have the same good fortune? I cannot admit, that the extirpation of the whole of so large an articulation as the knee, can be compared with the operation of amputation, in point of simplicity and safety. However, it is not on the difficulty of practising the former, that I would found my objections; for, I believe, that any man, possessing a tolerable knowledge of the anatomy of the leg, might contrive to achieve the business. The grounds on which I withhold my approbation from the attempt to cut out large joints, are the following:—1. The great length of time which the healing of the wound requires. Whoever peruses the case of Hector M'Caghan, will find that the operation was performed on the 2d of July, 1781, and that it was February 28th of the following year, before all the subsequent abscesses and sores were perfectly healed. This space of time is very nearly eight months! Mr. Park describes the patient as a strong, robust sailor, and gives no further particulars concerning the state of his constitution, than that his health was declining. I entertain little doubt, that if the excision of the knee had been performed in that state of the health, in which amputation becomes truly indispensable, this man would not have survived the illness arising from the operation. The only other case, in which Mr. Park extirpated the knee, ended fatally. In the instance related by Moreau, there seemed, indeed, to be considerable debility. This patient escaped the first dangers consequent to so severe an operation; and, *after three months confinement*, the patient was in such a state, that *Moreau expected he would be able to walk upon crutches in another month or six weeks!* The young man in the mean time was attacked by an epidemic dysentery, and died. On the 21st of October, 1809, Mülder extirpated the knee-joint of a pregnant woman in the hospital at Groningen; but she died of tetanus on the 8th of the following February. He conceives, that the operation is much facilitated by removing the ends of the femur and tibia in their connected state. (See *Diss. de Articulis extirpandis auctore G. H. Wachter.*) 2. Even supposing the excision of the knee to be followed by all possible success, is the advantage of having a mutilated, shortened, stiff limb, in lieu of a wooden leg, sufficiently great to induce any man to submit to an operation, beyond a doubt infinitely more dangerous than amputation? I think not. The practice is at present nearly exploded in this country; but I hear every now and then of its being adopted at Paris. Many interesting observations on the extirpation of various diseased joints may be found in the above-mentioned dissertation by Wachter, and in the analysis of it by Langenbeck (*Bibl. für die Chir. B.* 3, *Gottingen*, 1811.)

In quitting this part of the subject, I may just notice the interesting case recorded by Mr. Dunn, of Scarborough, who cut out several of the tarsal bones, including the diseased surface of the astragalus, and also some of the metatarsal bones, from a boy's foot, with complete final success. The hemorrhage, however, was profuse, and great difficulty experienced in stopping it. Whether this bold experiment merits imitation, I am not at present prepared to say; but, be this as it may, the fact merits attention. (See *Med. Chir. Trans. vol.* 11, *p.* 337.)

AMPUTATION OF THE FINGERS AND TOES, AND PART OF THE FOOT.

The best surgeons all agree with Mr. Sharp, that the amputation of the fingers and toes is most conveniently performed in their articulations. With a common scalpel, the skin is to be cut through circularly, not exactly upon the joint, but a little towards the extremity of the finger, in order that a sufficient flap may be preserved for covering the end of the bone. On taking away a finger from a metacarpal bone, Mr. Sharp recommends making two small longitudinal incisions on each side of the joint, as a means of facilitating the separation.

In amputating the fingers and toes, the operation is greatly facilitated by cutting into the joint when it is bent. Having made an opening in the back part of the capsule, one of the lateral ligaments may easily be cut, after which nothing keeps the head of the bone from being turned out, and the surgeon has only to cut through the rest of the exposed ligamentous and tendinous parts.

Some recommend making a small semicircular flap of skin to cover the bone; but this is quite unnecessary, if care be taken to draw the skin a little up, and to cut where Mr. Sharp directs. However, as making a small flap gives little pain, I have generally followed this method, though it appears to me nearly a matter of indifference which plan is adopted. In operating at the joints between the phalanges and matacarpal bones, a flap should always be made, either on the upper, or under part of the fingers to be removed.

Although it is generally best to remove the fingers at the joints, it is sometimes thought right, where the injury just includes the joint and no more, to saw through the bone, instead of operating at the next articulation. (See *Guthrie on Gunshot Wounds, p.* 384.)

It may happen, that the bones of the toes, and only part of the metatarsal bones, are carious, in which case, the leg need not be cut off, but only so much of the foot as is disordered. A small spring saw is here the most convenient. When this operation is performed, the heel and the remainder of the foot will be of great service, and the wound heal up safely, of which Mr. S. Sharp says, he had in his time seen one example. (*Op. of Surgery, Chap.* 37, *Ed.* 3.) Mr. Hey confirms this statement of Sharp's concerning the impropriety of removing the whole foot, when the metatarsal bones are carious, and every other part of the leg is sound, as the remainder of the foot is of immense service in walking, the use of the ankle not being destroyed.

Mr. Hey describes a new mode of removing the metatarsal bones, which on repeated trial has fully answered his expectations. By the term NEW, I here mean a particular method, which had not been previously described, though it may have been performed by others before Mr. Hey himself; for the merit of having first done it is imputed to the late Mr. Turner, of North Yarmouth, who did it with success about the year 1787. (See *Hutchison's Pract. Obs. p.* 70.) Mr. Hey makes a mark across the upper part of the foot, to denote where the metatarsal bones are joined to those of the tarsus. About half an inch from this mark, nearer the toes, he makes a transverse incision, through the integuments and muscles covering the metatarsal bones. From each extremity of this cut, he makes an incision along the inner and outer side of the foot to the toes: he removes all the toes from the metatarsal bones, and then separates the integuments and muscles, forming the sole of the foot, from the inferior part of the metatarsal bones, keeping the edge of the knife as near the bones as possible, in order to expedite the operation, and preserve as much muscular flesh in the flap as can be saved. He then separates the four smaller metatarsal bones, at their junction with the tarsus, and divides, with a saw, the projecting part of the first cuneiform bone, which supports the great toe. The arteries being tied, Mr. Hey applies the flap, which had formed the sole of the foot, to the integuments, which remain at the upper part, and keeps them in contact with sutures. The cicatrix being situated at the top of the foot, is in no danger of being hurt, while the place where the toes were situated, is covered with such strong skin, viz. what previously formed the sole of the foot, that it cannot be injured by any moderate violence. (See *Practical Observations in Surgery, p.* 535, *&c.*)

When the metatarsal bone of the great toe is alone diseased, Mr. Hey recommends dissecting it out from the cuneiform bone, instead of sawing it. The latter plan cannot be easily accomplished, without removing part of the integuments and muscles, and making a transverse, as well as a longitudinal, incision. These disagreeable things may be avoided by following the method of Mr. Hey, or that of Mr. C. Bell. For removing the metatarsal bone, either of the little, or great toe, the latter gentleman directs us to carry a scalpel round the root of the toe, and then along the side of the foot. The flaps are then to be dissected back, the metatarsal bone is to be separated from the next; and its square head is to be detached from the tarsus. (*Operative Surgery, Vol.* 1, *p.* 390.)

The removal of the central metatarsal, and metacarpal bones, is an operation of much difficulty, and the sawing of them is hardly practicable, without injuring the soft parts. Hence, I am decidedly of opinion, with Mr. C. Bell, that, instead of a formal amputation, it is better to extract the diseased bones from the foot, or hand, as, indeed, Mr. Hey was in the habit of doing.

That skilful surgeon, Langenbeck, however, has devised a ready mode of taking away the middle finger with its metacarpal bone, from the os magnum, or the ring finger, with its metacarpal bone, from the articulation of the latter with the os magnum and os cuneiforme. In order to find out these articulations, he draws a line from the upper head of the metacarpal bone of the thumb straight across to the metacarpal bone of the finger to be extirpated, and, at this place, he begins his first incision, which runs towards each side of the finger, like an inverted V. The bone is then separated all round from the soft parts, and dislocated from the carpus, when nothing remains to be done but to cut the parts towards the palm, where the wound is also made to resemble an inverted V, but does not extend any farther than is necessary to complete the separation. (See *Langenbeck's Bibl. B.* 1, *p.* 575, and *Plate* 3, *F.* 1.) This is unquestionably a simple and excellent method of operating, which Langenbeck also recommends as the best way of removing such bones of the metatarsus, as are not situated at the sides of the foot; care being taken to save a flap from the sole. It is often difficult, however, to know with certainty, whether the disease is confined to the metacarpal, or metatarsal bones; and, if it be not, and the carpus, or tarsus be affected, the operation will not answer, and amputation be indispensable. This happened in one of Langenbeck's cases, in which he had removed one of the metacarpal bones.

Modern surgeons never amputate the whole of the foot, or hand, when there is a reasonable chance of preserving any useful portion of it, though the rest may be most severely shattered. Thus, when a soldier had been struck by a grape shot, which shattered the metacarpal bones of the little and ring fingers, grazed the middle finger, and tore up the integuments on the palm and back of the hand, Mr. Guthrie succeeded in saving the two fingers and thumb, although, in the removal of the other parts, no regular flaps could be made for covering the wound. (*On Gunshot Wounds, p.* 382.) In winter campaigns, the toes, and more or less of the foot, are often attacked with mortification from cold. In this circumstance, when the disorder does not extend beyond the middle of the foot, or the toes, it is only necessary to cut away the gangrenous part. On the first entrance of the French army into Holland after the revolution, Paroisse met with many of these cases, in which it was necessary merely to take away the metatarsal bones, or sometimes those of the tarsus. All the patients, operated upon in this manner for the effects of cold, were cured; walking afterwards with more or less difficulty, according as the portion of the foot taken away had been greater or smaller. (*Opuscules de Chir. p.* 218.)

M. Roux, in his late publication, finds fault with our ignorance of Chopart's method of removing a part of the foot. He says, "I am certain, the principal surgeons in England have never practised, and are even totally unacquainted with, the amputation of the foot at the junction of the two halves of the tarsus, or Chopart's operation." (*Voyage fait à Londres en* 1814, *ou Parallèle de la Chirurgie Angloise avec la Chirurgie Françoise, p.* 338.) As it is an operation of considerable merit, I think it will be useful to introduce a description of it in the present work. It is performed in the nearly parallel articulations of the os calcis with the os cuboides, and of the astragalus with the os naviculare. Thus the heel is preserved, on which the patient can afterwards walk. The performance of it is simple. The tourniquet having been applied, the surgeon is to make a transverse incision through the skin, which covers the instep, two inches from the ankle joint. He is to divide the skin, and the extensor tendons, and muscles, in that situation, so as to expose the convexity of the tarsus. He is next to make on each side a small longitudinal incision, which is to begin below and a little in front of the malleolus, and is to end at one of the extremities of the first incision. After having formed in this way a flap of integuments, he is to let it be drawn upward by the assistant who holds the leg. There is no occasion to dissect and reflect the flap; for the cellular substance connecting the skin with the subjacent aponeurosis is so loose, that it can easily be drawn up above the place, where the joint of the calcaneum with the cuboides, and that between the astragalus and scaphoides, ought to be opened. The surgeon will penetrate the last the most easily, particularly by taking for his guidance, the eminence, which indicates the attachment of the tibialis anticus muscle to the inside of the os naviculare. The joint of the os cuboides and os calcis lies pretty nearly in the same transverse line, but rather obliquely forward. The ligaments having been cut, the foot falls back. The bistoury is then to be put down, and the straight knife used, with which a flap of the soft parts is to be formed under the tarsus and metatarsus, long enough to admit of being applied to the naked bones so as entirely to cover them. It is to be maintained in this position with three or four strips of adhesive plaster, which are to extend from the heel, over the flap, to the inferior and anterior part of the leg.

Chopart used to tie every artery as soon as it was divided. On the instep, the continuation of the anterior tibial artery will require a ligature; and in the sole, the internal and external plantar arteries, in the thickness of the flap of soft parts, must generally be taken up. One half of each ligature is to be cut away, and the other one is to be left hanging out between the plasters, at the nearest and most convenient point.

Walther and Graefe have given some very precise directions for the performance of this operation. A cut is first made, beginning half an inch below the outer ankle, and extending forwards along the side of the foot two inches. Another similar incision is then made from one inch below the inner ankle. The foot is now to be bent upwards, and the two first cuts united by a transverse incision, two finger-breadths from the front of the tibia. A flap is then dissected up, as far back as the commencement of the lateral incisions, or a line corresponding to the articulation of the astragalus with the os naviculare, and of the os calcis with the os cuboides. An assistant now checks the bleeding by applying the points of his fingers on the mouths of such vessels as bleed profusely, and holds up the flap. The extremity of the foot is now to be firmly inclined downwards, so as to stretch the ligaments connecting the tarsal bones together. The ligaments between the astragalus and os naviculare are to be first cut, when the foot may be twisted somewhat outwards, and the ligaments between the os calcis and os cuboides divided. The division is lastly completed by cutting through the soft parts regularly from above downwards, with the precaution of directing the amputating knife so as to leave a flap composed of part of the sole of the foot. (See *Abhandl. aus dem Gebiete der Pract. Med. &c. Landshut*, 1810, *B.* 1, *p.* 152, *& Graefe Normen für die Abl. grosserer Gliedm. p.* 142.)

Sometimes, in consequence of the soft parts of the instep being all gangrenous or otherwise destroyed, it is necessary to make the flap entirely from the sole of the foot, as Klein was obliged to do in one of his cases. (*Practische Ansichtenbedeutendsten Chir. Operationen. H.* 1, *p.* 28.) Indeed, Richerand thinks this mode generally advantageous, as the line of the cicatrix is not placed at the lower end of the stump, where it would be most exposed to injury. (*Nosogr. Chir. T.* 2, *p.* 502, *&c. Ed.* 4.) Langenbeck and Klein also condemn the painful and unnecessary measure of dissecting up a flap from the instep, as advised by Walther and Graefe. Chopart himself, as we have seen, merely drew back the integuments of the instep, without making any detachment of them from the subjacent parts. When the ends of the flexor tendons of the toes project too much from the inner surface of the lower flap, they are to be cut shorter, as Klein particularly directs; and I consider his advice not to use sutures for keeping the flap applied, but merely strips of sticking plaster, perfectly judicious. (*Op. cit. p.* 33-34.)

The following sources of instruction, on the subject of amputation, are particularly entitled to notice: *Celsus de Re Medicâ. Œuvres de Paré, livre* 12, *chap.* 30 & 33. *James Yonge, Currus Triumphalis è Terebintho, 8vo. Lond.* 1679. *R. Wiseman, Chir. Treatises, 4to. Lond.* 1692. *Sharp's Operations of Surgery, chap.* 37, *and Critical Enquiry into the present State of Surgery, chap.* 8. *Ravaton, Traité des Plaies d'Armes à Feu, Paris,* 1768. *Bertrandi, Traité des Opérations de Chirurgie, chap.* 23. *Le Dran's Obs. de Chir. Paris,* 1731, *and his Traité des Opérations de Chirurgie, Paris,* 1742, *and the English Translation with the additions of Cheselden, by Gataker, Lond.* 1749; *Heister's Instit. Chirurg. Pars* 2. *Sect.* 1. *Nouvelle Méthode pour faire l'opération de l'Amputation dans l'Articulation du Bras avec l'Omoplate, par M. De la Faye. P. H. Dahl, Dis. de Humeri Amputatione ex Articulo. Gott.* 1760. *Histoire de l'Amputation, suivant la Methode de Verduin et Sabourin, avec la Description d'un nouvel instrument pour cette Opération, par M. De la Faye. P. H. F. Verduin, Dis. Epistolaris de Nova Artuum decurtandorum Ratione,* 12*mo. Amst.* 1696. *Moyens de rendre plus simple et plus sûre l'Amputation à Lambeau, par M. de Garengeot. Observation sur la Resection de l'Os, après l'Amputation de la Cuisse, par M. Veyret. Mémoire sur la Saillie de l'Os après l'Amputation des Membres; où l'on examine les causes de cet inconvénient, les moyens d'y remédier, et ceux de la prevenir, par M. Louis. Second Mémoire sur l'Amputation des Grandes Extrémités, par M. Louis. The foregoing Essays are in Mém. de l'Acad. de Chirurgie, T.* 5, *Edit.* 12*mo. R. de Vermale, Obs. et Rémarques de Chirurgie pratique; Manheim,* 1767. *Essai sur les Amputations dans les Articles, par M. Brasdor, in T.* 15 *Mém. de l'Acad. de Chir. J. U. Bilguer de Membrorum Amputatione rarissime administranda aut quasi abroganda, 4to. Halæ Magd.* 1761. *White's Cases in Surgery,* 1770. *Bromfield's Chirurgical Observations and Cases, Vol.* 1. *chap.* 2. *8vo.* 1773. *O'Halloran's complete Treatise on Gangrene, &c., with a new method of Amputation, 8vo. Dublin,* 1765. *Alanson's Practical Observations on Amputation, Ed.* 2. 1782. *J. L. Petit, Traité des Maladies Chir. T.* 3, *Paris,* 1774, *or the later Ed.* 1790. *R. Mynor's Practical Thoughts on Amputation, Birmingh.* 1783. *T. Kirkland, Thoughts on Amputation, &c. 8vo. Lond.* 1780. *Loder, Comment. de Nova Alansoni, Amputationis Methodo, Progr.* 1. 7, *Jen.* 1784, *or*

Chir. Med. Beobachtungen, 8*vo.* *Weimar*, 1794. *J. F. Tschepius, Casus de Amputatione Femoris non Cruenta, Halæ*, 1742. (*Haller Disp. Chir.* 5, 239.) *Mursinna, Neue Med. Chir. Beobacht. Berlin*, 1796; *P. F. Walther, Abhandl. aus dem Gebiete der Prakt Medicin, besonders der Chirurgie und Augenheilkunde, B.* 1, *Landshut*, 1810; *Kern, Ueber die Handlungsweise bey der Absetzung der Glieder. Wien*, 1814; *G. Kloss, De Amputatione Humeri ex Articulo*, 4*to. Francof.* 1811; *W. W. Fraser, an Essay on the Shoulder-joint Operation*, 8*vo. Lond.* 1813. *H. Robbi, De Via ac Ratione, qua olim membrorum Amputatio instituta est*, 4*to. Lips.* 1815. *J. P. Roux, Memoire et Obs. sur la Réunion Immediate de la Plaie après l'Amputation*, 8*vo. Paris*, 1814. *J. G. Hause, Amputationis Ossium præcipua quædam momenta, Lips.* 1801. *J. F. D. Evans, Practical Observations on Cataract and closed Pupil, and on the Amputation of the Arm at the Shoulder, &c.* 8*vo. Lond.* 1815. *H. J. Brunninghausen, Erfahrungen und Bemerkungen über die Amputatien*, 8*vo. Bamb.* 1818. *Langenbeck, Bibl. für die Chirurgie, B.* 1, *p.* 562, *&c.* 8*vo. Gott.* 1816. *P. G. Van Hoorn, De iis, quæ in partibus Membri, præsertim osseis, amputatione vulneratis notanda sunt.* 4*to. Lugd.* 1803. *Graefe, Normen für die Ablosung grösserer Gliedm.* 4*to. Berlin*, 1813. *Klein, Practische Ansichten bedeudentsten Chir. Op. H.* 1, 4*to. Stuttg.* 1816. *A. C. Hutchison, Practical Observations in Surgery*, 8*vo. Lond.* 1816. *And further Obs. on the proper Period for amputating in Gunshot Wounds, &c.* 8*vo. Lond.* 1819. *Dr. Hennen, Principles of Military Surgery, 2d Ed.* 8*vo. Lond.* 1820; *a work full of valuable practical information. Pott's Remarks on Amputation. Sabatier, Médecine Opératoire, T.* 3, *Ed.* 2. *Hey's Practical Observations in Surgery, Edit.* 2. *Rémarques et Observations sur l'Amputation des Membres, in Œuvres Chir. de Desault par Bichat, T.* 2. *P. J. Roux, De la résection, ou du rétranchement de Portions d'Os malades, soit dans les articulations, soit hors des Articulations*, 4*to. Paris*, 1812. *Rees's Cyclopædia, art. Amputation. Vermischte Chirurgische Schriften, von J. L. Schmucker, Band* 1. *J. Bell's Principles of Surgery. Cases of the Excision of carious Joints, by Park and Moreau, published by Dr. Jeffray. Operative Surgery by C. Bell, Vol.* 1. *Richter's Anfangsgründe der Wundarzneykunst, Band* 7. *Richerand, Nosographie Chir. T.* 4, *Edit.* 4. *B. Bell's Surgery, Vol.* 5. *Pélletan Clinique Chirurgicale, T.* 3. *Gooch's Chirurgical Works,—various parts of the* 3 *Volumes. Larrey, Relation Chirurgicale de l'Armée d'Orient en Egypte et Syrie; also Mém. de Chirurgie Militaire: books, which should be in the library of every surgeon. Guthrie on Gunshot Wounds*, 8*vo. Lond.* 1815; *of which a new edition has since appeared: a publication which cannot be too attentively studied by every surgeon who wishes to know when, as well as how, to amputate in cases of gunshot-injury. Roux, Parallèle de la Chirurgie Angloise avec la Chirurgie Françoise, p.* 336, *&c. Paris*, 1815. *Lawrence on a New Method of tying Arteries, &c. Medico-Chir. Trans. Vol.* 6, *p.* 156, *&c. Report of Obs. made in the military Hospitals of Belgium, by Professor Thomson*, 1817. *Dictionnaire des Sciences Medicales, art. Amputation. C. Averill, operative Surgery, Lond.* 1823. *Symes and Liston, in Edinb. Med. and Surgical Journ. No.* 78.

AMYLUM. Starch. Powdered starch is sometimes used as an external application to erysipelas; but, chiefly, in clysters, when the neck of the bladder is affected with spasm. The following is the formula used at St. Bartholomew's Hospital. ℞ Mucilaginis Amyli, Aquæ distillatæ: sing. ℥ij Tinct. Opii guttas quadraginta: Misce.

ANASTOMOSIS. (from *ανα*, through, and *στομα*, a mouth.) Anatomists and surgeons imply, by this term, the communications of the blood-vessels with each other, or their running and opening into each other, by which the continuance of a free circulation of the blood is greatly insured, and the danger of mortification lessened. The immense importance of this part of our structure, in all cases in which the main artery, or veins of a limb are obliterated, is particularly conspicuous in the disease called aneurism. (See *Aneurism.*)

Nay, such has been the providence of nature in this respect that, even where the thoracic aorta has been completely obstructed, the channels for the conveyance of the blood to the lower extremities, have yet been found adequate to that purpose. This was proved in an example where the obstruction had been gradually produced by disease, and the anastomosing vessels of course had had time for enlargement; for, this is a very different case, from that in which a ligature is suddenly applied to the aorta; though, as far as can be deduced from the particulars of some experiments made on dogs by Sir Astley Cooper, and of one operation in which he tied the human abdominal aorta, (*Surgical Essays, Part* 1, *p.* 101,) blood will still pass to the lower extremities in sufficient quantity for their nutrition. At least, this inference is safely deducible from the very memorable operation to which I have referred, subject to one important condition, viz. that there be no additional cause of impediment to the passage of blood to the lower extremities besides the ligature above the bifurcation of the aorta. When Sir A. Cooper tied the human aorta in the abdomen, the experiment was made as the only possible means of hindering a man from bleeding to death, who had a large aneurism of the external iliac artery actually beginning to bleed, and extending too high to admit of any thing else being done. Now, although the unfortunate patient was not saved, and it must be acknowledged, that the chances of any other result were very small, the case furnished the important proof, that, if the abdominal aorta be suddenly and completely obstructed, the blood may yet pass in adequate quantity to the lower extremities, *provided there exist no other cause of impediment to the passage of the blood into those members*; for, on the side, occupied by the aneurism, the circulation in the limb was stopped, while, in the opposite limb, the circulation, and natural warmth were preserved. To this subject, I shall hereafter return. (See *Aorta.*)

The changes, which take place in the arterial system of the limb, when the main artery is rendered impervious by the application of a ligature, are well described by Mr. Hodgson: "The blood, meeting with an obstacle to its progress through the accustomed channel, is thrown in greater quantity, and with greater force, into those branches, which arise above the seat of the obstruction. The ramifications of these branches, in consequence of the unusual influx of blood, undergo a remarkable dilatation; the more minute vessels also, by which they anastomose with corresponding ramifications, arising from branches given off below the obstruction, are from the same cause sufficiently enlarged to allow a free passage of the blood into the inferior trunks of the limb. At first, the circulation is in this manner carried on through a congeries of minute anastomosing arteries; in a short time, a few of these channels become more enlarged, than the rest: as these increase in size, the smaller vessels gradually collapse, and ultimately a few large communications constitute permanent channels through which the blood is transmitted to the parts, that it is destined to supply. This is one mode by which a collateral circulation is established.

"But, in some situations, more direct and ostensible inosculations are provided; so that when one channel is obstructed, the blood passes at once through the other in a sufficient stream for the nourishment of the part, which it is destined to supply. Under these circumstances, no dilatation of the collateral branches is necessary: the circulation, in such instances, may be said to be constantly carried on through inosculating trunks. These great communications principally exist in the extremities of the body, where the dilating impulse, which the blood receives from the heart, is of course diminished. Thus, the radial artery inosculates freely with the ulnar; the anterior with the posterior tibial; and the internal carotid with the vertebral arteries. Two modes therefore exist, by which arteries communicate with each other—the anastomoses of minute ramifications, and the direct inosculations of trunks." (See *Hodgson on the Diseases of Arteries and Veins*, *p.* 234.) Refer also to *Inosculation*. The best general account of the inosculations, in relation to aneurism, is contained in Scarpa's Treatise on Aneurism; more especially, the Italian edition, which is embellished with beautiful engravings.

ANCHYLOPS. (from αγχι, near, and ωψ, the eye.) Same as Ægylops.

ANCHYLOSIS. (from αγκυλος, crooked.) This denotes an intimate union of two bones, which were naturally connected by a moveable kind of joint. All joints, originally designed for motion, may become anchylosed, that is, the heads of the bones, forming them, may become so consolidated together, that no degree of motion whatever can take place. Bernard Conner (*De stupendo ossium coalitu*) describes an instance of a general anchylosis of all the bones of the human body. A still more curious fact is mentioned in the *Hist. of the Acad. of Sciences*, 1716, of a child 23 months old, affected with universal anchylosis. In the advanced periods of life, anchylosis more readily occurs, than in the earlier parts of it. The author of the article *Anchylosis* in the *Encyclopédie Méthodique*, mentions, a preparation in which the femur is so anchylosed with the tibia and patella, that both the compact and spongy substances of these bones appear to be common to them all, without the least perceptible line of separation between them. In old subjects, the same kind of union is common between the vertebræ, and between these and the heads of the ribs.

Anchylosis is divided into the *true* and *false*. In the *true* the bones grow together so completely, that not the smallest degree of motion can take place, and the case is positively incurable. The position, in which the joint becomes thus inalterably fixed, makes a material difference in the inconvenience resulting from the occurrence. In *false* anchylosis, the bones have not completely grown together, and their motion is only diminished, not destroyed. True anchylosis is sometimes termed *complete*; false, *incomplete*.

In young subjects in particular, anchylosis is seldom an original affection, but generally the consequence of some other disease. It very often occurs after fractures, in the vicinity of joints; after sprains and dislocations attended with a great deal of contusion; and after white swellings and abscesses in joints. Aneurisms, and swellings and abscesses on the outside of a joint, may also induce anchylosis. In short, every thing which keeps a joint for a long time motionless may give rise to the affection, which is generally the more complete the longer the cause has operated.

When a bone is fractured near a joint, the limb is kept motionless by the apparatus, during the whole time requisite for uniting the bones. The subsequent inflammation also extends to the articulation, and attacks the ligaments and surrounding parts. Sometimes, these only become more thickened and rigid: on other occasions, the inflammation produces a mutual adhesion of the articular surfaces. Hence fractures so situated are more serious, than when they occur at the middle part of a bone. After the cure of fractures a certain degree of stiffness generally remains in the adjacent joints, but, this is different from true anchylosis; it merely arises from the inactivity in which the muscles have been kept, and their consequent loss of tone.

The position of an anchylosed limb is a thing of great importance. When abscesses form near the joints of the fingers, and the tendons mortify, the fingers should be bent, that they may anchylose in that position, which renders the hand much more useful, than if the fingers were permanently extended. On the contrary, when there is danger of anchylosis, the knee should always be kept as straight as possible. The same plan is to be pursued, when the head of the thigh bone is dislocated in consequence of a diseased hip. When the elbow cannot be prevented from becoming anchylosed, the joint should always be kept bent. No attempt should ever be made to *cure*, though every possible exertion should often be made to *prevent*, a true anchylosis. The attempt to prevent, however, is not always proper, for many diseases of joints may be said to terminate, when anchylosis occurs.

When the false, or incomplete anchylosis is apprehended, measures should be taken to avert it. The limb is to be moved as much as the state of the soft parts will allow. Boyer remarks, that this precaution is much more necessary in affections of the ginglymoid, than of the orbicular joints, on account of the tendency of the former to become anchylosed, by reason of the great extent of their surfaces, the number of their ligaments, and the naturally limited degree of their motion.

The exercise of the joint promotes the secretion of the synovia, and the grating first perceived in consequence of the deficiency of this fluid, soon ceases. A certain caution is necessary in moving the limb: too violent motion might create pain, swelling, and inflammation, and even caries of the heads of the bones. It is by proportioning it to the state of the limb, and increasing its extent daily, as the soft parts yield and grow supple, that good effects may be derived from it. (See *Boyer Mal. des Os, T.* 2.) The use of embrocations, and pumping cold water on the joint every morning, have great power in removing the stiffness of a limb remaining after the cure of fractures, dislocations, &c.

Unreduced dislocations are not always followed by anchylosis. Nature often forms a new joint, especially in persons of the lower order, who are obliged to move their limbs a great deal, in order to obtain a livelihood. The surrounding cellular substance becomes condensed, so as to form, around the head of the luxated bone, a membrane serving the purpose of a capsular ligament. The muscles, at first impeded in their action, become so habituated to their new state, that they resume their functions. This is particularly the case with bones which move in every direction, and have round heads; but, in ginglymoid joints, the heads of the bones are only imperfectly dislocated, and the motion is greatly restrained by the extent of surface; while some of the numerous ligaments are only sprained, not ruptured. These causes promote the occurrence of anchylosis.

Anchylosis may follow sprains and contusions of the joints, and such shocks, as the articular surfaces experience in leaping, or falling on the feet, from great heights. This is more likely to happen, when the inflammatory symptoms, resulting from such violence, have not been properly counteracted by bleeding, and other general remedies, while the plan of beginning to move the joint gently every day, as soon as the case will allow, has been entirely neglected.

When certain diseases of joints end in complete anchylosis, it is sometimes a desirable event. In fact, it is as much a means of cure, as the formation of callus is for the union of broken bones. The disease of the vertebræ, described by Pott, is cured, as soon as the bones anchylose, nor can the patient be considered well, before this event has taken place. *W. H. Müller, de Anchylosi, Lugd.* 1707. *L'Encyclopédie Méthodique, Partie Chir. T.* 1. *art. Anchylose. J. L. Petit, Traité des Mal. d' Os. T.* 2. *J. T. van de Wynpersse, de Ancyloscos Pathologia and Curatione; singularibus observationibus et fig. ill.* 4to. *Lugd.* 1783. *Gentleman's Magazine,* 1787, *universal anchylosis, ligaments ossified. Wurz, Wundarzn. p.* 224, *following the removal of the patella. Sandifort Exercit. Acad. p.* 1, *&c., anchylosis of the occiput with the atlas, and of the atlas with the dentatus; Sandifort, Obs. Pathol. anchylosis of the jaw. Dumas, Récueil Périodique de la Société de Med. T.* 10, *p.* 30, *and T.* 13, *p.* 352. *Hennen's Principles of Military Surgery, p.* 161, *&c. Ed.* 2. *The examples of general anchylosis are numerous: Plouquet refers to Columbus de Re Anatomicâ; Connor de stupendo Ossium coalitu, Oxon.* 1695; *Deslandes in Mém. de l'Acad. des Sciences,* 1716; *Frank, Reise nach, Paris, London, &c., p.* 127, *anchylosis of all the joints except those of the lower jaw; Olivier, in Journ. de Méd. T.* 12, *p.* 273; *Voigt Mag. für den Neuesten Zustand der Naturkunde,* 4 *B. p.* 412; *Portal, Cours d'Anat. Méd. T.* 1, *p.* 14; *Phil. Trans. No.* 461; *J. C. Smith, Nat. Hist. Hiberniæ Comit.* 1744. *Job a Meekren's Obs. C.* 64, *p.* 297. *Callisen's Systema Chir. Hodiernæ, T.* 2. *p.* 699. *edit.* 1800. *Boyer, Mal. des Os, T.* 2, *et Traité des Maladies Chir. T.* 4, *p.* 553. *Verduc Traité des Bandages, chap.* 35, *p.* 172. *Richerand, Nosogr. Chir. T.* 3, *p.* 223, *edit.* 4.

ANEURISM, or Aneurysm. (from ανευρυνω, to dilate.) The tumors which are formed by a preternatural dilatation of a part of an artery, as well as those swellings, which are occasioned by a collection of arterial blood, effused in the cellular membrane, in consequence of a rupture, or wound of the coats of the artery, receive the name of aneurisms. According to these opinions, aneurisms are of two kinds; the first being termed *true;* the second *spurious,* or *false.* Some modern writers have ventured to reckon another form of aneurism, which is said to happen, when the external coats of an artery being weakened by mechanical injury, or disease, the internal coat protrudes through the breach in the outer coat, so as to form a tumor distended with blood. This case has been denominated the *internal mixed aneurism,* or *aneurisma herniam arteriæ sistens.* The reality of this form of disease was believed by Dr. W. Hunter; and some delicate experiments, instituted by Haller on the mesenteric arteries of frogs, appear to have been the first ground of the opinion. Such an aneurism, however, has not been universally admitted, not that any body doubted the correctness of what Haller advanced, but because there might not always be a perfect analogy between the results of an experiment on animals, and those afforded by the observation of the diseases of the human body.

When Haller asserted, that, by separating the muscular from the inner coat of the arteries, he could, when he pleased, produce an aneurism in these animals; and when Hunter declared, that such an experiment made the artery firmer, than ever, in consequence of the adhesive inflammation taking place; the character and veracity of these eminent men naturally lead to the question, whether the experiments were conducted exactly in the same manner. Now, says Mr. Wilson, when we know, that Haller did not suffer the surrounding parts to unite, and that John Hunter did, we can no longer be at a loss to account for the different conclusions. (See *Wilson's Anatomy, Pathology, &c. of the Vascular System, p.* 378.)

However this may be with respect to the experiments made on certain animals, I am disposed to consider it fully proved by Mr. J. Hunter, Sir E. Home, and Professor Scarpa, that in the human subject, an aneurism will not arise from the kind of weakness, which is caused by cutting or even stripping off, the external coat of a sound artery, whether the wound be closed or not.

This fact would at least appear to be well established, with respect to the generality of the arteries; but, how far it is so in relation to the aorta, is another question, the inner membrane of which vessel is alleged to be more elastic, than that of common arteries. Dubois and Dupuytren, in fact, are stated to have presented to the Faculty of Medicine at Paris preparations, which exhibit the lining of the aorta protruding through the middle coat, in the form of a sac filled with blood. (See *Dict. des Sciences Méd. art. Aneurisme,* and, *Breschet in Transl. of Mr. Hodgson's work, p.* 130.)

By the term *mixed* aneurism, Dr. A. Monro, senior, implied the state of a true aneurism, when its cyst had burst, and the blood was diffused in the adjacent cellular substance; an event which is frequent. Besides these varieties of aneurism, the *aneurismal varix*, or *venous aneurism*, and the *aneurism from anastomosis*, constitute diseases which are usually regarded as cases pertaining to the present subject, though incapable of being comprised under the ordinary definition of an aneurism.

Nothing can be more manifest, than the fact, that, previously to the discovery of the circulation of the blood, no correct, nor valuable opinions, could have prevailed, respecting the diseases, which now go under the name of aneurisms. Indeed, it was not until after the days of Aristotle, that any distinction was made between the swellings of veins and those of arteries, such vessels not having been at that early period distinguished from each other. Their differences were first pointed out by Rufus of Ephesus.

Down to Galen, however, nothing like consistency was established in the notions respecting aneurism. His opinion was, that all tumors of this nature were produced either by anastomosis, or by rupture; and though he has described their symptoms, he has not informed us, of the characters by which each of these cases was distinguishable, one from the other. Paulus Ægineta divides aneurism into two sorts, both of which he says are attended with extravasation, and of course with rupture.

Vesalius, who first applied anatomy to the investigation of disease, has described an aneurism arising from the *rupture* of a *dilated* aorta; the first specimen, I believe, on record of this form of disease. (*Bonetus Sepulch. Anat. lib.* 4. *Sect.* 2.)

The combination of rupture with dilatation of the artery, was afterwards more particularly noticed by Nuck. (*Oper. Chir., &c. Lugd.* 1692.)

It was Fernelius who first promulgated the doctrine, that aneurisms were always dilated arteries. (*Universa Medicina, De Extern. Corp. Affect. lib.* 7. *cap.* 3, *Venet.* 1564.)

This opinion was espoused by Forrestus, Diemerbroek, and others; but at length, the inaccuracy of attempting to refer every aneurism solely to dilatation of the coats of the vessel, was established by the observations of Lancisi, Friend, Guattani, and Morgagni. In short, as Mr. Hodgson has stated, these authors proved, that aneurism may be produced either by the rupture, or the dilatation of the coats of an artery, or by a combination of both circumstances, the dilatation having preceded the rupture. (*On the Diseases of Arteries, &c. 8vo. Lond.* 1815.)

This admission of aneurism by dilatation, and of aneurism by rupture of the coats of an artery, together with the frequent combination of both circumstances, was indeed the prevailing undisturbed doctrine of every surgical school, until Professor Scarpa, inclining to the tenets of Sylvaticus (*De Aneurymate. Tract. Venetiis,* 1600, *4to.*) ventured to question the correctness of the common opinion about the dilatation of all the arterial coats. However, after the very clear and satisfactory elucidation of this disputed point by my friend Mr. Hodgson, the accurate views of the subject, first taken by Morgagni, and the other eminent writers specified above, may be regarded as established beyond the possibility of dispute. At the same time, it is not to be supposed, that Scarpa means to say, that the arteries are not subject to a morbid dilatation; on the contrary, he gives a particular description of this affection, which he carefully discriminates from aneurism.

Previously to offering a more particular account of the doctrine taught by Scarpa, respecting the formation of aneurism, as well as of the chief facts, which may be adduced against a part of such doctrine, it seems proper to make the reader acquainted with the various species of the disease, their ordinary symptoms, and a few other circumstances.

When any part of an artery is dilated, (attended with particular circumstances marking its difference from another form of dilatation, which, as I shall explain, perhaps ought not to be set down as aneurismal), the swelling is commonly named a *true*, or, *genuine aneurism*. In such cases, the artery is either enlarged at only a small part of its track, and the tumor has a determinate border, or, the vessel is dilated for a considerable length, in which circumstance, the swelling is oblong, and loses itself so gradually in the surrounding parts, that its margin cannot be exactly ascertained. The first case, which is the most common, is termed the *circumscribed true aneurism;* the last, the *diffused true aneurism;* a case, however, which would be looked upon by Scarpa only as a specimen of dilatation, different in several particulars from aneurism, as will be hereafter noticed. When blood escapes from a wound, or rupture, of an artery, into the adjoining cellular substance, the swelling is denominated a *spurious*, or *false aneurism*. In this instance, the blood either collects in one mass, distends the cellular substance, and condenses it into a cyst, so as to form a distinctly circumscribed tumor; or it is injected into all the cavities of the surrounding cellular substance, and extends along the course of the great vessels, from one end of the limb to the other, thus producing an irregular, oblong swelling. The first case is named, a *circumscribed false aneurism;* the second, a *diffused false aneurism.* (*Richter's Anfansgr. B.* 1.)

These appellations are in my opinion preferable to the term *cylindrical*, applied by Sauvages to true aneurisms, or *sacciform*, proposed by Morgagni for false aneurisms. (*Advers. Anat.* 2, *Aortæ Animadv.* 38, *et Epist. Anat.* 17, *No.*

27.) Because, as we shall see in the course of this article, though true aneurisms (including dilatations of all the arterial coats of every kind) do mostly affect the whole circumference of the vessel, and must therefore partake of a cylindrical shape, there are exceptions, in which a distinct circumscribed sac, composed of all the coats of the vessel, projects from one side of an artery, the diameter of which may not be at all increased. Here the disease might rather be named *sacciform*, the very appellation suggested by Morgagni for false aneurisms, in which the disease generally originates in this shape, from whatever particular side of the vessel the inner coats have given way. We see also that the subject actually demands more numerous distinctions, since aneurisms undergo in their progress various changes, which sometimes make an immense, and even a very sudden difference in their shape, cases which were at first circumscribed, afterwards becoming diffused.

The symptoms of a circumscribed true aneurism take place as follows: the first thing which the patient perceives, is an extraordinary throbbing in some particular situation, and, on paying a little more attention, he discovers there a small pulsating tumor, which entirely disappears when compressed, but returns again as soon as the pressure is removed. It is commonly unattended with pain, or change in the colour of the skin. When once the tumor has originated, it continually grows larger, and at length, attains a very considerable size. In proportion as it becomes larger, its pulsations become weaker, and, indeed, they are almost quite lost, when the disease has acquired much magnitude. The diminution of the pulsation has been ascribed to the coats of the artery losing their dilatable and elastic quality, in proportion as they are distended and indurated, and, consequently, the aneurismal sac being no longer capable of an alternate diastole and systole from the action of the heart. The fact is also imputed to the lamellated coagulated blood, deposited on the inner surface of the sac, particularly in large aneurisms, in which some of the blood is always interrupted in its motion. Immediately such coagulated blood lodges in the sac, pressure can only produce a partial disappearance of the swelling. This deposition of lamellated coagulum in the aneurismal sac is a circumstance of considerable importance; for, it has been well explained by Mr. Hodgson, that it is the mode, by which the spontaneous cure of the disease is in most instances effected. "One of the circumstances, which in the most early stage generally attend the formation of aneurism, (says this author) is the establishment of that process, which is the basis of its future care. The blood, which enters the sac soon after its formation, generally leaves upon its internal surface a stratum of coagulum, and successive depositions of the fibrous part of the blood gradually diminish the cavity of the tumor. At length, the sac becomes entirely filled with this substance, and the deposition of it generally continues in the artery, which supplies the disease, forming a firm plug of coagulum, which extends on both sides of the sac, to the next important ramifications that are given off from the artery. The circulation through the vessel is thus prevented, the blood is conveyed by collateral channels, and another process is instituted, whereby the bulk of the tumor is removed, &c. (*On the Diseases of Arteries, &c. p.* 114.) Whether there is any truth in Kreysig's conjecture, that some of the lymph may exude from the inside of the sac itself, I cannot pretend to say: he owns, however, that the inner concentric layers presenting the appearance of being deposited last, is a circumstance rather against his surmise, though he adverts to some other circumstances which incline him to look upon the opinion as possibly correct. (*German Transl. of Mr. Hodgson's Work, p.* 124.)

In a preceding paragraph, I have spoken of the diastole and systole of the aneurismal sac; for, it is the general belief, that the pulsation of the tumor is produced by the jet of blood into it at each stroke of the heart. This opinion, however, is disputed by an eminent writer, who asks, is it true, that the pulsation of aneurisms proceeds from the entrance of a more considerable stream of blood into the sac, and the distention of the swelling thereby produced? In aneurisms, which have only a narrow communication with the arterial tube, or which are filled with laminated coagula, the idea, says he, is quite inadmissible: the aneurism is rather shaken, as it were, like other different swellings in the vicinity of an artery, by the stroke of the heart occasioning a stretching of the whole arterial system, and at the same time communicating an impulse to the column of blood. (*Kreysig, Germ. Tr. of Mr. Hodgson's Work, p.* 143.) Here, however, I am by no means disposed to coincide with this distinguished physician, whose sentiments appear to me to be refuted by the fact, that, whenever any change happens, calculated to lessen, or entirely stop the influx of blood into the sac, the pulsation either diminishes, or ceases in proportion. Thus, when Kreysig adverted to the pulsation of aneurisms, in which much coagulated blood was deposited, he might at the same time have mentioned the effect, which such deposition has in weakening the pulsation, the layers of coagulated blood within the tumor being in the natural mode of cure, as Mr. Hodgson has correctly explained, "the means by which the force of the circulation is removed from the sac, and the fatal termination of the disease by rupture is prevented." (*On Diseases of Art. and Veins, p.* 126.) In proportion as the aneurismal sac grows larger, the communication of blood into the artery beyond the tumor is lessened. Hence, in this state, the pulse, below the swelling, becomes weak and small, and the limb frequently cold, and œdematous. On dissection, the lower continuation of the artery is found preternaturally small and contracted. The pressure of the tumor on the adjacent parts may also produce a variety of symptoms, ulceration, caries, &c. Sometimes, (says Richter) an accidental contusion, or concussion, may detach a piece of coagulum from the inner surface of the cyst, and the circulation through the sac be obstructed by it: nay, he asserts, that the coagulum may possibly be impelled quite into the artery below, so as to induce important changes. The danger of an aneurism arrives when it is on the point of bursting, by which occurrence the patient usually bleeds to death, and this sometimes in a few seconds. The fatal event may generally be foreseen, as the part about to give way becomes particularly tense, elevated, thin, soft, and of a dark purple colour. (*Richter's Anfangsgr. Band.* 1.)

A large axillary aneurism, which burst in St. Bartholomew's Hospital some years ago, did not burst by ulceration, but by the detachment of a small slough from a conical, discoloured part of the tumor; and soon after this case fell under my observation, I had an opportunity of seeing the process, by which an inguinal aneurism burst: at a certain point, the tumor became more conical, thin, and inflamed, and here a slough, about an inch in width, was formed. On the dead part becoming loose, a profuse bleeding began, which was stopped for a short time by pressure, but soon returned with increasing violence, and put an end to the patient's misery. We are then to conclude, that external aneurisms do not burst by ulceration, but, by the formation and detachment of a slough. I believe this is a fact, which was first particularly pointed out in the early editions of my work, and it gives me pleasure to find, that it is a statement which entirely coincides with that subsequently made by several writers of eminence, especially Mr. A. Burns (*On Diseases of the Heart, p.* 225,) and Boyer (*Traité des Maladies Chirurgicales, T.* 2, *p.* 98.)

As far as my information extends, Mr. A. Burns first explained the very different mode of rupture which happens in internal aneurisms: these he observed generally burst by actual laceration, and not by sphacelation of the cyst. (*On Diseases of the Heart, p.* 225.) But a still more particular account of the process, by which external and internal aneurisms burst, is delivered by Mr. Hodgson. When the sac points externally, (says this gentleman) it rarely or never bursts by laceration, but the extreme distention causes the integuments and investing parts to slough, and upon the separation of the eschar, the blood issues from the tumor. A similar process takes place, when the disease extends into a cavity, which is lined by a mucous membrane, as the œsophagus, intestines, bladder, &c. In such cases, the cavity of the aneurism is generally exposed by the separation of a slough, which has formed upon its most distended part, and not by laceration. But, when the sac projects into a cavity lined by a serous membrane, as the pleura, the peritoneum, the pericardium, &c. sloughing of these membranes does not take place, but, the parietes of the tumor having become extremely thin in consequence of distention, at length burst by a crack, or fissure, through which the blood is discharged. (*On the Diseases of Arteries, &c. p.* 85.)

When the aneurism is of considerable size, the collateral arteries, which originate above the swelling, are manifestly enlarged. Boyer informs us, that, in dissecting the lower extremity of a patient, on whom Desault had operated eight months previously for a popliteal aneurism, he found in the substance of the great sciatic nerve an artery, whose diameter was equal to that of the radial at the wrist. This vessel had its origin from the ischiatic artery, and descended to the back part of the knee, where it anastomosed with the upper articular arteries. Boyer had also noticed in the same subject before the operation, that one of the branches of the upper internal articular artery was so much enlarged, that its pulsation could be plainly felt on the internal condyle of the thigh-bone. (*Op. cit. p.* 93.) It is such enlargement of the collateral arteries above the disease, which insures to the limb below the tumor an adequate supply of blood when the obstruction to its passage through the diseased artery becomes considerable, or when this vessel has been rendered totally impervious by a surgical operation performed for the cure of the complaint.

In the advanced stage of an aneurism, the skin is found extremely thin, and confounded, as it were, with the aneurismal sac. The cavities of the cellular substance near the disease are either filled with serum, or totally obliterated by adhesion. The adjacent muscles, whether they lie over the aneurism, or to one side of it, are stretched, displaced, dwindled, and sometimes confounded with other parts. It is the same with the large nervous cords situated at the circumference of the tumor: they are pushed out of their natural situation, diminished in size, sometimes adherent to the outside of the sac, and so changed as scarcely to admit of being known again. Lastly, the cartilages and the bones themselves are not exempt from the mischief, which the aneurismal swelling produces in all the surrounding parts: they are gradually destroyed, and, at length, not the least trace of their substance remains, just in the same way as the bones of the cranium are destroyed by fungous tumors of the dura mater. (See *Dura Mater.*) Even the cartilages of the larynx, and rings of the trachea, are sometimes destroyed; this tube is pierced, and the blood escapes into it, or the aneurism bursts into the œsophagus. (*Boyer, Traité des Maladies Chir. T.* 2, *t.* 99.) As I shall hereafter explain, however, the pressure of an aneurismal tumor more quickly produces an absorption of bone, than of cartilage.

While an aneurism is small and recent, it does not generally cause much pain, nor seriously impede the functions of the limb. But when it has increased, several complications are produced. Thus, the dragging of the saphenal nerve, by femoral aneurisms, frequently occasions acute pain in the course of this nerve as far as the great toe. The distention of the sciatic nerve by the popliteal aneurism, sometimes brings on intolerable pain, which extends to all the parts to which this nerve is distributed, and which can hardly ever be appeased by the topical use of opiate applications. The compression of the veins and lymphatics gives rise to œdema, numbness, and coldness of the limb. And, finally, the long-continued pressure of the aneurism on the neighbouring bones causes their destruction. (*Boyer, p.* 105, *T.* 2.)

In cases of true aneurism, the coats of the artery are not always in the same state, the kind of changes observed depending upon the progress of the tumor. In the early stage of the disease, either the whole cylinder of the vessel, or only a part of its circumference, is dilated; but this period is generally of short duration, especially in arteries of middling size, because their middle coat is capable of less resistance, than that of the larger arteries, like the aorta, where this coat is yellowish, firm, and very elastic. As Breschet remarks, this difference of resistance in the middle coat of the aorta, and the branches given off from it, accounts for the rarity of true aneurisms either in the small arteries, or those of middling size, and their greater frequency in the principal trunk of the arterial system.

At length, in consequence of the increasing distention, some of the coats of the artery, possessing the least elasticity, give way, and these are found to be the internal and middle coats, while the external one still makes resistance, and continues to be more and more dilated by the lateral impulse of the blood.

The second stage of true aneurism, is that which is mostly met with, that, in which the tumor increases more rapidly, and therefore begins to excite greater attention. The disease, when it has attained this form, is in point of fact no longer a true aneurism; but a case which Monro distinguished by the name of the *consecutive*, or *external mixed false* aneurism. In this stage, the patient's life is endangered, and death often brought on by the rupture of the tumor. Examinations of the dead subject, under these circumstances, have frequently led to mistaken notions, and, doubtless, if various swellings of this kind had not been found in different degrees, or stages, in the same individual, one might be disposed to join Scarpa in the belief, that no aneurism consists of a dilatation of all the arterial coats. (*Breschet, Fr. Transl. of Mr. Hodgson's work, p.* 128, 129.)

The *false aneurism* is always attended with at least a rupture, or giving way of the inner coat of the vessel, and usually with a breach in both this and the muscular coat, the outer elastic tunic forming the pouch in which the blood collects. But, after the swelling has attained a certain size, this coat also bursts, and then the blood either becomes diffused, or a large circumscribed space is formed for it by the condensation of the surrounding cellular membrane. False aneurisms, when produced by a wound, or puncture, are of course from the first attended with a division of all the coats of the vessel. This form of the disease is often seen at the bend of the arm, where the artery is exposed to injury in venesection. (See *Hemorrhage.*) In this circumstance, as soon as the puncture is made, the blood gushes out with unusual force, and in a bright scarlet, irregular, interrupted current; flowing out, however, in an even, and less rapid stream, when pressure is applied higher up than the wound. These last are the most decisive marks of the artery being opened; for blood may issue from a vein with great rapidity, and in a broken current, when the vessel is turgid, and situated immediately over the artery, which imparts its motion to it. The surgeon endeavours precipitately to stop the hemorrhage by pressure, and in general a *diffused false aneurism* is the result. The external wound in the skin is closed, so that the blood cannot escape; but, this does not hinder it from passing into the cellular substance. The swelling, thus produced, is uneven, often knotty, and extends upward and downward along the track of the vessel. The skin is also usually of a dark purple colour. Its size increases, as long as the internal hemorrhage continues, and, if this should proceed beyond certain bounds, mortification of the limb ensues. Such is the *diffused false aneurism* from a wound.

The *circumscribed false aneurism*, from a wound, or puncture, arises in the following manner. When proper pressure has been made in the first instance, so as to suppress the hemorrhage; but, the bandage has afterwards been removed too soon, or before the artery has healed, the blood passes through the unclosed wound, or that which it has burst open again, into the cellular substance. As this has now become agglutinated by the preceding pressure, the blood cannot diffuse itself into its cells, and, consequently, a mass of it collects in the vicinity of the aperture of the artery, and distends the cellular substance into the form of a sac. Sometimes, though not often, the circumscribed false aneurism, originates immediately after the opening is made in the artery. This chiefly happens when the aperture in the vessel is exceedingly small, and, consequently, when the hemorrhage takes place so slowly, that the blood, which is first effused, coagulates, and prevents the entrance of that which follows into the cavities of the cellular substance, and of course, its diffusion. False aneurisms, proceeding from the rupture of the inner coats of an artery, are always at first circumscribed by the resistance of the outer tunic.

The circumscribed false aneurism consists of a sac, composed of the external coat of the artery, or, in case this has given way, it is composed of an artificial pouch, formed amongst whatever parts happen to be in the vicinity of the burst artery. This cavity is filled with blood, and situated close to the artery, with which it has a communication. Hence, in false aneurisms, a throbbing is always perceptible, and is more manifest, the smaller such tumors are. The larger the sac becomes, the less elastic it is, and the greater is the quantity of laminated coagula in it; so that in very large aneurisms of this kind, the pulsation is sometimes wholly lost.

The tumor is at first small, and on compression entirely disappears; but, returns as soon as this is removed. It also diminishes, when the artery above it is compressed; but, resumes its wonted magnitude, immediately such pressure is discontinued. When there is coagulated blood in the sac, pressure is no longer capable of producing a total disappearance of the tumor, which is now hard. The swelling is not painful, and the integuments are not changed in colour. It continually increases in size, and, at length, attains a prodigious magnitude.

The following are generally enumerated, as the discriminating differences between circumscribed true and false aneurisms: the true aneurism readily yields to pressure, and as readily recurs on its removal; the false one yields very gradually, and returns in the same way; and, as it contains laminated coagula, it cannot be reduced in the same degree by compression, as an aneurism formed by a dilatation of the arterial coats, where such strata of coagulated blood are usually absent. Frequently, a hissing sound is audible, when the blood gushes into the sac. The pulsation of the false aneurism is always more feeble, and, as the tumor enlarges, is sooner lost, than that of the true one, which throbs after it has acquired a considerable volume. (See *Richter's Anfangsgr. B.* 1.)

FORMATION OF ANEURISMS.

If the doctrines of Scarpa, published in 1804, had proved correct, the grand distinction of aneurism into *true* and *false* must have been rejected, as erroneous: "for," says he, "after a very considerable number of investigations, instituted on the bodies of those, who have died of internal, or external aneurisms, I have ascertained, in the most certain and unequivocal manner, that there is only one kind, or form of this disease; viz. that caused by a solution of continuity, or rupture of the proper coats of the artery, with effusion of blood into the surrounding cellular substance: which solution of continuity is occasioned sometimes by a wound, a steatomatous, earthy degeneration, a corroding ulcer, or a rupture of the proper coats of the artery, I mean the internal and muscular, without the concurrence of a preternatural dilatation of these coats being essential to the formation of this disease; and, therefore, that every aneurism, whether it be internal, or external, circumscribed, or diffused, is always formed by effusion." (*Treatise on Aneurism; Transl. by Wishart, Pref.*)

According to Scarpa, it is an error to suppose, that the aneurism at the curvature, or in the trunk, of the aorta, produced by a violent and sudden exertion of the whole body, or of the heart in particular, and preceded by a congenital relaxation of a certain portion of this artery, or a morbid weakness of its coats, ought always to be considered, as a tumor formed by the distention, or dilatation of the proper coats of the artery itself, that is, of its internal and fibrous coats. Scarpa considers it quite demonstrable, that such aneurisms are produced by a corrosion and rupture of these tunics, and, consequently, by the effusion of arterial blood under the cellular sheath, or other membrane, covering the vessel. If ever there be a certain degree of preceding dilatation, it is not essential to constitute the disease: for it is not a constant occurrence, most aneurisms are unpreceded by it, and, in those rare cases, in which an aneurism is preceded and accompanied with a certain degree of dilatation of the whole diameter of the curvature of the aorta, there is an evident difference between an artery simply enlarged in diameter, and the pouch, which forms an aneurismal sac.

Careful dissections, says Scarpa, will prove, that the aorta contributes nothing to the formation of the aneurismal sac, and that this is merely the cellular membrane, which, in the sound state, covered the artery, or that soft cellular sheath, which the artery received in common with the neighbouring parts. This is raised by the blood into the form of a tumor, and is covered, in common with the artery, by a smooth membrane.

This eminent professor does not deny, that, from congenital relaxation, the proper coats of the aorta may occasionally yield and become disposed to rupture; but, he will not admit, that dilatation of this artery precedes and accompanies all its aneurisms, or that its proper coats ever yield so much to distention, as to form the aneurismal sac. *The root of an aneurism of the aorta never includes the whole circumference of the artery;* but the aneurismal sac arises from one side in the form of an appendix, or tuberosity. On the contrary, the *dilatation of the artery always extends to its whole circumference*, and, therefore, differs essentially from aneurism. Thus, he urges, that there is a remarkable difference between a dilated and an aneurismatic artery, although *these two affections are sometimes found combined together*, especially, at the origin of the aorta. If we also consider, that the dilatation of an artery may exist, without any organic affection, the blood being always in the cavity of the vessel; that, in an artery so affected, there is never collected any grumous blood, or polypous layers; that the dilatation never forms a tumor of considerable bulk; and that, while the continuity of the proper coats remains uninterrupted, the circulation of the blood is not at all, or not so sensibly changed; we shall be obliged to allow, that aneurism differs essentially from one kind of dilatation of an artery.

Some additional remarks on this topic, more recently published by Scarpa, will be presently considered.

By dissections of arteries, both in the sound and morbid state, Scarpa endeavours to demonstrate what share the proper and constituent coats of the artery have in the formation of the aneurismal sac, and what belongs to the cellular covering, and other adventitious membranes surrounding the artery.

The covering of an artery is merely an adventitious sheath, which the vessel receives in common with the parts in the vicinity of which it runs. On cutting an artery across in its natural situation, the segment of the cut vessel retires and conceals itself in this sheath.

This cellular covering is most evident round the curvature and trunk of the aorta, the carotid, mesenteric, and renal arteries; it is less dense round the trunks of the brachial, femoral, and popliteal arteries. The pleura lies over the cellular sheath of the arch of the aorta, and over that of the thoracic aorta; while that of the abdominal aorta is covered by the peritoneum. Both these smooth membranes adhere to, and surround, two-thirds of the circumference of the vessel. The great arteries of the extremities are not covered in addition to the cellular substance, by any smooth membrane of this sort, but by a cellular sheath, which is demonstrably distinct from the adipose membrane, and serves to inclose the vessels, and connect them with the contiguous parts.

When air, or any other fluid, is injected by a small hole made artificially, between the cellular covering, and the subjacent muscular coat of the artery, the injected matter elevates into a tumor the cellular membrane, which closely embraces the artery, without properly destroying its cells, which it distends in a remarkable manner. When melted wax is injected, and pushed with much force, the cellular sheath of the artery is not only raised over the vessel, like a tumor, but, the internal cells of that covering are also lacerated, and, on examining afterwards the capsule of the artificial tumor, it appears as if it were formed of several layers, rough and irregular internally, smooth and polished externally. The same thing happens when any injection is pushed with such force into an artery, as to rupture the internal and muscular coats at some point of their circumference. Nicholls performed this experiment several times before the

Royal Society. (*Philos. Trans. an.* 1728.) As soon as the internal coat is ruptured, the muscular one also gives way; but, the external cellular sheath, being of an interlaced texture, and the thin laminæ, of which it is composed, being not simply applied to one another, but, reciprocally intermixed, is capable of supporting great distention, by yielding gradually to the impulse of the blood, without being torn, or ruptured.

Scarpa is farther of opinion, that the same phenomena may be observed, when the internal coat of the aorta becomes so diseased, as to be ruptured by the repeated jets of blood from the heart. In this circumstance, the blood, impelled by the heart, begins immediately to ooze through the connexions of the fibres of the muscular coat, and gradually to be effused into the interstices of the cellular covering, forming, for a certain extent, a kind of *ecchymosis*, or *extravasation of blood*, slightly elevated upon the artery. Afterwards, the points of contact, between the edges of the fibres of the muscular coat, being insensibly separated, the arterial blood, penetrating between them, fills and elevates, in a remarkable manner, the cellular covering of the artery, and raises it after the manner of an incipient tumor. Thus, the fibres and layers of the muscular coat, being wasted, or lacerated, or simply separated from each other, the arterial blood is carried with great force, and in greater quantity, than before, into the cellular sheath of the artery, which it forces more outwards; and, finally, the divisions between the interstices of the cellular coat, being ruptured, it is converted into a sac, which is filled with polypous concretions, and fluid blood, and at last forms, strictly speaking, the aneurismal sac. The internal texture, although apparently composed of membranes placed one over the other, is, in fact, very different from that of the proper coats of the artery, notwithstanding the injured vessel and aneurismal sac are both covered externally, in the thorax and abdomen, with a smooth membrane.

Scarpa has examined a considerable number of aneurisms, of the arch, and of the thoracic, and abdominal trunk, of the aorta, without finding a single one, in which the rupture of the proper coats of the artery was not evident, and in which, consequently, the sac was produced by a substance completely different from the internal and muscular coats.

The aneurismal sac never comprehends the whole circumference of the vessel. At the place where the tumor joins the side of the tube, the aneurismal sac presents a kind of constriction, beyond which it becomes more or less expanded. This would never happen, or rather the contrary circumstance would occur, if the sac were formed by an equable distention of the tube and proper coats of the affected artery. In incipient aneurisms, at least, the greatest size of the tumor would then be in the artery itself, or root of the swelling, while its fundus would be the least. But, *whether aneurisms be recent and small, or of long standing and large, the passage from the artery is always narrow, and the fundus of the swelling greater in proportion to its distance from the vessel.* The sac is always covered by the same soft dilatable cellular substance, which united the artery in a sound state to the circumjacent parts. Such cellular substance, in aneurisms of the thoracic aorta, is covered by the pleura, and, in those of the abdominal aorta, by the peritoneum, which membranes include the sac and ruptured artery, presenting outwardly a continued smooth surface, just as if the artery itself were dilated. But, if the aorta be opened lengthwise on the side opposite the constriction, or neck of the tumor, the place of the ulceration, or rupture, of the proper coats of the artery, immediately appears within the vessel, on the side opposite to that of the incision. The edge of the fissure, which has taken place, is sometimes fringed, often callous, and hard, and through it it was, that the blood formed itself a passage into the cellular sheath, which is converted into the aneurismal sac. If, as sometimes happens, in the arch of the aorta near the heart, the artery, before being ruptured, has been somewhat dilated, it seems, at first, as if there were two aneurisms; but, the constriction, which the sac next to the artery, presents externally, points out exactly the limits, beyond which the internal and muscular coats of the aorta had not been able to resist the distention, and where of course they have been ruptured. The partition, which may always be seen dividing the tube of the artery from the aneurismal sac, and which is lacerated in its middle, consists of nothing else than the remains of the internal and muscular coats of the ruptured artery.

By carefully dissecting the proper coats of the ruptured aorta in its situation, and comparing them with the cellular substance forming the sac, Scarpa affirms, that the truth of the preceding statement may be indisputably demonstrated.

When an incision is made lengthwise in the side of the vessel opposite the rupture, its proper coats are found either perfectly sound, or a little weakened and studded with earthy points, but, still capable of being separated into distinct layers. On the contrary, in the opposite side of the aorta, where the rupture is, the proper coats are unusually thin, and are only separable from each other with difficulty, or even not at all; they are frequently brittle like an egg-shell, and are disorganized and torn at the place where they form the partition between the ruptured artery, and the mouth of the aneurismal sac. Continuing to separate these coats, from within outwards, we arrive at the cellular sheath surrounding the aorta. This sheath being much thickened in large aneurisms, and very adherent to the subjacent muscular coat of the artery at the place of the constriction of the sac, is very apt to be mistaken for a dilated portion of the vessel itself. But, even in such cases, we may at last separate it, without laceration, from the tube of the artery, above and below the injury, and, successively, from the muscular coat, as far as the neck of the aneurism. Then it is clear, the muscular coat does not pass beyond the partition, separating the cavity of the artery from that of the aneurismal sac, over which it is not prolonged, but terminates at the edge of the rupture like a fringe, or in obtuse points. Errors are more apt to occur, in consequence of the aorta and sac being both covered by the pleura, or peritoneum.

The portion of the aorta, within the pericardium, being only covered by a thin reflected layer of this membrane, such layer may also be lacerated, when the proper coats give way, and blood be effused into the cavity of the pericardium. Examples of this kind are related by Walter, Morgagni, and Scarpa himself. In the latter instance, on making an incision into the concave part of the aorta, opposite the tumor which had formed under the layer of the pericardium, which had also burst by a small aperture, its internal coat, corresponding to the base of the swelling, was quite rough, interspersed with yellow hard spots, and actually ulcerated for the space of an inch in circumference. The preparation is preserved in the museum at Pavia.

But, all other parts of the aorta having, between them and the pleura and peritoneum, a cellular sheath of a stronger and more yielding nature, which allows itself to be distended into a sac, and being strengthened internally, by polypous layers, and, externally, by the pleura or peritoneum, oppose for a long while the fatal effusion of blood.

Scarpa believes, that what he calls the slow, morbid, steatomatous, fungous, squamous degeneration of the internal coat of the artery is more frequently the cause of its bursting, than violent exertions of the whole body, blows, or an increased impulse of the heart. This kind of diseased change is very common in the curvature, and the thoracic and abdominal trunks, of the aorta. In the incipient state of such disease, the internal coat of the artery loses, for a certain space, its beautiful smoothness, and becomes irregular and wrinkled. It afterwards appears interspersed with yellow spots, which are converted into grains, or earthy scales, or into steatomatous, and cheese-like concretions, which render the internal coat of the artery brittle, and so slightly united to the adjoining muscular coat, that upon being merely scratched with the knife, or point of the nail, pieces are readily detached from it, and, on being cut, it gives a crackling sound, similar to the breaking of an egg-shell. This ossification cannot be said to be proper to old age, since it is sometimes met with in subjects not much advanced in life. The whole of the side of the artery, in that part which is occupied by the morbid affection, is, for the most part, hard and rigid, sometimes soft and fungous, and, in most cases, the canal of the artery is preternaturally constricted. In the highest degree of this morbid disorganization, true ulcerations are found on the inside of the artery, with hard and fringed edges, fissures, and lacerations of the internal and fibrous coats of the artery.

Having presented the reader with an abridged account of the most important remarks made by Scarpa, in support of the doctrine he defends, I now annex his conclusions. 1. That this disease is invariably formed by the rupture of the proper coats of the artery. 2. That the aneurismal sac is never formed by a dilatation of the proper coats of the artery, but, undoubtedly, by the cellular sheath, which the artery receives in common with the parts contiguous to it; over which cellular sheath the pleura is placed in the thorax, and the peritoneum in the abdomen. 3. That if the aorta, immediately above the heart, appears sometimes increased beyond its natural diameter, this is not common to all the rest of the artery, and when the aorta, in the vicinity of the heart, yields to a dilatation greater than natural, this dilatation does not constitute, properly speaking, the essence of the aneurism. 4. That there are none of those marks regarded by medical men as characteristic of aneurism from *dilatation*, which may not be met with in aneurism from *rupture*, including even the circumscribed figure of the tumor. 5. That the distinction of aneurism into *true* and *spurious*, adopted in the schools, is only the production of a false theory; since observation shows, that there is only one form of the disease, or that caused by a rupture of the proper coats of the artery, and an effusion of arterial blood into the cellular sheath, which surrounds the ruptured artery. (See *Treatise on Aneurism, by A. Scarpa, transl. by J. H. Wishart, Edin.* 1808.)

Such were the inferences made by Scarpa, in 1804, one of the most distinguished anatomists and surgeons of the present day upon the continent. It has been already stated, that great as this authority is, several eminent modern surgeons, as Richerand, Boyer, Dubois, Dupuytren, Sabatier, Breschet, &c. did not yield to it, but still contended that in some aneurisms, the coats of the artery were dilated. These professors in France coincided with what has been usually taught upon this subject in the surgical schools of Great Britain. Every lecturer here has been accustomed to describe the distinctions of aneurisms into true and false, or into some cases which are accompanied with dilatation, and into others, which are attended with rupture of the arterial coats. A few years ago, Mr. Hodgson, of Birmingham, published a valuable treatise on aneurism, in which work he differs from Scarpa, and joins those surgical writers who believe in the occasional dilatation of the coats of the arteries in this disease. He inquires: "Is every aneurism produced by a destruction of the internal and middle coats of the vessel, and does not a partial dilatation of these coats occasionally precede, and give rise to their destruction? I believe that this is frequently the case. We have seen that the disorganization of the coats of an artery, by destroying their natural elasticity, will give rise to permanent dilatation of the whole circumference of the vessel; and there is every reason to expect, that a loss of its elasticity in a portion only of the diameter of the vessel will give rise to a partial dilatation of its coats. Indeed, the proofs of a partial dilatation of the coats of an artery, particularly of the aorta, are incontestably established by the possibility of tracing the coats of the vessel, throughout the whole extent of the expansion, and by the existence of those morbid appearances in the sac, which are peculiar to the coats of the arteries.

"In the year 1811, (says Mr. Hodgson), I dissected an aneurism of the aorta, which was removed from the body of a young woman by my friend Dr. Farre. The sac was as large as a small melon, and had proved fatal by bursting into the posterior mediastinum, and subsequently into the cavity of the thorax. This aorta exhibited the formation of aneurism by partial dilatation in three distinct stages. The internal coat was throughout inflamed, and presented a fleshy and irregular appearance. At the arch of the aorta, there was a dilatation not larger than the half of a small pea. About two inches lower in the same vessel, was a second dilatation, which would have contained a hazel nut, and immediately above the diaphragm was the large aneurism which had proved fatal. I removed that portion of the vessel, which contained the smallest dilatation, and macerated it until its coats could be separated without violence. I found that the dilatation existed equally in the three coats of the vessel, and, when separated, each presented the appearance of a minute aneurism. The second dilatation exhibited the same circumstances in a more advanced stage. The coats of the vessels were more intimately adherent to each other, than in a natural state, but, it was evident, that the dilatation consisted in a dilatation of the internal, the middle, and the external coats of the aorta. In the large aneurism, the disorganized internal and middle coats could be traced for some distance into the sac, when the parts contained in the posterior mediastinum, and the vertebræ, formed the remainder of the cyst. There can be little doubt, that this sac commenced in a dilatation of the coats of the vessel, similar to those appearances which existed in the superior portion of the dissection, and the artery appeared to illustrate the formation of aneurism by partial dilatation in three distinct stages" (*Hodgson on the Diseases of Arteries and Veins*, *p.* 66, 68.) As far as Kreysig's information extends, nobody before Mr. Hodgson had examined the structure of an aneurismal sac in this accurate manner, viz. by maceration, and the results, he thinks, are not liable to the slightest objections. (See the *German Transl. of Mr. Hodgson's work, with notes by Kreysig and Koberwein*, *p.* 109, *Hanover*, 1817.)

Mr. Hodgson has seen this partial dilatation in almost all the arteries, which are subject to aneurism: at the division of the carotids, and iliacs; in the arteries of the brain, &c.; and he agrees with Dr. Baillie, (*Morbid Anatomy, &c.*) Laennec, (*Cerattius Beschreib. d. Krankh. Praparate d. Anat. Theatres zu Leipz. p.* 408, 8*vo.* 1819,) and others, that aneurisms at the origin of the aorta are generally formed by dilatation of the coats of the vessel.

"Partial as well as general dilatation (says Mr. Hodgson), frequently precedes the formation of aneurism in the arteries of the extremities. A gentleman had a large anuerism in the thigh, which had undergone a spontaneous cure. Upon examining the limb after death, the popliteal artery was found to be thickened and covered with calcareous matter. A small pouch, which would have contained the seed of an orange, originated from the side of this artery. This little sac was evidently formed by a dilatation of the coats of the vessel. A man died from the sloughing of an aneurism in the ham: in the femoral artery there was a small aneurism, about as large as a walnut. The external coat was dissected from the surface of the tumor to a considerable extent. The internal and middle coats were evidently dilated, and contributed to the formation of the sac. The dilatation of these coats was gradual, and they continued for a considerable distance to form the sac, when they were inseparably blended with the surrounding parts." (*Op. cit. p.* 70.)

When Mr. A. Burns bears testimony to the fidelity and accuracy of Scarpa's general detail, he adds, that perhaps it may not be uniformly found, that "the root of an aneurism never includes the whole circumference of the tube of an artery." We have, says he, a preparation, in which the reverse has taken place. In this case, the whole cylinder of the vessel, from the heart to beyond the curvature, is equally dilated; and dilated to such an extent, that the tumor measures no less, than ten inches in circumference. Scarpa limits dilatation, says Mr. Burns, to that state of an artery, in which the coats remain in their natural relation to each other, and in which they are not altered in their texture, nor lined on their inner surface with "polypous layers." "This, however, was not the case in the instance, which I have brought forward. In it you have seen that the coats were much dilated, and also very much altered in their structure. Externally and internally, they had assumed the look of the membranes of the fœtus, only they were thicker and denser, but they were equally gelatinous and nearly as transparent; and, on their inner surface, they were crusted over with laminæ of coagulating lymph. By peeling off this incrustation, after the sac had been inverted, we saw plainly, that although the internal coats were round the complete cylinder of the vessel much diseased, and considerably dilated, yet they were not dilated in the same degree as the external coverings of the artery. At irregular distances, longitudinal rents were formed in the fibrous coats, and these chasms were filled with coagulating lymph. The internal coats, over the whole circumference of the vessel, had assumed the diseased condition, which in aneurism is generally confined to a part of the cylinder. In this tumor, all the coats continued for a time to dilate equally, but at length the internal gave way, forming longitudinal rents, through which the external coats could be seen, after the lymphatic coating had been scraped off. In this instance, had the sac been dissected in the early stage, it would have presented precisely the same appearances as those described by Dr. Monro, and the one (the aneurism) lately examined by the surgical editor of the London Med. Review." Mr. Burns afterwards expresses doubts, whether the sac ever acquires a large size without dilatation. The case, reported in the latter periodical work, was the largest, that he knew of, in which all the coats were found uniformly dilated. The sac, which was as large as the fist, was lined throughout with flakes of bone, and though the internal coat of the vessel was thus patched, and extremely thin and brittle, it did not, on minute inspection, any where exhibit a solution of continuity. Mr. A. Burns further states, that the above case reported by himself, was the only one out of fourteen, which did not corroborate Scarpa's description. (*On Diseases of the Heart, &c. p.* 204.) Mr. Wilson, after mentioning the frequency of aneurism in the aorta, carotid, subclavian, and axillary arteries, and its rarity in the brachial, tells us, that he knows of no example of aneurism below the elbow, where the swelling could not be traced to a wound of the coats of the artery. He adds, that true aneurism has not unfrequently occurred in the internal and external iliac arteries, in the inguinal, femoral, and very frequently in the popliteal. It has taken place in the posterior tibial artery, but he knows of no instance of it in the anterior tibial, or peroneal arteries. "I have (says he,) met with only one instance of true aneurism affecting any of the branches of the aorta, which are distributed to the abdominal viscera. In the year 1809, on inspecting the body of a clergyman, in the presence of the late Sir W. Farquhar, a tumor, very much resembling the heart in colour, shape, and size, appeared to hang down from the under surface of the left lobe of the liver. When this tumor was opened, and carefully inspected, it appeared to have been formed by the left branch of the hepatic artery having become very much enlarged and aneurismal. It had burst, and the blood which had escaped was found in an imperfect cyst, partly in a fluid, and partly in a coagulated state, forming a large proportion of the tumor" This preparation is in Windmill-street. (See *Lectures on the Blood, and on the Anatomy, Physiology, and Surgical Pathology of the Vascular System, p.* 379, 380, *8vo. Lond.* 1819.)

The facts adduced by Mr. Hodgson appear sufficiently conclusive, and from them the following doctrine is clearly deducible.

First, That numerous aneurisms are formed by destruction of the internal and middle coats of an artery, and the expansion of the external coat into a small cyst, which giving way from distention, the surrounding parts, whatever may be their structure, form the remainder of the sac.

Secondly, That sometimes the disease commences in the dilatation of a portion of the circumference of an artery. This dilatation increases until the coats of the vessel give way, when the surrounding parts form the sac, in the same manner as when the disease is in the first instance produced by destruction of the coats of an artery. (*P.* 74.)

The conclusions of Mr. Hodgson, as he himself explains, are supported by the observations of numerous writers.

The learned Sabatier says, there can be no doubt, that many aneurisms depend upon the dilatation of the arterial coats; but, *in far more numerous examples, the internal tunics are ruptured, and it is the cellular coat alone, which separates from them, and enlarges, so as to form the aneurismal sac; "de sorte que les artères, qui sont dans ce cas, sont diloriquées, suivant l'expression de Lancisi.*"

It is difficult to conceive, he observes, how all the coats of an artery can dilate and yield sufficiently to form the investment of such immense tumors as some aneurisms are. Indeed, that very tunic, which composes the greater part of the thickness of the vessel, and which is termed the *muscular coat*, is known to consist of fibres whose texture is firm, and little capable of bearing extension. However, Haller, in describing a very large aneurism, situated in the aorta near the heart, relates, that the innermost coat of this vessel was ruptured and torn, the loose jagged edges of the laceration being visible in the aneurismal sac These were squamous, bony, and of little thickness; while the muscular and cellular coats were quite sound. Donald Monro noticed the same thing in five different aneurisms, in the course of the femoral and popliteal arteries of a man, who had been confined a long while to his bed, after being operated upon for bubonocele. Monro succeeded in tracing the fibres of the muscular coat over the swellings, so that he had no doubt of this tunic being dilated. (See *Médécine Opératoire, T.* 3, *p.* 160—162.)

According to Richerand, when an aneurism is recent and of small size, the dissection of the tumor exhibits a simple dilatation of the arterial coats; while, in other cases, where the aneurism is large, and has existed a considerable time, the internal and middle coats of the vessel are invariably lacerated. In the early stage of the disease, the blood, which fills the aneurismal sac, is fluid, and on the contrary, in cases, where the internal tunics of the artery are ruptured, the sac contains more or less coagulated lymph. The external, or cellular coat, composes the greater part of the cyst; and the coagulated lymph, with which it is filled, is arranged in layers, the density of which is described as being greater in proportion to the length of time, which they have been deposited. Such as are nearest the sac are, therefore, represented as being most compact, and containing the smallest quantity of the colouring matter of the blood; more deeply, the concretions of lymph resemble simple coagula; and lastly, the blood, which is still nearer the arterial tube, retains its fluidity.

After the aneurismal sac has been cleansed from the lymph and coagulated blood, which it contains, its parietes will appear to be almost entirely formed of the cellular coat of the artery. Towards the bottom may be observed the aperture, arising from the laceration of the internal and middle coats, which, being much less elastic than the external, are ruptured in an early stage of the disease. It is when these two tunics give way, that the aneurismal tumor undergoes a sudden and considerable increase in its size; for, then the cellular coat alone has to sustain all the pressure of the blood, which, now becoming effused into a more ample cyst, loses a great deal of its impetus, coagulates, and forms fibrous masses; circumstances, to which may be ascribed the hardness of the swelling, the weakness of its pulsation, &c. (*Nos. Chir. T.* 4, *p.* 82, *Ed.* 2.)

But, this author seems to venture far beyond the bounds of accuracy, when he represents *every* small aneurism, as exhibiting a dilatation of the arterial coats, unless his meaning refer more particularly to the outer coat alone.

The reality of what are called true internal aneurisms was ably urged by C. F. Ludwig, in a programma written expressly on that subject. (*Diagnostices Chir. Fragm. de Aneurysmate Interno; Lips.* 1805.) But, an interesting case, exemplifying an aneurismal dilatation of all the coats of the abdominal aorta, has been recently published by Professor Nægele, of Heidelberg. The swelling was as large as a man's head, and weighed about five pounds. The aorta began to be dilated at the point, where it passes into the cavity of the abdomen between the crura of the diaphragm. This dilatation extended gradually down to a point, about four finger breadths from the bifurcation of the aorta into the iliac arteries, at which point, strictly speaking, the large aneurismal sac commenced The length of the whole dilated part of the vessel was eleven inches; that of the sac, six; and its diameter five inches. The artery was not equally dilated in every direction, the expansion being most considerable laterally, and forwards. Professor Nægele and Ackermann found, that the three coats of the aorta, the internal, muscular, and cellular, were all equally dilated. These gentlemen traced the muscular coat with a scalpel from the top to the bottom of the tumor, and not the slightest doubt could be entertained, that the case was a true aneurism. *(F. C. Nægele, Epistola ad T. F. Baltz, quâ Historia et Descriptio Aneurysmatis, quod in aorta abdominali observavit, continetur, Heidelb.* 1816.)

In the valuable cases, collected by H. F. Janin, very convincing evidence will be found of there being two kinds of aneurism; one attended with the rupture of the coats of the artery, the cellular coat alone forming the aneurismal sac; and the other, consisting in an equal dilatation of all the coats of the artery. Of the latter species of aneurism, Janin relates three very unequivocal cases. (See *Annales du Cercle Medical, T.* 1, *Art.* 2, 1820.)

After the clear demonstration of an aneurismal sac being occasionally composed of all the coats of an artery, as afforded in the dissections and pathological preparations, to which a reference has been made, the reader will be better prepared to judge of the difference existing upon this subject between Scarpa and other modern writers, and as far as I can judge, the question is now reduced to one, whether any of the dilatations on record, said to comprise all the arterial coats, merit the name of aneurism. We have seen, that he has always unequivocally admitted that the arteries may be dilated, though the kind of dilatation, to which he alludes, is thought by him, as well as by A. Burns, and my friend Mr. Hodgson, (*On Diseases of Arteries, &c. p.* 58), to require discrimination in a pathological point of view. "It is proved (says Scarpa) by dissection, that the morbid dilatation is circumscribed by the proper coats of the diseased artery; and that the inner surface of the sac, formed by the *partial*, or total protrusion of the arterial tube, is never filled with polypous laminæ, or layers of fibrine disposed over each other; (a fact particularly dwelt upon by Mr. Hodgson, p. 82) which layers never fail to be formed in greater or smaller quantity in the cavity of an aneurism. "The opinion, that these layers of coagula are not met with in small dilatations of arteries, but are found in large expansions of them, he says, is contradicted by numerous careful observations, and especially by a specimen, actually before him when he was writing, where a morbid dilatation of the arch of the aorta, in the vicinity of its origin from the heart, six inches in length, and five in breadth, was entirely free from any of the lamellated coagula, always found in aneurisms. On the contrary, the sac of the aneurism is formed from the parts surrounding the wounded, or ruptured artery, into which pouch, the blood, entering as into a natural receiver, and quite out of the current of the circulation, moves only slowly, and constantly deposits these layers of fibrine, and this sometimes in such quantity as to fill the whole cyst. Scarpa, at the same time, particularly explains, that, if accidentally furrows, or fissures, exist on the inside of the morbid dilatation, the fibrine may be deposited in these rough places, but only in them. These fissures and inequalities of the internal surface of the morbidly dilated artery, he regards strictly as so many beginnings of another disease of the vessel, quite different from dilatation, that is, of aneurism subsequent to dilatation. (See *Memoria sulla Legatura delle principali Arterie degli Arti, con una Appendice all' Opera sulle' Aneurisma, fol. Pavia,* 1817, *or the Treatise on Aneurism, transl. by Wishart, Ed.* 2, *p.* 119, *Edinb.* 1819.)

In this manner, no doubt, Scarpa would account for the presence of lamellated coagula in the case reported by Mr. A. Burns, *(On Diseases of the Heart, p.* 306,) though the latter gentleman himself, for reasons already detailed in the foregoing pages, did not regard the expansion of all the coats of the artery, as corresponding to the morbid dilatation implied by Scarpa. Thus Scarpa further agrees with other modern writers, in admitting the possibility of aneurism becoming ingrafted, as it were, on one of these unnatural dilatations, more than one example of which combination were indeed recited in his first work. In that treatise, he has asserted, that what he calls morbid dilatation, always extends to the whole circumference of the vessel. But, this point seems, from the appendix, to be renounced, as he now observes, "Where the morbid dilatation is *partial*, or on one side of the artery, like a thimble, (for, *very frequently*, even in the arch of the aorta, this partial dilatation does not exceed the size of half a bean,) the entrance for the blood into this capsule is as large as the bottom of the sac." *(Transl. by Wishart, p.* 120, *Ed.* 2.) According to Scarpa, where the morbid dilatation occupies the whole circumference of the arterial tube, the tumor always retains a cylindrical or oval form; and, if situated in such manner, that it can be compressed, it yields very readily to pressure, and almost disappears; and, after death, is found much smaller, than during life. On the contrary, *aneurism*, whether preceded by dilatation, or not, *constantly originates from one side of the ruptured artery.* The entrance for the blood is small, compared with the size of the fundus of the sac; the tumor assumes an irregular shape; yields with difficulty to pressure; retains nearly the same size in the dead, that it had in the living body; and its sac, instead of becoming thinner as the swelling enlarges, like the coats of an artery do, when they are simply affected with dilatation, attains greater thickness, the larger the aneurism grows. These essential differences between the two diseases are illustrated by an interesting case, met with by Professor Vacca, where a patient died with an aneurism of one subclavian artery, and a simple morbid dilatation of the whole circumference of the other. (See *Sprengel, Storia delle Operaz. di Chir. Trad. Ital. Parte* 2, *p.* 294.)

When these two different affections are situated in the thorax, or abdomen, it is impossible to discriminate them from each other before death. The symptoms, occasioned by the pressure of the tumor on the viscera, must be nearly the same, whether caused by a morbid dilatation, or an aneurism. The means for retarding their fatal termination is also the same in both forms of the disease. With regard to the possibility of cure, however, Scarpa says, that there is great difference; for, when the case is an internal aneurism, there may be some slight hope of a radical cure by the efforts of nature and art, which hope can never be entertained in a case of morbid dilatation; a fact, which is accounted for by no laminated coagula being deposited in the latter disease. *(On Aneurism, transl. by Wishart, p.* 124, *Ed.* 2.) A great deal of the latter statement coincides with the observations of Mr. Hodgson, who particularly notices, that he has never met with lamellated coagula in such sacs, as consist either in a general, or partial dilatation of the coats of the vessel. *(On Diseases of Arteries, &c. p.* 82.) Whether this ever takes place in such cases may still be a question, because if Professor Nægele has given a correct description of the aneurism of the abdominal aorta, already mentioned, which aneurism was of large size, and consisted of a dilatation of all the coats of the vessel, there was in this rare example a large quantity of these layers of coagulated blood. Yet, whether the professor actually means the fibrine, arranged in laminæ, or only common coagulated blood, which, as every one knows, may be found either in the cysts of dilated, or of ruptured arteries, may admit of doubt. The statement, therefore, made by Hodgson and Scarpa, may not be contrary to what was really seen by Nægele and Ackermann. The following case, however, observed by Laennec, and quoted by a modern writer, must (if correctly reported) afford not only an unequivocal specimen of aneurism by dilatation of all the coats of the aorta, but, of laminated coagula within its cavity. "In homine enim, qui repente sub atrocissimis pectoris doloribus corruit, præter aortum adscendentem in aneurysma ita expansam, ut neonati infantis caput æquaret, cystidem aneurismaticam immediate supra arteriæ cœliacæ ortam magnitudine nucis juglandis invenit, quæ luculenter ostendit sinum communicantem cum arteriæ cylindro per foramen magnitudine amygdalæ, diametro totius arteriæ illo loco non mutato. Saccus hic cultro anatomico accurate ac subtiliter subjectus, eamdem structuram, easdem ostendit membranas, quibus gaudebat arteria, e cujus latere excreverat; cæterum *massis grumosis, sive fibrosis erat impletus.* Inde igitur patet, hoc aneurysma sacciforme et laterali et partiali quidem tunicarum aortæ dilatatione ortum esse." *(J. H. G. Ehrhardt, De Aneurysmate Aortæ, p.* 13, *4to. Lips.* 1820.)

From what has been stated, then, it appears, that there is only one principal point of difference between Scarpa and other writers, and this resolves itself into the question, whether a dilatation of an artery, arising at one particular side of the vessel, and lined by its internal coat, ought not to be regarded as an aneurism, because its communication with the tube of the artery is more capacious, than what exists in other aneurisms, where the inner coat has given way, and because it rarely (perhaps never) contains laminated coagula, unless fissures should happen to exist at some points of the inner arterial tunic thus expanded?

The greater number of aneurisms increase gradually, and sooner or later incline to the side, on which the least resistance is experienced. De Haen mentions an aneurism of the aorta, which first made its appearance between the second and third ribs of the left side, and, which instead of growing larger, as is usual, subsided, and could neither be seen, nor felt, for more than a month before the patient's decease, although, on opening the body, a tumor of the arch of the aorta was found, three times as large as the first. De Haen imputes the sudden disappearance of the swelling to its weight, the yielding of the parts with which it was connected, and to its gravitating into the chest, when the patient lay on his right side; for, the difficulty of breathing, and other complaints, produced by the pressure on the lungs, underwent a material increase, as soon as the tumor ceased to protrude.

The pulsations which accompany true aneurisms continue to be strong, until the inner coats of the vessel give way, or the layers of coagulated blood, lodged in the sac, are numerous. Hence, when soft swellings, situated near any large arteries, lose their pulsatory motion, their course, precise situation, and other circumstances, ought to be most carefully investigated, before any decision is made about the mode of treatment.

A few years ago, I saw a man in St. Bartholomew's hospital, who had a large swelling of great solidity, occupying the ham, and apparently extending a good way forwards round the condyles of the femur. Its hardness, shape, large size, and entire freedom from pulsation, not only then, but at an earlier period, as far as could be collected from the patient's own account, led to the belief, that the case was probably a tumor complicated with exostosis of the femur, and as this opinion seemed to be confirmed by no fluid escaping from a puncture made with a lancet, amputation was performed. To our surprize, however, dissection proved, that the disease was a large diffused popliteal aneurism, in which the spontaneous cure by an obliteration of the sac with coagula was taking place. (See *Med. Chir. Trans. Vol.* 8, *p.* 497.)

In many instances, the most fatal accidents have happened, in consequence of incisions having been made in aneurisms, which were mistaken for abscesses, because there was no pulsation. Vesalius was consulted about a tumor of the back, which he pronounced to be an aneurism. Soon afterwards, an imprudent practitioner made an opening in the swelling, and the patient bled to death in a very short time. Ruysch relates, that a friend of his, having opened a tumor near the heel, not supposed to be an aneurism, the greatest difficulty was experienced in suppressing the hemorrhage. De Haen speaks of a patient, who died in consequence of an opening, which had been made in a similar swelling at the knee, although Boerhaave had given his advice against the performance of such an operation. Palfin, Schlitting, Warner, and others, have recorded mistakes of the same kind. (*Sabatier, T.* 3. *p.* 167.) Ferrand, head surgeon of the Hôtel-Dieu, mistook an axillary aneurism for an abscess, plunged his bistoury into the swelling, and killed the patient. "*J'ai été témoin d'erreurs semblables, commises par les practiciens non moins fameux; et si des anéurismes externes on passe à ceux des artères placées à l'intérieur, les erreurs ne sont ni moins ordinaires ni de moindre consequence.*" (*Richerand, Nosogr. Chir. T.* 4, *p.* 75, *Ed.* 2.)

Notwithstanding a pulsation is one of the most prominent symptoms of an aneurism, it is not to be inferred, that every swelling which pulsates is unquestionably of this description; for, as Mr. Warner has explained, it does happen, that mere imposthumations, or collections of matter, arising from external as well as internal causes, are sometimes so immediately situated upon the heart itself, and, at other times, upon some of the principal arteries, as to partake, in the most regular manner, of their contraction and dilatation. He details the particulars of a boy, about thirteen years of age, whose breast-bone had been badly fractured, and who was admitted into Guy's Hospital, a fortnight after the accident had happened.

The broken parts of the bone were removed some distance from each other. The intermediate space was occupied by a tumor of a considerable size; the integuments were of their natural complexion. The swelling had as regular a contraction and dilatation as the heart itself, or the aorta could be supposed to have. Upon pressure, the tumor receded; upon a removal of the pressure, the tumor immediately resumed its former size; all these are allowed to be distinguishing signs of a recent true aneurism. The situation and symptoms of this swelling were judged sufficient reasons for considering the nature of the disease as uncertain: on which account, it was left to take its own course.

"The event was; the tumor burst in about three weeks after his admission; discharged a considerable quantity of matter; and the patient did well by very superficial applications." (*Cases in Surgery, Edit.* 4, *p.* 155.)

An extraordinary form of disease, having very much the appearance of an aneurism, sometimes presents itself. A swelling, attended with considerable pain, and a strong pulsation, is gradually produced high up the arm; and, at length, attains a very large size. The strength of the throbbings at first leads to the suspicion, that the case must be an aneurism; but, on careful examination, the humerus is found to have given way at a point involved in the disease, and here to be as flexible, as if there were a fracture. This circumstance, and the extension of the swelling too far away from the track of the artery, in time raise doubts about the case being an aneurism. The patient ultimately falls a victim to the effects of the disease on the constitution, and, when the arm is dissected after death, the tumor is found to consist of a sarcomatous, or medullary mass, occupying the central portion of the limb, and accompanied with a solution of continuity extending completely through the whole thickness of the bone. Two cases of this description were admitted into St. Bartholomew's hospital in the course of the year 1820. One of these patients, a woman, I had an opportunity of seeing; and, after her death, the real nature of the disease was proved by dissection. My friend Mr. Vincent has seen a similar disease in the leg, resembling aneurism in the circumstance of pulsation, but attended with destruction of a part of the tibia, and a moveableness of the separated ends of the bone.

A few years ago, I saw a large abscess in the situation of the quadratus lumborum muscle, which pulsated so strongly, that the case was supposed by several experienced men to be an aneurism of the abdominal aorta. The patient was a boy, belonging to Christ's Hospital, and under the care of the late Mr. Ramsden, surgeon to that establishment, by whose discernment the real nature of the case was detected. It is curious, that, in this instance, the pulsations of the swelling suddenly ceased, after having continued in a very strong and manifest way, and without interruption, for several weeks, during which it was under the observation of the above eminent practitioner.

As Mr. Wilson has observed, any encysted, or even solid tumor, situated in the neighbourhood of, or upon a large artery, may have a considerable degree of motion communicated to it from the pulsation of the artery. The thyroid gland, when a bronchocele is formed, occasionally receives a pulsatory motion from the carotid arteries. This may be mistaken for an aneurism, from which disease, however, it can be discriminated by placing our fingers behind the tumor, and drawing it forwards when the pulsation ceases. But, there are other criteria for distinguishing a swelling, on or near an artery, from an aneurism. In such a case, the whole tumor moves at once, without any alteration of size. In an aneurism, the swelling does not simply move, it expands. A tumor of the thyroid gland, having apparently a pulsatory motion, may be known not to be an aneurism of the carotid, by observing, that, from its connexion with the larynx, it follows the movements of the latter in deglutition. Aneurisms, not of very long standing, and not containing a large mass of laminated coagula, may also be diminished, or rendered more or less flaccid, by pressing the artery leading to the disease. (See *Wilson on the Blood, Anatomy, Pathology, &c. of the Vascular System, p.* 385, *and Burns on the Heart, p.* 257.)

The following case, recorded by Pelletan, shows, that an artery running more superficially, than natural, may, under particular circumstances, give rise to the suspicion of an aneurism. A strong robust man, about forty years of age, was in the habit of going on foot to dine three leagues from Paris, every day, on the completion of his business. One day, having been this distance, and returned, he felt an acute pain along the leg, and in the right ankle. The pain did not subside, and a tumor appeared at the lower third of the leg, opposite the space between the two bones. The skin was of a yellowish colour from effused blood, and a pulsation existed, by which the hand of an examiner was lifted up. There seemed great reason for concluding, that the case was an aneurismal swelling. In comparing the affected limb with the sound one, however, Pelletan perceived in the latter a similar kind of throbbing. In short, in both legs, the pulsation of an arterial tube could be felt for three inches, and Pelletan distinctly ascertained, that in the diseased member, the throbbing did not extend to the whole of the tumor, but only lengthwise. By a particular disposition in this individual, the anterior tibial artery, which usually runs along the interosseous ligament, covered by the tibialis anticus, and extensor communis digitorum pedis, came out from between these muscles, at the middle of the leg, and lay immediately under the skin and the fascia.

The swelling and ecchymosis gradually dispersed, and the symptoms were supposed to originate from the rupture of some muscular fibres. (*Clinique Chir. T.* 1, *p.* 101, 102.)

Whenever an aneurismal sac of immoderate size beats violently, and for a long while, against the bones, as the sternum, ribs, clavicle, and vertebræ, they are in the end invariably destroyed, so that the aneurismal sac elevates the integuments of the thorax, or back, and pulsates immediately under the skin. Scarpa, with the best modern writers, attributes the effect to absorption, in consequence of the pressure.

J. L. Petit saw the condyles of the femur, and the upper head of the tibia, almost destroyed by an aneurism of the popliteal artery; and another case, in which the caries and absorption of bone were very extensive, is reported by Rosenmüller. (*Anhang zu Scarpa üb. d. Pulsadergeschwulste, p.* 364.) According to Mr. Hodgson, the carious and corroded state of the bones in aneurism is never attended with the formation of pus; "at least, the discovery of pus in its vicinity has not been remarked by those, who have examined such cases. In this respect, therefore, it differs essentially from common caries, or ulceration of bones. Exfoliation also is very rarely attendant upon it; from which circumstance, one important practical observation is deducible, namely, that if the aneurism be cured, the bones will recover their healthy state, without undergoing those processes, which take place in the cure of caries or necrosis." (*On the Diseases of Arteries and Veins, p.* 80.)

The same author confirms the remark made by Dr. W. Hunter, (*Med. Obs. and Inquiries, Vol.* 1. *p.* 348;) Scarpa, (*On Aneurism, p.* 100, *Ed.* 2.) and others, that cartilage is less rapidly destroyed by the pressure of an aneurism than bone. This fact is strikingly illustrated in a case of aneurism of the thoracic aorta, recorded in another modern publication: the bodies of the vertebræ from the fourth down to the ninth were carious; the four lowest in particular: yet, the intervertebral cartilages were not materially affected. (*F. L. Kreysig, Die Krankheiten des Herzens, B.* 3, *p.* 176, *8vo. Berlin*, 1817.)

A case is related by Pelletan, to which I refer the reader, as exemplifying not only the degree, in which internal aneurisms may injure the vertebræ, but also the occasional possibility of such diseases being mistaken for rheumatism, or a lumbar abscess. (See *Clinique Chir. t.* 1, *p.* 97-100.)

CAUSES OF ANEURISM.

In many instances it is difficult to assign any cause for the commencement of the disease. Among the circumstances, which predispose to aneurisms, however, the large size of the vessels may undoubtedly be reckoned. Those trunks, which are near the heart, are said to have much thinner parietes, in relation to the magnitude of the column of blood, with which they are filled, than the arteries of smaller diameter; and since the lateral pressure of this fluid against the sides of the arteries, is in a ratio to the magnitude of these vessels, it follows, that aneurisms must be much more frequent in the trunks near the heart, than in such as are remote from the source of the circulation. (*Richerand, Nosogr. Chir. T.* 4, *p.* 72, *Edit.* 2.) The whole arterial system is liable to aneurisms; but, says Pelletan, experience proves, that the internal arteries are much more frequently affected, than those which are external. (*Clinique Chir. T.* 1, *p.* 54.)

The curvatures of the arteries are another predisposing cause of the disease, and, according to Richerand, such cause has manifest effect in determining the formation of the great sinus of the aorta, the dilatation, which exists between the cross and the origin of this large artery, and is the more considerable, the older the person is: Monro even thought, that one half of old persons have an aneurism at the beginning of the aorta. And with respect to aneurisms in general, which are preceded by calcareous depositions, thickening, and disease of the coats of the vessel, they are most frequently met with in persons of advanced age. Aneurisms from wounds are of course often seen in individuals of every age. In old people, the coats of the arteries are subject to a disease, which renders them incapable of making due resistance to the lateral impulse of the blood. The disease, here alluded to, is what is described in a foregoing part of this article, one common effect of which is the deposition of calcareous matter between the inner and muscular coats of the arteries. "People in the early part of life," says Mr. Wilson, "are not very subject to these calcareous depositions; but, I have occasionally met with them in the arteries of very young people. I have seen a well marked deposition of the phosphate of lime in the arteries of a child under three years of age." He adds, that few persons, above the age of sixty, are free from these ossifications. (See *Lectures on the Blood, and on the Anatomy, Pathology, &c. of the Vascular System, p.* 375, *Lond.* 1819.)

Though spontaneous aneurisms are most common in old persons, the disease is not absolutely confined to them; for I assisted Mr. Docker at Canterbury in an operation for the cure of a popliteal aneurism in a postilion, whose age must have been under thirty; and Mr. Wilson says, that he has met with several instances of the disease in the aorta and other vessels, where the patients were not more than forty years of age. (*Op. cit. p.* 376.)

According to Sir Astley Cooper, the time of life when aneurism generally occurs, is between the ages of thirty and fifty; an age, when exercise is considerable, and strength on the decline. In very old age the disease is not so common. However, he operated successfully on a case of popliteal aneurism, where the patient was eighty-four or eighty-five years old. He has also seen a boy only eleven years old, with aneurism of the anterior tibial artery. The man of more than eighty is the oldest, and the boy of eleven the youngest, aneurismal patients he has ever seen. (See *Lancet, Vol.* 1, *p.* 426.)

Richerand affirms, that, out of twelve popliteal aneurisms, which he has seen in hospital, or private practice, ten were caused by a violent extension of the leg. This statement, he says, will derive confirmation from the following experiment.

Place the knee of a dead subject on the edge of a firm table, and press on the heel, so as forcibly to extend the leg far enough to make the ligaments of the ham snap. Now dissect the parts, cut out the artery, and examine its parietes in a good light, when the lacerations of the middle coat will be observable, and rendered manifest by the circumstance of those places appearing semitransparent, where the fibres are separated, the parietes at such points merely consisting of the internal and external tunics. (*Nosogr. Chir. t.* 4, *p.* 73, 74, *Edit.* 2.) But, the insufficiency of this explanation is clear enough from the fact, that such violence, as is requisite to break the ligaments of the knee, cannot be imagined to happen in the accidents which ordinarily bring on aneurism in the ham.

The implicit belief also which Richerand seems to place in the idea, that the laceration of the middle coat of an artery will bring on an aneurism, while the inner coat is perfect, will appear to be unfounded, when it is remembered, that Hunter, Home, and Scarpa, even dissected off the external and middle coats of arteries, without being able in this manner to cause an aneurism. Nay, where the experiment has been made of applying a tight ligature to an artery, and immediately removing it again in order to determine whether the division of both the inner coats of the vessel would terminate in an obliteration of the tube of the vessel, no aneurism has been the consequence.

Pelletan accounts for the frequency of popliteal aneurisms somewhat differently from Richerand: speaking of the two principal motions of the knee, viz. extension and flexion, he remarks, that the first of these is so limited, that it is actually an incipient flexion, necessarily produced by the curvature backward both of the condyles of the femur, and those of the tibia. This curvature, which would seem to protect the popliteal artery against any dangerous elongation, that might otherwise be caused by a forcible extension of the joint, becomes the very source of such an elongation in persons, who are accustomed to keep their limbs bent, or, who, from this state, proceed hastily and violently to extend the leg. The arterial tubes are really shortened, when the limbs are in the state of flexion, and lengthened, when the extension of the members renders it necessary. Hence, says Pelletan, it is manifest, that an habitual shortened state of these vessels, and their sudden elongation, must be attended with hazard of rupturing their parietes. (*Clinique Chirurgicale, t.* 1, *p.* 112.)

The opinion of Pelletan, however, is quite untenable; because Mr. Hodgson has several times repeated the experiment mentioned by Richerand, and found, as that gentleman did, that the coats of the artery were never lacerated, unless the degree of violence had been such as to rupture the ligaments of the knee. (*On Diseases of Arteries, &c. p.* 64.)

Aneurisms are exceedingly common in the aorta, and they are particularly often met with in the popliteal artery. The vessels, which are next to these the most usually affected, are the crural, common carotid, subclavian, and brachial arteries. The temporal and occipital arteries, and those of the leg, foot, forearm, and hand, are far less frequently the situations of the present disease. But, although it is true, that the larger arteries are the most subject to the ordinary species of aneurisms, the smaller arteries seem to be more immediately concerned in the formation of one peculiar aneurismal disease, now well known by the name of the *aneurism by anastomosis*, of which I shall hereafter speak.

According to surgical writers, the causes of aneurisms operate either by weakening the arterial parietes, or by increasing the lateral impulse of the blood against the sides of these vessels. It is said to be in both these ways, that the disease is occasioned by violent contusions of the arteries, the abuse of spirituous drinks, frequent mercurial courses, fits of anger, rough exercise, exertions in lifting heavy burdens, &c. In certain persons, aneurisms appear to depend upon a particular organic disposition. Of this description was the subject, whose arteries, on examination after death, were found by Lancisi affected with several aneurisms of various sizes. I have known a person have an aneurism of one axillary artery, which disease got spontaneously well, but, was soon afterwards followed by a similar swelling of the opposite axillary artery, which last affliction proved fatal. I have seen another instance, in which an aneurism of the popliteal artery was accompanied with one of the femoral in the other limb. Boyer mentions a patient, who died of a femoral aneurism in la Charité, at Paris, and who had also another aneurism of the popliteal artery, equal in size to a walnut. (*Traité des Maladies Chir. &c. p.* 102, *t.* 2.) The greatest number of aneurisms that Sir Astley Cooper has seen in one patient is seven; and it is a remark, made by this eminent surgeon, that when an aneurism occurs in the ham, the disease is frequently of a local nature; but, that when it is between the groin and ham, disease of other arteries is very commonly met with. (See *Lancet, Vol.* 1, *p.* 426.) The most remarkable case, however, proving the existence of a disposition to aneurisms in the whole arterial system, is mentioned by Pelletan. "J'ai pourtant vu plusieurs fois ces nombreux aneurismes occupant indistinctement les grosses ou les petites artères, mais surtout celles des capacités: *j'en ai compté soixante-trois sur un seul homme, depuis le volume d'une aveline jusqu'à celui de la moitié d'un œuf de poule.*" (*Clinique Chir. t.* 2, *p.* 1.)

Aneurisms, and those diseases of the coats of arteries, which precede the formation of aneurism, are much less frequently met with in women than men. (*Lassus, Pathologie Chir. t.* 1, *p.* 348.) A few years before John Hunter died, Mr. Wilson heard him remark, that he had only met with one woman affected with *true* aneurism. (*Anatomy, Pathology, &c. of the Vascular System, p.* 376.) Mr. Hodgson drew up the following table, exhibiting the comparative frequency of aneurisms in the two sexes in different cases of this disease, and also in the different arteries of the body, as deduced from examples, either seen by himself, during the lives of the patients, or soon after their death.

	Total.	Males.	Females.
Of the ascending aorta, the arteria innominata, and arch of the aorta - - -	21	16	5
Descending aorta - -	8	7	1
Carotid artery - - -	2	2	
Subclavian and axillary - -	5	5	
Inguinal artery - - -	12	12	
Femoral and popliteal - -	15	14	1
	63	56	7

This table does not include aneurisms arising from wounded arteries, nor aneurisms from anastomosis. (*On the Diseases of Arteries and Veins, p.* 87.)

Sir Astley Cooper estimates the proportion of males with aneurism to females similarly afflicted, as about five to one; and, he adds, that if we take only cases of popliteal aneurism, the proportion of males will be still greater. He observes, that, when aneurisms do occur in females, they are generally internal. He has seen, however, about eight cases of popliteal aneurism in females. (See *Lancet, Vol.* 1, *p.* 426.)

It was observed by Morgagni, and it has been noticed in this country, that popliteal aneurisms occur with particular frequency in postilions and coachmen, whose employments oblige them to sit a good deal with their knees bent. In France, the men, who clean out the dissecting rooms, and procure dead bodies for anatomists, are said almost all of them to die of aneurismal diseases. Richerand remarks, that he never knew any of these persons, who were not addicted to drinking, and he comments on the debility, which their intemperance and disgusting business together must tend to produce. (*Nosogr. Chir. t.* 4, *p.* 74, *Edit.* 2.)

Aneurisms are supposed by Roux to be much more frequent in England than France; a circumstance, which, before he proves it to be a fact, he vaguely refers to the mode of life, and kind of labour, to which a large part of the population of England is subjected. Indeed, he connects this surmise with a reason for the very cultivated state of this part of knowledge in England, thinks, that we have been placed in favourable circumstances for perfecting the treatment of aneurisms, and acknowledges, that we have contributed more than his countrymen, both in the last and present century, to the improvement of this branch of surgery. (*Roux Parallèle de la Chirurgie Angloise avec la Chirurgie Françoise, &c. p.* 249.) But, ere M. Roux ventured into such conjectures, he ought at least to have specified what particular occupations and kind of labour are known by Englishmen themselves to be frequently conducive to aneurism; for, with the exception of postilions and coachmen, of whom there is also abundance in France, I am not aware, that any determinate class of persons is found in this country to be affected with particular frequency.

In some instances, aneurisms of the axillary artery appear to have arisen from violent extension of the limb. (See the cases recorded by Pelletan in *Clinique Chir. t.* 2, *p.* 49 *and* 83.) In other examples, related by the same practical writer, aneurisms arose from reiterated contusions and rough pressure on parts (*Op. cit. p.* 10 *and* 14.)

The extremity of a fractured bone may injure an artery, and give rise to an aneurism, instances of which are recorded by Pelletan (*Op. cit. t.* 1, *p.* 178), and Duverney (*Traité des Mal. des Os, t.* 1.) In Pelletan's case, the disease followed a fracture of the lower third of the leg. An aneurism of the anterior tibial artery, from such a cause, is also described by Mr. C. White. (*Cases in Surgery, p.* 141.)

The following case of an aneurism of the humeral artery, after amputation, is recorded by Warner: C. D. was afflicted with a caries of the joint of the elbow, which was attended with such circumstances, as rendered the amputation of the limb necessary. The operation was performed at a proper distance above the diseased part, and the vessels were taken up with needles and ligatures.

In a few days the humeral artery became so dilated above the ligature upon it as to be in danger of bursting. Hence it was judged necessary to perform the operation for the aneurism, which was done, and the vessel secured by ligature, above the upper extremity of its distended coats. Every thing now went on, for some time, exceedingly well, when suddenly the artery again dilated, and was in danger of bursting above the second ligature. These circumstances made it necessary to repeat the operation for the aneurism. From this time, every thing went on successfully, till the stump was on the point of being healed; when, quite unexpectedly, the artery appeared a third time diseased in the same manner as it had been previously, for which reason, a third operation for aneurism was determined on, and performed.

The last operation was near the axilla, and was not followed by any relapse.

Could the several aneurisms of the humeral artery (says Mr. Warner) be attributed to the sudden check alone, which the blood met with from the extremity of the vessel being secured by ligature; or is it not more reasonable to suppose, that the coats of the artery, nearly as high up as the axilla, were originally diseased and weakened? The latter, in the opinion of this judicious writer, seems the most probable way of accounting for the successive returns of the disease of the vessel; since it is found from experience, that such accidents have been very rarely known to occur after amputation, either of the arm or thigh, where nearly the same resistance must be made to the circulation in every subject of an equal age and vigour, who has undergone such operation.

If it should be supposed, that the several dilatations of the coats of the vessel, continues Mr. Warner, arose merely from the check in the circulation, it will not be easy to account for the final success of this operation; and, especially when we reflect, that the force of the blood is increased in proportion to its nearness to the heart. (See *Cases in Surgery, p.* 139, 140, *Edit.* 4.) Ruysch has related an observation somewhat similar. (*Obs. Anat. Chir. T.* 1, *p.* 4.)

Aneurisms sometimes follow the injury, which a large artery suffers in gunshot wounds. The passage of a bullet through the thigh, in one example, gave rise to a femoral aneurism. (See *Parisian Chirurgical Journal, vol.* 2, *p.* 109.) The same cause produced an aneurism high up the thigh of a soldier, who was under the care of my friend Mr. Collier at Brussels, after the battle of Waterloo.

PROGNOSIS.

In cases of aneurism, the prognosis varies according to a variety of important circumstances. The disease may generally be considered as exceedingly dangerous; for, if left to itself, it almost always terminates in rupture, and the patient dies of hemorrhage. There are some examples, however, in which a spontaneous cure took place, and aneurismal swellings have been known to lose their pulsation, become hard, smaller, and gradually reduced to an indolent tubercle, which has entirely disappeared. After death, the artery, in such instances, has been found obliterated, and converted into a ligamentous cord, without any vestige of the aneurism being left. Aneurisms are also sometimes attacked with mortification; the sac and adjacent parts slough away; the artery is closed with coagulum; and thus a cure is effected. Lastly, tumors, having all the character of aneurisms, have been known to disappear under the employment of such pressure as was certainly too feeble to intercept entirely the course of the blood. Such examples of success, however, are not common, and whenever they happen, it is because the entrance of blood into the sac is prevented by the coagulation of that already contained in it, and because the artery above the swelling is filled with coagulum. They must, in fact, have been cured on the very same principle, which renders the surgical operation successful.

Nothing is subject to more variety, than the duration of an aneurism previously to its rupture, the tumor bursting sooner or later, according as the patient happens to lead a life of labour, or ease, of intemperance, or moderation. Even the bursting of an internal aneurism may not immediately kill the patient: a stonecutter died in the hospital Saint Louis with an enormous aneurism, situated on the left side of the lumbar vertebræ. The body was opened by Richerand, who found, that the external tumor consisted of blood, which after making its way through the muscles, had been effused into a cyst, formed in the midst of the cellular substance of the loins. The track, through which it came, led into another aneurismal sac, contained in the abdomen, and situated behind the peritoneum, on the left side of the lumbar vertebræ. In endeavouring to discover, whence the extravasated blood proceeded, Richerand found, that the abdominal aorta was entire, though in contact with the swelling. The original affection consisted of an aneurismal dilatation of the inferior portion of the thoracic aorta, which had burst at the point, where it lies betwixt the crura of the diaphragm. The blood had probably escaped very slowly, and it had accumulated in the cellular substance round the kidney, so that three cysts had burst successively, before the patient died. (*Nosogr. Chir. T.* 4, *p.* 82, *Edit.* 2.)

Every aneurism, so situated that it can neither be compressed, nor tied above the swelling, is for the most part absolutely incurable. But, it should be recollected, that sometimes the size of the swelling appears to leave no room for the application of a ligature above it, while things are in reality otherwise, in consequence of the communication between the sac and the artery, bearing no proportion to the magnitude of the tumor itself. At the present day, also, enlightened by anatomical knowledge, and encouraged by successful experience, surgeons boldly follow the largest arteries, even within the boundaries of the chest and abdomen, as we shall presently relate, and numerous facts have now proved, that few external aneurisms are beyond the reach of modern surgery. It being certain, that aneurisms cannot commonly be cured, except by an obliteration of the affected artery, it follows, that the circulation must be carried on by the superior and inferior collateral branches, or else the limb would mortify. Experience proves, that the impediment to the passage of the blood, through the diseased artery, obliges this fluid to pass through the collateral branches, which gradually acquire an increase of size. It is therefore a common notion, that it must be in favour of the success of the operation, if the disease be of a certain standing; and in direct opposition to the sentiments of Kirkland, Boyer even asserts, that the most successful operations have been those performed on persons, who have had the disease a long while. (*Traité des Maladies Chirurg. T.* 2, *p.* 116.)

There is this objection to delay, however, that the tumor becomes so large, and the effects of its pressure so extensive and injurious, that, after the artery is tied, great inflammation, suppuration, and sloughing, often attack the swelling itself, and the patient falls a victim to what would not have occurred, had the operation been done sooner.

The large size of an aneurism, as Mr. Hodgson has rightly observed, is a circumstance, which materially prevents the establishment of a collateral circulation. When the tumor has acquired an immense bulk, it has probably destroyed the parts, in which some of the principal anastomosing branches are situated; or by its pressure it may prevent their dilatation. (*On the Diseases of Arteries and Veins, p.* 259.) The practice of permitting an aneurism to increase, that the collateral branches may become enlarged, (says this gentleman) is not only unnecessary but injurious, inasmuch as the increase of the tumor must be attended with a destruction of the surrounding parts, which will render the cure of the disease more tedious and uncertain. (*P.* 266.)

The most successful operations, which I have seen, were performed before the aneurismal swellings were very large. However, notwithstanding the great disadvantages of letting the swelling become bulky before the operation, the fact appears scarcely yet to have made due impression, and surgeons are yet blinded with the plausible scheme of giving time for the collateral vessels to enlarge: at least, I infer, that things are so, from having lately seen a patient, who had been advised to let the operation be postponed on such a ground, though the swelling in the ham was already as large as an egg.

The surgeon should not be afraid of operating, although appearances of gangrene may have taken place on the tumor; for, as Mr. Hodgson remarks, should it burst afterwards, it is probable, that both extremities of the artery in the sac will be closed with coagulum. (*Hodgson, p.* 305.) Sir Astley Cooper tied the external iliac artery in two cases of inguinal aneurism, when gangrene existed, and though the tumors burst, no hemorrhage ensued. The coagulum was discharged; the sac granulated; and the sores gradually healed. (*Medico Chir. Trans. Vol.* 4, *p.* 431.)

The effects of the pressure of aneurisms upon the bones, are justly regarded as an unpleasant complication, when they take place in an extensive degree, and, according to writers, they may sometimes induce a necessity for amputation. (*Boyer, Traité des Mal. Chir. t.* 2, *p.* 117.) However, I have never seen a case of this description; and Mr. Hodgson, as we have already explained, informs us, that the affection of the bones is hardly ever attended with exfoliations, or the formation of pus, so that if the aneurism can be cured, the bones will generally recover their healthy state, without undergoing those processes which take place in the cure of caries, or necrosis. (*On Diseases of

Arteries and Veins, p. 80.) At the same time, there can be no doubt, that where the tumor has been allowed to attain a large size, before an attempt is made to cure it, and where, from this cause, both the neighbouring soft parts and the bones have suffered considerably, the completion of a cure, that is to say, the full restoration of the use of the limb, must be far more distant than in other cases, where the cure is attempted in an earlier stage. Here, then, we see another reason against the pernicious doctrine of waiting for the enlargement of the anastomosing vessels, in addition to that which has been urged in the previous column.

The age, constitution, and state of the patient's health, are also to be considered in the prognosis; for they undoubtedly make a great difference in the chance of success after the operation.

The operation, however, should not be rejected on account of the age of the patient, if the circumstances of the case in other respects appear to demand it: for it has often succeeded at very advanced periods of life. "I have seen several aneurisms cured by the modern operation, in patients above sixty years of age." (*Hodgson, p.* 304.) Similar cases have fallen under my own notice. Sir Astley Cooper has operated with success for a popliteal aneurism on one patient aged 85, and on another 69 years old, with the same favourable result. (*Lancet, Vol.* 2, *p.* 426.)

When an aneurism exists in the course of the aorta, the violent action of the heart, excited by an operation in the extremities, may cause it to burst, and prove instantaneously fatal. Two cases occurred a few years ago in this metropolis, in which the patients died from such a cause during operations for popliteal aneurisms. (See *Hodgson on Diseases of Arteries, p.* 306. *London Med. Review, vol.* 2, *p.* 240, *and Burns on Diseases of the Heart, p.* 226.) Were the coexistence of the internal aneurism known, the operation for the other tumor would be improper, and the surgeon should limit the treatment to palliative means.

Experience proves, however, that the circumstance of there being two aneurisms in the limbs should not prevent the operation, which is to be practised at separate periods. Facts in support of this statement are quoted by Mr. Hodgson. (*P.* 310.)

OF THE SPONTANEOUS CURE, AND GENERAL TREATMENT OF ANEURISMS.

The obliteration of the sac, in consequence of a deposition of lamellated coagulum in its cavity, as Mr. Hodgson has well described, is the mode by which the spontaneous cure of aneurism is in most instances effected. The blood soon deposits upon the inner surface of the sac a stratum of coagulum; and successive depositions of the fibrous part of the blood by degrees lessen the cavity of the tumor. At length, the sac becomes entirely filled with this substance, and the deposition of it generally continues in the artery on both sides of the sac as far as the giving off of the next large branches. The circulation through the vessel is thus prevented; the blood is conveyed by collateral channels; and another process is instituted, whereby the bulk of the tumor is removed. (*On the Diseases of Arteries, &c. p.* 114.) Such desirable increase of the coagulated blood in the sac is indicated by the tumor becoming more solid, and its pulsation weak, or ceasing altogether.

Another mode, in which the disease is spontaneously cured, happens as follows: an aneurism is sometimes deeply attacked with inflammation and gangrene; a dense, compact, bloody coagulum is formed within the vessel, shutting up its canal, and completely interrupting the course of the blood into the sac. Hence, the ensuing sphacelation and the bursting of the integuments and aneurismal sac, are never accompanied by a fatal hemorrhage; and the patient is cured of the gangrene and aneurism, if he has strength sufficient to bear the derangement of the health necessarily attendant on so considerable an attack of inflammation and gangrene.

When a patient dies of hemorrhage, after the mortification of an aneurism, it is because only a portion of the integuments and sac has sloughed, without the root of the aneurism, and especially the arterial trunk, being similarly affected. For cases illustrative of this statement, refer to *Hodgson on Diseases of Arteries, p.* 103, *&c.*

A third way, in which an aneurism may be spontaneously cured, is by the tumor compressing the artery above, so as to produce adhesion of its sides, and obliteration of its cavity. This mode of cure must be uncommon: it has been adverted to by Sir E. Home, Scarpa, Dr. John Thomson, and others; but some facts, tending to prove it, have been collected by Mr. Hodgson, and are published in his useful work. (*See p.* 107, *&c.*)

A fourth mode of cure is illustrated in a case, related by Sir Astley Cooper: a man, in Guy's hospital, had an aneurism just below the groin. He was sitting before the fire, when he felt something burst in the upper part of his thigh. On examination, he found no blood had escaped, and, in fact, the aneurism had not yet reached the skin, so as to be adherent to it. His thigh, however, was enormously swelled; he was unable to use his limb, and was put to bed. For three days, afterwards a pulsation was perceptible in the aneurism; but it then ceased, and the size of the limb began to diminish. At the end of four months, the aneurismal swelling had considerably subsided, he could use the limb, and in less than six months, he was discharged from the hospital. He afterwards fell a victim to the rupture of another aneurism in the abdomen. On examination of the body it was found, that the aneurism in the thigh, just below Poupart's ligament, had burst under the fascia lata, and the femoral artery had been obliterated by the pressure of the large quantity of effused blood. (*See Lancet, Vol.* 1, *p.* 430.)

"The surgical treatment of aneurism (says Mr. Hodgson) consists in the obliteration of the cavity of the artery communicating with the sac, so that the ingress of the blood into the latter is either entirely prevented, or the stream which passes through it is supplied only by anastomosing branches, and consequently the force of the circulation is so much diminished, that the increase of the tumor is prevented, and the deposition of coagulum is promoted. By the absorption of its contents, and the gradual contraction of the sac, the cure is ultimately accomplished. The blood is conveyed to the parts, which it is destined to supply, by collateral vessels, some of which being gradually enlarged, constitute permanent channels for the circulation. The obliteration of the artery is effected by the excitement of such a degree of inflammation in its coats, as shall produce adhesion of its side. These objects have been attempted by the compression or the ligature of the artery. The latter method constitutes the operation for aneurism." (*P.* 165.)

According to Scarpa, *a complete cure of an aneurism cannot be effected, in whatever part of the body the tumor is situated, unless the artery, from which the aneurism is derived, be, by nature or art, obliterated and converted into a perfectly solid, ligamentous substance, for a certain extent above and below the place of the ulceration, laceration, or wound.* When aneurisms are cured by compression, the cure is never accomplished, as some have supposed, by the pressure strengthening the dilated proper coats of the artery, and restoring, especially to the muscular coat, the power of propelling the blood along the tube of the artery, as it did previously to its *supposed dilatation.* Petit, and Foubert, thought, that the natural curative process sometimes consisted in a species of clot, which closed the laceration, ulceration, or wound of the artery, and resisted the impulse of the blood, so as still to preserve the continuity of the coats of the artery, and the pervious state of the vessel. Haller imbibed a similar sentiment, from experiments made on frogs.

If the foregoing statement of Scarpa, respecting the obliteration of the tube of the adjacent portion of the artery, when an aneurism is cured, had been delivered merely as what is the most common course of things, it would not have been incorrect; but when he denies the possibility of the calibre of the vessel being ever preserved, whether the disease be cured by art or nature, he is exceeding the bounds of accuracy.

Notwithstanding aneurisms cannot in general be cured, as Scarpa has explained, unless the artery be rendered impervious for some extent above and below the tumor, I believe we must make an exception to this observation with respect to the few aneurisms of the aorta (especially those of its arch), which, according to the records of surgery, have been diminished and cured by Valsalva's treatment. In such examples, we are not to suppose that the aorta becomes obliterated at its very beginning; but that the diminution of the quantity of circulating blood, the reduced impetus of this fluid, the lessened distention of the aneurismal sac, the general weakness induced in the constitution, and the increased activity of the lymphatic system, all necessary effects of Valsalva's method, have combined to bring about a partial subsidence of the tumor.

"It is a common opinion (says Mr. Hodgson), that the radical cure of an aneurism cannot take place, without the obliteration of the artery, from which the disease originates. It is probably owing to this idea, that aneurisms of the aorta have generally been considered as incurable diseases, and consequently that so little attention has been given to their treatment." (*P.* 118.) The facts, however, which this gentleman has related, satisfactorily prove, 1st. That a deposition of coagulum may take place in an aneurismal sac, to such an extent as entirely to block up the communication between its cavity and that of the artery from which it originates. Secondly, that a sac, thus filled with coagulum, cannot prove fatal by rupture; and thirdly, that the gradual absorption of its contents, and the consequent contraction of the sac, may proceed to such an extent as to effect *the cure of the disease, without any obstruction taking place in the calibre of the vessel* from which it originates. See cases 20, 21, 22, &c. (*Hodgson on Diseases of the Arteries, &c. p.* 119, *&c.*) In support of this doctrine, some facts are also cited from Corvisart. (*Essai sur les Maladies du Cœur, p.* 313, *&c.*)

A part of these cases, it is true, are not viewed exactly in this light by Kreysig, who argues (as I think without much probability), that they might have been only adipose swellings connected with, or formed in the parietes of the artery, a disease described by Stenzel. (*German Transl. of Mr. Hodgson's Book, p.* 174.)

That a punctured artery may occasionally be healed in this manner, Scarpa himself proves, by a case which he examined, where an aneurism took place from the wound of a lancet in bleeding. In the article *Hemorrhage*, we shall see, that Jones's experiments show the same thing, and the particular circumstances in which it may happen. But the occurrence is rare, and Scarpa says, that it can hardly be called a *radical* cure, as the cicatrix is always found in a state ready to burst and break, if the arm be, by any accident, violently stretched or struck where the wound was situated.

In the spontaneous cure of aneurisms, arising from arteries of inferior size to that of the aorta, repeated examinations have proved, that the deposition of coagulum does not in general merely fill up the sac, but obliterates the tube of the artery above and below the disease to the next important ramifications. Yet, even here, exceptions probably take place; for Mr. Hodgson has brought forward one instance, in which a small sac, which originated from the anterior artery of the cerebrum, was completely filled with firm coagulum, which did not extend into the cavity of the vessel. (*On Diseases of Arteries, p.* 132.) And he reports the particulars of a *true* femoral aneurism, communicated to him by Sir A. Cooper, in which, after the patient's death, the femoral artery was found dilated into a sac, which was lined on all sides with very firm layers of coagulum, in the centre of which was an irregular canal, through which the circulation was continued. As the inside of this canal presented a membranous appearance, it was inferred that the aneurism had been cured. (*Op. cit. p.* 134.) Here I may be permitted to remark, that if this case be correctly reported, viz. if it were a true aneurism by dilatation of all the arterial coats, and the inside of it was *every where* lined by firm layers of coagulum, it amounts to a proof that such a deposition is not entirely confined to aneurisms by rupture, as Scarpa supposes. And, in addition to this fact, I may mention, as referring to the same question, a case of aneurism from dilatation of the arterial coats, observed by Guattani, where the same process took place. "Arteriæ iliacæ ovalem hanc partem aneurysmaticam polyposa substantia variæ densitatis adeo infarctam esse denotebam, ut tunicarum ejusdem forma penitus destructa in uniformem massam, spongiæ cera imbutæ similem, transformata videretur." (*Hist.* 17. *Collect. Lauth, p.* 158.)

Whenever the ulcerated, lacerated, or wounded artery is accurately compressed against a hard body, like the bones, it ceases to pour blood into the surrounding cellular sheath, because its sides, being kept in firm contact, for a certain extent above and below the breach of continuity, become united by the adhesive inflammation, and converted into a solid, ligamentous cylinder. Molinelli, Guattani, and White, have given examples and plates illustrative of this fact. When aneurisms get well spontaneously, the same fact is observed after death, as Valsalva, Ford, &c. have demonstrated. I have myself seen, in St. Bartholomew's hospital, an instance in which a man had had a spontaneous cure of an aneurism in the left axilla, but afterwards died of hemorrhage from another aneurismal swelling under the right clavicle: the artery on the left side was found completely impervious. My friend, Dr. Albert, had under his care, in the York Hospital, Chelsea, a dragoon, who recovered spontaneously of a very large aneurism of the external iliac artery: the tumor sloughed, discharged about two quarts of coagulated blood, and then granulated and finally healed up. Paoli relates a similar termination of a popliteal aneurism. Moinichen and Guattani relate other examples. Hunter found the femoral artery quite impervious, and obliterated, at the place where a ligature had been applied fifteen months before. Boyer noticed the same fact in a subject eight years after the operation. Petit describes the spontaneous cure of an aneurism at the bifurcation of the right carotid: the subject having afterwards died of apoplexy, the vessel, on dissection, was found closed up and obliterated from the bifurcation, as far as the right subclavian artery. Desault had an opportunity of opening a patient, in whom a spontaneous cure of a popliteal aneurism was just beginning: he found a very hard, bloody thrombus, which extended for three finger-breadths, within the tube of the artery, above the sac, and was so firm, as to resist injection, and make it pass into the collateral branches.

Both the spontaneous and surgical cures of aneurisms have generally two stages: in the first, the entrance of the blood into the aneurismal sac is interrupted; in the second, the parietes of the artery approach each other, and, becoming agglutinated, the vessel is converted into a solid cylinder. This doctrine is corroborated by the tumor first losing its pulsation, and then gradually diminishing and disappearing.

In order that compression may make the opposite sides of an artery unite, and thus produce a radical cure of an aneurism, Scarpa says, the degree of pressure must be such as to place these opposite sides in firm and complete contact, and such as to excite the adhesive inflammation in the coats of the artery. The point of compression must also fall above the laceration or wound of the artery; for when it operates below, it hastens the enlargement of the tumor; and Scarpa adds, that in practice, bandages which are expulsive and compressive are more useful for making pressure than any tourniquets or instruments, many of which are contrived to operate, without retarding the return of blood through the veins.

In order that pressure may succeed, the coats of the vessel, at the place where it is made, must be sufficiently free from disease to be susceptible of the adhesive inflammation. When the arterial coats, round the root of the aneurism, are much diseased, Scarpa considers them as insusceptible of the adhesive inflammation, although compressed together in the most scientific manner, and, even when tied with a ligature, which only acts by making circular pressure on the vessel.

This statement would appear to derive confirmation from the following fact: Mr. Langstaff amputated the thigh of a person seventy-five years of age; but the vessels were so ossified, that they could not be effectually tied, and the patient died within twenty-four hours. It is generally supposed, says Mr. Lawrence, that this condition of the arterial coats is incompatible with their union under the application of the ligature. The opinion should be received, however, with some limitation. In a man fifty-nine years of age, bleeding took place nearly a month after amputation, from the ossified femoral artery, and Mr. Lawrence was therefore obliged to expose and tie that vessel again for the suppression of the hemorrhage, when he found a hard tube, which cracked immediately the ligature was tightened: the bleeding, however, never returned. (See *Med. Chir. Trans. vol.* 6. *p.* 193.) This case is mentioned, however, not with any view of encouraging surgeons to apply ligatures round diseased portions of arteries, a thing which should always be avoided when possible, but to let them be aware, that an ossified artery is sometimes susceptible of being permanently closed, when a ligature is put round it. With respect to Scarpa's idea of making pressure operate so as to place the two opposite parietes of the artery at the mouth of the aneurismal sac, completely in contact, in order that they be united by the adhesive inflammation, and the cavity of the vessel be obliterated, I should think with Mr. Hodgson, that if pressure will succeed only under these circumstances, it will answer very seldom, because, in almost all aneurismal sacs, a sufficient deposition of coagulum will have taken place to prevent the possibility of placing the opposite sides of the artery at the mouth of the aneurism in a state of complete contact. (*On Diseases of Arteries, &c. p.* 172.) Possibly, however, Scarpa's directions refer to a point of the vessel, rather beyond the usual limits of the laminated coagula; and he is particular in recommending the practice only where the aneurism is soft and small.

Some advise trying compression in every case of aneurism, whether small, circumscribed, soft, flexible, indolent, or elevated, diffused, hard, and painful. But, in the latter case, Scarpa represents compression as decidedly hurtful. He says also, that every bandage which compresses the aneurism, and also circularly constricts the affected part, is always injurious. The bandage, likewise, which compresses only the aneurism, and directs the point of pressure below the rupture in the vessel; that which, on account of the great size, exquisite sensibility, depth of the root of the aneurism, and fleshy state of the surrounding parts, cannot effectually compress the artery against the bones, so as to bring the opposite side of the vessel into contact; and, lastly, the compression applied to a spontaneous aneurism, attended with a steatomatous, ulcerated, earthy disease of the arterial coats, ought to be considered as more likely to do harm than benefit. In cases of a completely opposite description, bandages have produced, and may produce, a radical cure, and should not be entirely disused. (*Scarpa on Aneurism, ed. 2. p. 221.*)

Guattani first employed compression systematically for the cure of aneurisms, and out of fourteen cases in which he adopted the plan, four were cured by it. Mr. Freer details other examples; but, in general, pressure has hitherto been applied to the tumor itself, a method less likely to answer, than that of making pressure on a sound part of the artery. Mr. Freer recommends the employment of Sennfio's instrument, or the following method: first place a bandage, moderately tight, from one extremity of the limb to the other; then put a pad upon the artery, a few inches above the tumor; next, surrounding the limb with a tourniquet, let the screw be fixed upon the pad, having previously secured the whole limb from the action of the instrument, by a piece of board wider than the limb itself, by which means the artery only will be compressed, when the screw is tightened. The tourniquet should now be twisted till the pulsation in the tumor ceases. In a few hours the limb will become œdematous and swelled, when the tourniquet may be removed, and the pressure of a pad and roller will afterwards be enough. By experiments which this gentleman made on the radial arteries of horses, these vessels were found to become inflamed, and to be rendered impervious by such a process. (*Freer, p.* 112.) In a modern work, Dubois is stated to have cured an aneurism of the thigh by steady pressure on the vessel for twenty-four hours. (*Med. Chir. Trans. vol.* 4. *p.* 437.)

Sir A. Cooper describes another machine for compressing the femoral artery, in cases of popliteal aneurism: it was used by Sir W. Blizard. "The points of support for this instrument, were the outer part of the knee, and the great trochanter, a piece of steel passing from one to the other; and to the middle of this a semicircular piece of iron was fixed, which projected over the femoral artery, having a pad at its end, moved by a screw, by turning which, the artery was readily compressed, and the pulsation in the aneurism stopped, without any interruption to the circulation in the smaller vessels." But although the patient, on whom it was tried, possessed unusual fortitude, he was incapable of supporting the pressure of the instrument longer than nine hours. (*Med. and Phys. Journal, vol.* 8.) Few patients, indeed, can endure the pressure of such instruments a quarter of this time, when they are put on sufficiently tight to afford any chance of obliterating the artery; and, on account of the suffering which they produce, they are rarely used by modern surgeons.

Whenever the treatment by pressure is attempted, the plan should be assisted with repeated bleedings, spare diet, and perfect quietude in bed. Digitalis has also been sometimes prescribed, with the view of lessening the impetus of the circulation. It is likewise a favourite plan with some practitioners, to apply snow, or powdered ice, to the tumor, as I shall notice in describing Valsalva's treatment of aortic aneurisms. These last applications have been employed for the purpose of promoting the coagulation of the blood within the aneurismal sac, and the consequent obliteration of the cavity of the aneurism and the artery. Various examples, in which it has been thought to have produced a cure, are recorded by Guerin. (*Récueil Périod. de la Soc. de Santé de Paris, No.* 3. *Pelletan, Clinique Chir. and Ribes, Bulletins de la Faculté de Méd. de Paris,* 1817. *No.* 1. *and* 2. *p.* 284.) The employment of ice, however, is not considered proper in every case. Breschet says, that, when the swelling is large, the parts very tense, their texture changed, and the skin thin, the practice is likely to accelerate the formation of a slough; and he confirms a remark made by Mr. Hodgson, that some patients cannot continue this treatment longer than a few minutes, while others find it absolutely insupportable. (*Fr. Transl. of Mr. Hodgson's Work, t.* 1. *p.* 212—229.)

The grand means, most to be depended upon, for curing aneurisms, is tying the artery above the tumor. This more certainly prevents the great ingress of blood into the sac, and what is quite as important, more certainly excites the adhesive inflammation within the tied part of the vessel, and, by holding the opposite sides of it steadily in contact, brings about their union, and an obliteration of the tube of the vessel, with tolerable regularity. The chief current of blood into the sac is thus stopped, the contents of the aneurism are afterwards gradually absorbed, and the tumor dwindles away in proportion. The natural course of the blood being now permanently interrupted in the arterial trunk, it passes more copiously into the collateral branches, and these enlarging and anastomosing with others, which originate from the large arteries beyond the obstruction, the necessary circulation is carried on. (See *Anastomosis* and *Inosculation.*)

The ligature of the superficial femoral artery may be performed with the same confidence of success, as the ligature of the brachial artery, that is, without any fear of destroying the circulation, or depriving the subjacent limb of its vitality. Indeed, the numerous and conspicuous anastomoses, which are met with all round the knee, correspond exactly with those which are observed round the elbow, and at the bend of the arm. This is not a peculiarity of the arteries of the extremities, but it is a general rule which nature has followed in the distribution of all the arteries, that the superior trunks communicate with the inferior, by means of the lateral vessels. After the principal trunk of an artery is tied, its lateral branches not only carry on the circulation in the parts below the ligature, but do so with greater quickness and activity than they did previously, while the course of the blood was unimpeded through the principal trunk. This evidently arises from the increased determination of blood into the lateral vessels, as well as from the enlargement of the diameter of these vessels. After the amputation of the thigh, while the blood flows in a full stream from the superficial femoral artery, very little or no blood is poured out of the lateral vessels; but as soon as that artery is tied, the blood issues with impetuosity from the small arteries, which run along, within the vasti and cruræus muscles; and on these smaller arteries being also tied, the blood immediately oozes out from the minute arterial vessels of the muscles and cellular membrane. When the principal trunk of an artery is tied, its lateral branches gradually acquire a much larger diameter. After amputation of the thigh, on account of a popliteal aneurism, the size and situation of which could not fail materially to impede the course of the blood through the trunk of the femoral artery, it has been often remarked, that, although both the trunk and the greater and smaller branches had been tied with the greatest accuracy, the patients have been in danger of losing their lives, on account of the repeated copious hemorrhages from the innumerable small lateral vessels that had become unusually enlarged. In several cases, during the treatment, and especially after the radical cure, of popliteal aneurism, by tying the superficial femoral artery, in the upper third of the thigh, all the ramifications of the recurrent popliteal arteries have been felt beating strongly round the knee. We have already noticed, that Boyer found, in a man who some years previously had been operated on for a popliteal aneurism, but had afterwards died from a caries of the tibia, that an arterial branch, which runs in the substance of the sciatic nerve, was dilated so much, as to be equal in diameter to the radial artery. White, in dissecting the arm of a lady, who, fifteen years before, had been operated on for an aneurism in the bend of the arm, found the brachial artery obliterated, and converted into a solid cylinder, for three inches below the place of the ligature, and as far as the division into the radial and ulnar arteries; but the recurrent radial and ulnar branches had become so much enlarged, that, taken together, they exceeded the size of the brachial artery, above the situation of the ligature. In the dead body it is found, that an anatomical injection will pass more freely from one extremity to the other of an aneurismatic, than of a sound limb, and this even when no vessels are visibly enlarged. Although it be self-evident, that the circulation through the collateral vessels ought to be much more easy and quick the lower down the ligature is applied to the principal trunk; yet experience shows, that this difference is not to be estimated very high; for in cases of popliteal aneurism, *cæteris paribus*, the success is the same, whether the femoral artery be tied very low down, or very high up in the thigh. (*Scarpa.*)

This facility of the passage of the blood through the lateral vessels, is not the same in subjects of all ages; and, in the same subject, it is not the same in the inferior, as in the superior extremity. An age under forty-five, and the operation being done on the arm, which is nearer the source of the circulation, than the lower extremity, increases the chance of success. However, notwithstanding these are the opinions of Scarpa, and as general ones may not be incorrect, surgeons in England now operate for aneurisms of the lower extremity, and on patients much older than forty-five, with a degree of confidence, which nothing but great success could inspire.

According to Scarpa, the circumstances chiefly preventive of success, especially in the popliteal and femoral aneurisms, are the following: rigidity, atony, or disorganization of the principal anastomoses, between the superior and inferior arteries of the ham and leg; sometimes depending on an advanced age, or on it, *together with the large size of the aneurism, which by long continued pressure, has caused a great change in the neighbouring parts*; or sometimes on steatomatous, ulcerated, earthy, cartilaginous disorganization of the proper coats of the artery, not confined to the seat of the rupture, but extending a great way above and below the aneurism, and also to the principal popliteal recurrent arteries, tibial arteries, and, occasionally, to portions of the whole track of the superficial femoral artery. Sometimes, the pressure of large aneurisms renders the thigh bone carious. In such circumstances, the ligature is apt to fail in closing the trunk of the artery; and, if it should succeed, the state of the anastomosing vessels will not admit of a sufficient quantity of blood being conveyed into the lower part of the limb. Hence, when the patient is much advanced in life, languid, and sickly; when the internal coat of the artery is rigid, and incapable of being united by a ligature; when the aneurism is of long standing, and considerable size, with caries of the os femoris, or tibia; when the leg is weak and cold, much swelled, heavy, and œdematous; Scarpa considers the operation contra-indicated. I must, however, declare in this place, that I have seen very large aneurisms, as well as aneurisms in persons of advanced age, cured by the Hunterian plan, in St. Bartholomew's Hospital; and, with respect to the affection of the bones, though it may be an unfavourable circumstance, its consequences are not so serious as those of ordinary caries, as I have already explained.

It appears, then, that the obliteration of the artery, for a certain extent above and below the place of rupture, forms the primary indication in the radical cure of aneurism, whether compression or the ligature be employed; all other means are only auxiliary. Internal remedies may be useful, inasmuch as they tend to moderate the determination of the blood towards the place, where the artery has been tied or compressed.

In the articles *Hemorrhage*, and *Ligature*, I have related in detail the effects of the ligature upon a tied artery, and particularly the various processes which arise from its application, and terminate in the permanent obliteration of the vessel. In the same places, I have explained what are the best ligatures for use, as well as the safest manner of using them. Confining myself in the sequel of this article, to what expressly relates to aneurism, I shall here merely annex the following general directions, as stated by Mr. Hodgson.

First, The cord should be thin and round, such a ligature being most likely to effect a clean division of the internal and middle coats of the vessel, and not liable to occasion extensive ulceration or sloughing.

Secondly, The ligature should be tight, in order to insure the complete division of the internal and middle coats, and to prevent its detachment, it being almost impossible, even with the thinnest ligature, entirely to cut through a healthy artery.

Thirdly, The vessel should be detached from its connexions only to such an extent as is necessary for the passage of the ligature underneath it.

Fourthly, The immediate adhesion of the wound should be promoted by all such means as are known to promote that process in general. (*On the Diseases of Arteries*, *p.* 225, 226.)

In the course of his experiments upon brutes, to ascertain the operation of the ligature, Dr. Jones arrived at a fact, which offered the probability of leading to an improvement in the operation for aneurism. (*Treatise on Hemorrhage, chap.* 3.) When a small firm ligature is applied to an artery, it causes a division of the internal and middle coats; and if it be afterwards removed, an effusion of lymph takes place between the cut surfaces into the cavity of the vessel. *If several divisions of the internal and middle coats be thus effected in the vicinity of each other*, the effusion of lymph was found by Dr. Jones to be sufficiently extensive to obliterate the cavity of the vessel. In the year 1800, Mr. C. Hutchison tied the brachial arteries of two dogs, and removed the ligatures immediately after their application: in both instances, as he assures us, the complete obliteration of the canal of the artery was the consequence of the operation. (See *Practical Obs. in Surgery, p.* 103.) If immediately after the operation for aneurism, the ligature could be removed, and yet the vessel become obliterated, it would be highly advantageous, as there would then be left in the wound no extraneous substance to prevent its union, or promote secondary hemorrhage by extending the sloughing, or ulcerative process too far. It is to be regretted, that success has not attended the repetition of the experiment by others. Mr. Hodgson tried it, but the artery did not become impervious. (See *Experiments A. & B. p.* 228, 229, of this gentleman's work.) Mr. Dalrymple, of Norwich, made the experiment not less than seven times on horses, and three times on sheep, and failed in every instance to obtain the same result as Dr. Jones. Not only was no coagulum formed, but, even where the animal had been suffered to live until the thirteenth, fifteenth, and eighteenth days after the operation, the canal of the artery was not found obliterated. In each case, indeed, its calibre was contracted; but, it was still capable of transmitting a lessened column of blood. (*Travers, in Med. Chir. Trans. Vol.* 4, *p.* 442.) Thus, it appears, that an effusion of lymph is an invariable consequence of the operation, and, as Mr. Travers has observed, the want of union is therefore owing to the opposite sides of the vessel not being retained in a state of contact, so as to allow of their adhesion. The presence of the ligature, in the common mode of its application, effects this object; and for the success of Dr. Jones's experiment, it appeared only necessary, that the opposite sides of the wounded vessel should be retained in contact, until their adhesion was sufficiently accomplished to resist the passage of the blood through the tube. This object might probably be effected by compression; but, the inconveniences attending such a degree of pressure, as would retain the opposite sides of an artery in contact at the bottom of a recent wound, are too great to permit its employment. It occurred to Mr. Travers, that if a ligature were applied to an artery, and suffered to remain only a few hours, the adhesion of the wounded surfaces would be sufficiently accomplished to insure the obliteration of the canal; and by the removal of the ligature at this period, the inconveniences attending its stay would be obviated. The danger, produced by the residence of a ligature upon an artery, arises from the irritation, which, as a foreign body, it produces in its coats. Ulceration has never been observed to commence in less than twenty-four hours after the application of a ligature; whilst it is an ascertained fact, that lymph is in a favourable state for organization in less than six hours, in a wound the sides of which are preserved in contact. (*Jones, ch.* 4, *exp.* 1.) If it be sufficient, therefore, to ensure their adhesion, that the wounded coats of an artery be kept in contact by a ligature only three or four hours, ulceration and sloughing may in a great degree be obviated by promoting the immediate adhesion of the wound. Justified by this reasoning, Mr. Travers performed several experiments, by which he ascertained, that if a ligature were kept six, two, or even one hour upon the carotid artery of a horse, and then removed, the adhesion was sufficiently advanced to effect the permanent obliteration of the canal. It appeared probable, that the same result would be obtained upon the healthy artery of a human subject. (See *Travers's Obs. in Med. Chir. Trans. Vol.* 4, *and Hodgson on the Diseases of Arteries and Veins, p.* 228, *et seq.*)

Sir A. Cooper performed one operation for a popliteal aneurism, with the view of ascertaining the efficacy of such a method on the human subject. He completely stopped the flow of blood for thirty-two hours, and then removed the ligature; but, the pulsations of the tumor commenced again. He next applied the ligature forty hours longer, at the end of which time, no pulsation recurred on the ligature being taken away. On the twelfth day, however, a considerable bleeding took place, and it was necessary to take up the vessel anew.

Mr. C. Hutchison tried this method, as modified by Mr. Travers, in an operation, which he performed for a popliteal aneurism in a sailor, in Nov. 1813. A double ligature was passed under the femoral artery. The ligatures were tied with loops, or slip knots, about a quarter of an inch of the vessel being left undivided between them. All that now remained of the pulsation in the tumor, was a slight undulatory motion. Nearly six hours having elapsed from the application of the ligatures, the wound was carefully opened, and the ligatures untied and removed, without the slightest disturbance of the vessel. In less than half a minute afterwards, the artery became distended with blood, and the pulsations in the tumor were as strong as they had been before the operation. Mr. Hutchison then applied two fresh ligatures; hemorrhage afterwards came on; amputation was performed, and the patient died. (See *Practical Obs. in Surgery, p.* 102, *&c.*) Now, as Mr. Hutchison chose to apply other ligatures, on finding that the pulsation returned, the above case only proves, that the artery is not obliterated in about six hours, and we are left in the dark respecting the grand question, namely, whether the vessel would have become obliterated by the effusion of coagulating lymph and the adhesive inflammation, notwithstanding the return of circulation through it. As for the hemorrhage which occurred, I think it might have been expected, considering the disturbance and irritation, which the artery must have sustained in the proceedings absolutely necessary for the application of not less than four ligatures, and the removal of two of them. According to my ideas, only one ligature ought to have been used, and none of the artery detached. We also have no description of the sort of ligatures, which were employed; an essential piece of information in forming a judgment of the merits of the preceding method. The application, removal, and reapplication of ligatures are not consistent with the wise principles inculcated by the late Dr. Jones, and have in more instances, than that recorded by Mr. Hutchison, brought on ulceration of the artery and hemorrhage.

The limits of this work prevent me from entering into the particulars of the very interesting experiments, undertaken by Mr. Travers, upon the arteries of animals, for the purpose of ascertaining the earliest period when a ligature might be removed from an artery, without any risk of the vessel not being duly obliterated. A full detail of them may be seen in another work, (See *Med. Chir. Trans. Vol.* 4 *and* 6;) and others, in relation to the same question, may likewise be perused in Scarpa's appendix to his great work on aneurism. (*Memoria sulla Legatura delle principali Arterie degli Arti, &c. Fol. Pavia,* 1817.) The cases, above related, and other considerations, long ago satisfied me, that, flattering as the suggestion of Dr. Jones was, the plan of removing the ligature, previously to its natural separation, would never answer in the operation for the cure of aneurism, unless either an obliteration of the arterial tube would follow with reasonable certainty the taking away of the ligature directly after it had been applied and it had divided the inner coats of the vessel; or, at all events, unless the ligature could be withdrawn at a determinate period, when either the same obliteration would surely ensue, or be already complete; and, all this, with such regularity and infallibility in every case, that the surgeon would have no chance of being called upon to apply another ligature, do a second operation, or disturb the artery in any kind of way whatsoever.

Mr. Travers, in the prosecution of this inquiry, in which he evinced a full determination to be guided by no motive, but the love of truth, at length tried the temporary application of the ligature in a case of brachial aneurism, which he operated upon Feb. 14, 1817. The artery was tied an inch and a half above the bend of the elbow with a noose ligature. The pulsation in the radial artery immediately ceased. On the 16th, at four o'clock in the afternoon, the ligature was removed with little difficulty, after having remained on the artery *fifty hours.* No pulsation ensued in the vessel below the point, where the ligature had been applied, and the case was completely successful.

On the 28th November, 1817, in a case of popliteal aneurism, Mr. Travers tied the femoral artery at one o'clock. On the 29th, at four in the afternoon, the ligature was removed without difficulty, after having been on the vessel *twenty-seven hours.* At this period, no pulsation could be felt in the sac; but, at seven in the evening, a faint pulsation was perceptible. On the 30th, the pulsation, though very distinct, was less strong, than before the operation. On the 2d, 3d, and 6th of December, the pulsation is described as still continuing. On the latter day, pressure was applied by means of a roller from below the knee to the groin, and was continued for a month, during which time the pulsation in the sac evidently became more feeble. On the 10th of January, the tumor became tense, and severely painful, and no pulsation in it could be distinguished. The next day, the swelling was more diffused and less prominent; and on the 12th, as the disease underwent no amendment, Mr. Travers tied the artery again, about two inches above the place, where the former ligature had been applied. The next day, the pain had diminished. The ligature was afterwards allowed to separate of itself; and the case went on favourably to the cure. According to Mr. Travers, the first of these cases tends to prove, that *the continuance of the ligature upon the artery, for a period of fifty hours,* as certainly and completely answers the purpose of its application, as if allowed to remain until thrown off by the natural process.

In the second case, Mr. Travers infers from the suspension of pain, and the diminished strength of the pulsation, for a month after the application of the temporary ligature, that a degree of impediment to the current of blood in the artery had been produced; circumstances, which once led him to entertain hopes, that the cure of the aneurism was gradually accomplishing. At length, however, the increase of the tumor, and the aggravation of pain, and inflammatory symptoms, dispelled such expectation, and it was thought necessary to tie the femoral artery a second time, and adopt the common mode.

There are one or two points, about this case, on which the author does not particularly dwell, though they require consideration, ere one can form a correct judgment of the accuracy of one of his positions, "that non-pulsation of the sac is a sign auspicious, or otherwise, simply as it stands connected with increase or diminution of bulk, and pain." (*Med. Chir. Trans. vol.* 9, *p.* 415.) The first question is, how are we to account for the sudden accession of pain, the absence of pulsation, the increase of the swelling, and the other changes which happened on the 10th of January? Judging from the particulars given, I should say, that at this period, the aneurismal sac gave way, and the disease changed from the circumscribed into the diffused form; an alteration which would account for the pulsation being entirely lost, the increase of pain, and the extension of the swelling, &c. Now, although the circumstance of the sac giving way, or the increase of pain, swelling, &c. on the 10th of January, may be taken as an argument, that the application of the ligature for *twenty-seven hours,* had failed in producing obstruction enough in the vessel to retard the progress of the disease, we ought to remember, that, at the time when these changes happened, a trial of pressure was making, to which one might impute the change of the aneurism from the circumscribed to the diffused form, with quite as much probability, as to the enlargement of the sac by blood sent into it through the imperfectly obliterated artery. However this may be, certain it is, that the second operation was done, when no pulsation existed in the swelling; and, perhaps, therefore, the case would have been doubly interesting, had the artery not been tied a second time, until circumstances had unequivocally proved, that this cessation of pulsation, attended as it was with an inflammatory state of the tumor, would not ultimately have ended in the cure of the disease.

Here, however, I may be speaking rather in the spirit of an experimentor, whose curiosity has not been fully satisfied, than as a surgeon, who should always be governed by the paramount consideration of extricating his patient from danger; and, this will appear the more likely, when I add, that my mind has long been made up about the inexpediency of the temporary ligature, as an innovation in surgery. The last case induced Mr. Travers to relinquish the temporary ligature; and amongst other reflections, which incline him to give up the practice, he candidly states, "that the adhesive union is prevented by the enclosure of a foreign body in the wound, long before suppuration has commenced. Suppuration is as certain to take place, though the ligature be removed after a few hours, as if it were left to be cast off; and the granulating process is more languidly performed, after an interruption in its early stage, for the purpose of removing the obstacle to union, than where no such interruption has been given, and the obstacle has been removed by nature's own means. Hence, it follows, that the theory, which, in removing the ligature within a given time, proposed the double advantage of a quicker, as well as a surer process, fails in both points, when brought to the test of practice upon the human subject." (See *Med. Chir. Trans. p.* 416-17)

We have seen, that, when a temporary ligature, which had been applied to the brachial artery *fifty hours*, was withdrawn by Mr. Travers, pulsation in the aneurismal tumor at the bend of the elbow did not return, and the disease was cured; but, that, in another instance, where the ligature had been allowed to remain on the femoral artery only *twenty-seven hours*, a feeble pulsation was renewed a few hours afterwards in a popliteal aneurism, and as the swelling became painful and more diffused, some weeks after this experiment, though no pulsation could then be perceived, the femoral artery was tied a second time, and the ligature left to separate in the usual manner.

But, from a case more recently published, it would seem, that the employment of a temporary ligature for only *twenty-four hours* on the femoral artery, may obliterate the vessel, and accomplish the cure of a popliteal aneurism. The patient was a sea-faring man, aged 32; and the operator, Mr. Roberts, of Carnarvon; Mr. Evans and Mr. Carrey, other surgeons of that town, being present at the application, and also at the removal of the ligature. No pulsation recurred in the tumor; the edges of the wound were brought together with adhesive plaster; and, in eleven days, the part was quite healed. (*Med. Chir. Trans. vol.* 11, *p.* 100.) This is the strongest case, I believe, which has been adduced in support of the use of the temporary ligature, whether we consider the little time, which it was applied, the permanent cessation of all pulsation, the quickness with which the wound healed, or the complete recovery of the use of the limb; for when the patient was met six months after the operation, "he could go to the mast-head with as great facility as at any period of his life." This fact proves also, that there is a degree of irregularity in the period, when the temporary ligature may be removed, without the pulsation in the tumor below the constricted part ever returning. Whether the variety is to be referred to temperament, the kind of ligature used, its greater tightness in one case, than another, or other circumstances, is not at present determined.

The greatest advocate, which this practice has gained, is Scarpa, whose sentiments however, about the most advantageous form of ligatures, and mode of applying them in cases of aneurism, are very much at variance with what is inculcated by the best and most experienced surgeons in this country. Instead of using a fine ligature, composed of a single piece of thread, twine, or silk, he employs a cord consisting of from four to six threads, according to the size of the artery, which is to be tied; and, instead of aiming expressly at the division of the internal coats of the vessel with his ligature, as the generality of English surgeons do, for reasons explained in another part of this work, (See *Hemorrhage*,) he prefers a largish ligature, and interposes between the artery and the knot a small cylinder of linen spread with ointment, with the view of preventing the inner coats of the vessel from being divided. His reasons for this practice may be explained in a few words: he admits, that whenever there is a concurrence of all the circumstances, capable of inducing in the tied artery, the proper degree of adhesive inflammation, above and below the place where a single circular ligature has been applied, this method is adequate to produce a speedy and steady closure of the arterial tube. But, says he, it sometimes happens, at least in man, that the pressure made by the circular ligature produces the ulcerative process more quickly in the artery, than the adhesive inflammation. In fact, the circular ligature ulcerates the artery in general about the third day after the operation; and the adhesive inflammation does not always complete its course in this period of time. During this delay of the adhesive inflammation, the ulcerative process, occasioned by the pressure of the ligature, attacks more quickly even than surgeons generally suppose, the external cellular sheath of the artery, and penetrates into the cavity of the yet pervious vessel—and this of course with increased quickness, when the inner coats of the artery are already divided by the ligature. The dangers of non-adhesion and too rapid ulceration of the artery, Scarpa thinks, are placed at the greatest distance by preserving undivided all the three coats of the vessel under the pressure of the ligature; and hence, his partiality to larger ligatures, than are now used by the best surgeons in England, and to the interposition of a cylinder of linen between the knot and the vessel, as recommended by Paré, Heister, and Platner. If, however, he has had reason to suspect, that a simple circular ligature has frequently failed in England, because other innovations have been occasionally substituted for it, and because *we should not have sought for a better, if we had already had the best,* how much more vulnerable is his own practice on a similar principle; since, generally speaking, it has not retained half so many approvers as they who still express their preference to other methods, and more especially to the use of a single ligature, uncomplicated with other extraneous substances. Is it probable, he asks, that the single circular ligature, which was formerly used with doubtful success by the greatest surgeons, should now have become, as is pretended, the most certain means of preventing secondary hemorrhage? "It is now wished (says he) to ascribe the failures of Mr. Hunter, and of many other operators, not to the circular ligature, but to the improper treatment of the wound in general, and in particular to the introduction into it of lint, and, more especially, to the irritation occasioned by the ligature of reserve." On the contrary, it is argued by Scarpa, that, though Mr. Hunter, after his first trials, simplified the local treatment, though all skilful surgeons merely covered the wound with a pledget of soft ointment, and most of them omitted the reserve-ligature, yet, notwithstanding these reforms, secondary hemorrhage after the use of a simple circular ligature was not rendered less frequent. (*On Aneurism*, *p*. 23, *Ed*. 2.) With respect to the latter general assertion, its incorrectness may be learned by reference to the details of Mr. Hunter's own operations, and by going into the principal hospitals of this metropolis, where the use of a simple circular ligature for the cure of aneurisms very rarely fails, as far as secondary hemorrhage is concerned. Why then did the operation more frequently fail here in former times? The answer is plain: the kind of ligature now employed in England, cannot be compared to what was used in Mr. Hunter's time, or even to what was here in fashion five and twenty years ago. And, besides the universal rejection of ligatures of reserve, practitioners now have a more thorough comprehension of what ought to be avoided in the operation, have a just fear of separating and disturbing the artery too much, know how to appreciate the advantage of closing the wound, and attach due importance to the choice of smaller or more eligible ligatures. (See *Hemorrhage* and *Ligature*.) When, therefore, Scarpa supposes, that in England the practice with the circular ligature in the treatment of aneurism, is materially the same now, as heretofore, and that secondary hemorrhage is as frequent, he has not availed himself of all the information on this subject, which he might have acquired from Mr. Wishart, the able translator of his writings on aneurism, or from an attentive perusal of Mr. Hodgson's valuable treatise.

In an equality of circumstances, conducive to the success of the Hunterian operation, Scarpa thinks, that the fact is not proved, as it is presumed to be, that the rupture of the internal and middle coats of the artery does excite the adhesive inflammation and union of the artery more effectually, than is done by the simple compression and close contact of its two opposite internal parietes in a sound and uninjured state. This remark is partly true, and partly incorrect, at the same time that it involves a question, which must be deferred till we come to the article *Hemorrhage*. The truth in the observation is, that an artery may generally be rendered impervious with tolerable certainty, by compressing its opposite parietes steadily and firmly together for a certain time, without dividing its inner coats: the inaccuracy of it depends upon the fact, that, surgeons have no instrument, nor contrivance (not excepting even the ligature of four or six threads, with the interposition of the cylinder of linen spread with ointment), which can retain the opposed undivided surfaces of the inner coats of the vessel closely together in the manner commended by Scarpa and for the due time, without the objection of denuding more of the artery, than need be done in the application of a small ligature; or without the serious inconvenience, and risk, necessarily attending the introduction of a larger quantity of extraneous matter into the wound, than is desirable, with the view of averting all chance of the ulceration of the artery reaching beyond prudent limits. And, when metallic instruments are used for the same purpose, objections not less real are incurred, as will be hereafter more particularly explained.

Scarpa considers, that his mode of ligature ought to be preferred, as combining the triple advantage of preserving entire all the three coats of the artery; of exciting quickly, and in a proper degree, the adhesive inflammation in them; and of retarding, as much as possible, the ulcerative process of the arterial tube.

Partly impressed, however, with the truth of the tenets laid down by Dr. Jones (See *Hemorrhage*), Scarpa enjoins attention to the following rules. 1. *Not to insulate and detach the artery any further, than is necessary for allowing a ligature to be passed around it.* 2. Not to let the cylinder of linen exceed a line in length, or a little more above and below the breadth of the tape, which is about a line for the large arteries of the extremities. 3. That the ligature be not too tight. 4. And *that it be never applied immediately below the origin of a large lateral branch.* (See *Scarpa on Aneurism*, *p*. 44, *Ed*. 2.)

Some further consideration of Scarpa's mode of applying the ligature will be introduced in the article *Hemorrhage*; and I now proceed to notice his sentiments concerning the advantage, which may be derived from removing the ligature in cases of aneurism, as soon as the tube of the vessel has been obliterated by the adhesive inflammation. From the facts recorded by Scarpa, it is inferred, that, with the kind of ligature and the cylinder of linen used in his practice, the closure of the artery by the adhesive inflammation and the two internal coagula is sufficiently far advanced *on the third, or fourth day after the operation*, to resist the impulse of the blood; and hence (says he) there is no rational motive for waiting beyond this time for the spontaneous separation of the ligature, or for allowing it, by its further presence, to ulcerate, and even open the artery at the principal point of adhesion. He then comments on the advantages to the wound, derived from the removal of all extraneous matter from it on the third or fourth day. With respect to the general period of such removal, however, he makes one exception, viz. the case of great and evident debility from sickly constitution, or very advanced age, as it is observed, that, in such patients, the reunion of a simple wound is frequently protracted to the sixth day. *In cases of this description, Scarpa recommends, delaying the removal of the ligature to the completion of the fifth*, or *sixth day*, but under the express condition, that the ligature has been applied with the interposition of a cylinder of linen; as it is proved, that a common circular ligature causes ulceration of the artery before the third day, and it is not till the sixth day, that the external coat of the vessel begins to ulcerate, when the other modification of the ligature is adopted. (*p.* 50.)

Scarpa supports the preceding advice by four cases, in which his kind of ligature was applied, and withdrawn at the end of the third, or fourth day, and the arterial tube obliterated. However, I do not think, that, in England, these cases, when minutely and attentively considered, will be regarded as inducements to persevere in the use of temporary ligatures. In every instance, the wound is described as suppurating, and sometimes *plentifully*. In one, the foot mortified, and amputation became necessary. In another, the very day after the disturbance of removing the ligature, the thigh was attacked with erysipelas, and, on the eighth day, the wound is represented as being *foul*, and the erysipelas not yet cured.

Independently of the uncertainty of the period, when the arterial tube is closed by the adhesive inflammation in various patients, it appears to me, that the disturbance of the vessel and wound, by the steps necessary for the loosening and removal of the ligature, will ever form an insuperable objection to the practice. Scarpa appears to have some apprehension of this kind himself; for he remarks, "In the act of removing the ligature, there can be no doubt it is of great consequence, that the artery be not rudely handled, or stretched. And, indeed, if, on untying the running knot, the subjacent knot could be with the same facility untied, we could not wish for a better mode of performing this part of the operation. But, the knot, although a simple one, is not so readily untied, as the running knot, on account of the moisture, with which the threads forming the ligature are soaked, or because the ligature has been previously waxed." (*p.* 64, *Ed.* 2.) In fact, his apprehensions then lead him to suggest the scheme of placing, previously to making the knot, a thread longitudinally, on each side of the cylinder, and at the time of removing the ligature, the threads are to be drawn in opposite directions, in order to undo the knot, without displacing, or stretching the artery. Thus, instead of one small ligature, which is all that an English surgeon leaves in the wound, Scarpa recommends his ligature of four, or six threads, a roll of linen, and two other threads; a quantity of extraneous substances, which cannot fail to be a source of serious irritation and mischief. I shall therefore take leave of the proposal of removing the ligature on the third, or fourth day, or any other particular day, with expressing my belief, that, if there were only the following objection to the plan, it would never be adopted in this country; namely, the advocates for this practice are necessarily obliged to renounce the infinite advantage of bringing the edges of the wound together directly after the operation. Had the suggestion of Dr. Jones proved invariably correct, and the ligature admitted of being withdrawn immediately after the inner coats of the vessel had been divided by it, the case would have been very different, as there would then have been no foreign body at all left in the wound; the parts might have been immediately brought together with the greatest chance of union by the first intention, and no subsequent disturbance either of the artery, or of the wound, would have been incurred.

The next practice, which I shall notice, is that of applying two ligatures to the artery, and cutting it through in the interspace. This suggestion may be said to be as ancient as the time of Celsus, who has advised the method to be followed in the treatment of a wounded artery: "*Quæ* (*arteriæ*) *sanguinem fundunt apprehendendæ, circaque id quod ictum est duobus locis deligandæ intercidendæque sunt, ut in se ipsæ coeant, et nihilominus ora reclusa habeant.*" (*De Medicina, Lib.* 5, *c.* 26, § 21.) The fact is curious, though I mention it without the least intention of detracting from the great merits of several modern surgeons, that the Greeks were acquainted with the practice, lately recommended, of tying and dividing the trunk of the artery high above the tumor, as will appear from the following extract: (*Ætii.* 4. *Serm. Tetr.* 4. *cap.* 10.) *At vero quod in cubiti cavitate fit aneurisma, hoc modo per chirurgiam aggredimur: primum arteria supernè ab ala ad cubitum per internam brachii parte simplicem sectionem, tribus, aut quatuor digitis infra alam, per longitudinem facimus, ubi maxime ad tactum arteria occurrit: atque ea paulatim denudata, deinceps incumbentia corpuscula sensim excoriamus ac separamus, et ipsam arteriam cæco uncino attractum duobus fili vinculis probe adstringimus, mediamque inter duo vincula dissecamus; et sectionem polline thuris explemus, ac linamentis inditis congruas deligationes adhibemus.* Afterwards we are directed to open the aneurismal tumor at the bend of the elbow, and when the blood has been evacuated, to tie the artery twice and divide it again. If the ancients had only omitted the latter part of their operation, they would absolutely have left nothing to be discovered by the moderns.

This method of applying two ligatures to the artery, and dividing the vessel between them, was revived in France about half a century ago by Tenon, who, as well as some later surgeons, was totally unacquainted with its antiquity. (See *Pelletan, Clinique Chir. T.* 1, *p.* 192.) At one time, it had also modern advocates in Mr. Abernethy and Professor Maunoir, of Geneva, each of whom supposed the plan an invention of his own. (See *Surgical and Physiol. Essays, Part* 3, 8*vo. Lond.* 1797, *and Mémoires Physiologiques et Pratiques sur l'Aneurisme, &c.* 8*vo. Geneve,* 1802.)

When an artery is laid bare, and detached from its natural connexions, and the middle of such detached portion tied with a single ligature, as was Mr. Hunter's practice, Mr. Abernethy conceived, that the vessel, so circumstanced, would necessarily inflame, and be very likely to ulcerate. The occurrence of bleeding from this cause at first led to a practice, which this gentleman justly censures, viz. applying a second ligature above the first, and leaving it loose, but ready to be tightened, in case of hemorrhage. As the second ligature, however, must keep a certain portion of the artery separated from the surrounding parts, and must, as an extraneous substance, irritate the inflamed vessel, it must make its ulceration still more apt to follow. The great object, therefore, which Mr. Abernethy insisted upon, was that of applying the ligature close to that part of the artery, which lies amongst its natural connexions; a just principle, the truth and utility of which still remain incontrovertible, though there may be a better way of accomplishing what Mr. Abernethy intended, than the measures, which this gentleman was led to recommend.

The peculiarity in Mr. Abernethy's first operation consisted in applying two ligatures round the artery, close to where it was surrounded with its natural connexions. For this purpose, he passed two common sized ligatures beneath the femoral artery, and having shifted one upwards, the other downwards, as far as the vessel was detached, he tied both the ligatures firmly.

The event of this case was successful. An uneasy sensation of tightness, however, extending from the wound down to the knee, and continuing for many days after the operation, made Mr. Abernethy determine in any future case, to divide the artery between the two ligatures, so as to leave it quite lax.

Mr. Abernethy next relates a case of popliteal aneurism, for which Sir Charles Blicke operated, and divided the artery between the ligatures. The man did not experience the above kind of uneasiness; and no hemorrhage ensued when the ligatures came away, although there was reason to think, that the whole arterial system had a tendency to aneurism, as there was also another tumor of this kind in the opposite thigh.

The reasoning, which induced this gentleman to revive this ancient practice, was ingenious; for, when the artery was tied with two ligatures, and divided, in the foregoing manner, it was argued, that it would be quite lax, possess its natural attachments, and be as nearly as possible in the same circumstances as a tied artery upon the face of a stump. Strictly speaking, however, as Mr. Hodgson first pointed out, an artery tied in two places, and divided in the interspace, cannot be regarded as placed exactly in the same condition, as an artery tied in amputation. In the latter case, the retraction of the vessel corresponds with that of the surrounding parts, which are divided at the same instant, and therefore its relative connexions stand as before the operation. But, in the operation for aneurism, the retraction of the artery takes place, without being attended with a corresponding retraction of its connexions. How far the retraction of the artery is beneficial, or injurious, is by no means evident; and the advantages arising from it may in most situations be obtained, without dividing the vessel, by placing the limb in a bent position. One important object, however, is gained by the division of the artery; namely, that it is generally in that case tied close to its connexions, and it is very evident how liable the application of the ligature in the middle of a denuded extent of the vessel must be to produce ulceration or sloughing of its coats. The same object, however, will be gained by tying the undivided artery close to its connexions at the end nearest to the heart; and the existence of a single ligature at the bottom of the wound will be less liable to give rise to suppuration and the formation of sinuses, than the employment of two. When an artery is divided, the portions situated beyond the ligatures, must slough, and prove an additional cause of suppuration in the wound. Experience has amply proved the safety of employing a single ligature, and it is at present used by many of the most experienced operators in this country. (See *Hodgson on the Diseases of Arteries, &c. p.* 221, *&c.*)

According to Scarpa, numerous examples of the failure of the plan of applying two ligatures, and cutting through the artery in the interspace, are already generally known to the profession, and there are many expert and ingenious surgeons, who do not dissemble the disadvantage and uncertainty of this practice. He speaks of one failure, which occurred to Mr. Abernethy himself. But, I entertain doubts how far any inference against the method can be drawn from Monteggia's instance, in which a ligature of reserve had been used. Nor can I understand, how a circumstance, which Scarpa strongly insists upon, can be well founded, I mean, the danger of the ligature being forced off the mouth of the artery by the impulse of the blood. Any risk of this kind cannot exist if the ligature be duly applied, as Dr. Jones has particularly explained; and, at all events, how can it be greater here, than after amputation, where it is not usually made a subject of complaint? Indeed, the several examples of secondary hemorrhage, after this method, quoted by Scarpa from the practice of Monteggia, Morigi, and Assalini, may be more rationally imputed either to reserve ligatures having been also used, or the common fear in Italy of applying the ligatures tightly; in which event, one can readily suppose, that the ligature might really slip, or by remaining a long time on the vessel might give rise to dangerous ulceration. Thus, Morigi speaks of one case, in which the bleeding occurred on the *nineteenth day.* (*Scarpa on Aneurism, p.* 14, *Ed* 2.) On the whole, I am disposed to believe, that when this method has been executed precisely according to Mr. Abernethy's directions, it has not often failed; and I am acquainted with only one case in London, in which it was followed by secondary hemorrhage. However, in the year 1807, Mr. Norman, of Bath, tied the femoral artery with two ligatures and divided the vessel between them; the upper ligature came away on the sixteenth day after the operation; the lower one on the fifteenth; and the following day a profuse hemorrhage came on, the patient losing a pound of blood. Pressure with a compress and wet bandage was continued for some time, and the wound healed. (*See Med. Chir. Trans. vol.* 10, *p.* 123.) This is the only case of secondary hemorrhage, which he has met with after operating for aneurisms.

Scarpa very properly urges, that the application of two ligatures, and dividing the artery in the interspace, can never be an eligible mode, where the smallness of the space, the depth of the artery, and the importance of the surrounding parts, do not permit the vessel to be separated and insulated to such an extent, as is required for dividing it, with a probability of the division of it being sufficiently distant from the two ligatures. Such for example, are the cases of ligature of the carotid in the vicinity of the sternum; of the iliac above Poupart's ligament; of the internal iliac, a little below its origin from the common iliac; of the axillary artery between the point of the coracoid process and the acromial portion of the clavicle; or of the subclavian in its passage between the scaleni muscles. Scarpa then comments on the difficulty and even impossibility of taking up the end of the truncated artery again in many situations, were hemorrhage to ensue; and he joins Mr. Hodgson in thinking the advantages of the method, even where it is practicable, by no means demonstrated. Nay, he goes further; for he agrees with Heister, Callisen, and Richter in setting it down as worse than useless, on account of the portion of the artery between the ligatures being converted into a dead and putrid substance, which rests upon the bottom of the wound, from which it cannot be removed, until the two ligatures are separated. Here, deeply impressed with the truth of principles, which perhaps he has rather lost sight of in speaking of his own particular method, he comments on the little probability of the wound uniting, under the disadvantage of two ligatures hanging out of it, and of sloughs at its bottom. He argues correctly, that the laying bare, and insulating a large portion of artery, would often be objectionable on the ground, that it could not be done, without the surgeon being obliged to apply the principal ligature too near the origin of a large lateral branch; as for example would happen in a case of inguinal aneurism, situated *an inch and a quarter* below the origin of the profunda. Thus, a coagulum could not be formed, and the artery would be in danger of not being closed. On the contrary, by employing only a single ligature at *an inch and a quarter* below the origin of the profunda, the operation would be equally simple and successful. *(Scarpa on Aneurism, p. 19–21, Ed. 2.)*

The above considerations would certainly lead me to avoid the practice of detaching an artery from its surrounding connexions any more than is absolutely necessary for the conveyance of a single ligature under; but I fully concur with Sir Astley Cooper, in the prudence of using two ligatures, and applying them in the way recommended by Mr. Abernethy, whenever the artery has been extensively separated from its sheath in the operation. (*See Lancet, vol. I. p.* 433.)

The frequent occurrence of accidents after the introduction of Mr. Hunter's operation might have been ascribed to more probable causes, than the condition of an undivided artery, upon which the ligature was applied. The employment of numerous ligatures gradually tightened, or the introduction of extraneous bodies into the wound, were alone sufficient to produce ulceration of the artery: and such practices were adopted in most of the cases, in which secondary hemorrhage took place.

After the reasons, which have been urged against the plan of tying the artery with two ligatures, and dividing it in the interspace, it may appear superfluous to notice a modification of this practice, intended as a security against the slipping of the ligature. But, as the proposal has had the approbation of some men of eminence, and I heard of an instance, in which it was practised not long ago, the subject may still be worthy of notice.

Sir Astley Cooper has published a case of popliteal aneurism, in which the femoral artery had been tied with two ligatures, as firmly as could be done without risk of cutting it through. "But (says he) as I was proceeding to dress the wound, I saw a stream of blood issuing from the artery, and when the blood was sponged away, one of the ligatures was found detached from the vessel. Soon after the other was also forced off, and thus the divided femoral artery was left without a ligature, and unless immediate assistance had been afforded him, the patient must have perished from hemorrhage." The same kind of accident has occurred in Mr. Cline's practice. For the prevention of it, Sir Astley at first tried the method of conveying the ligatures, by means of two blunt needles, under the artery, an inch asunder, and close to the coats of the vessel, excluding the vein and nerve, but passing the threads through the cellular membrane surrounding the artery. When these were tied, and the artery had been divided between them, the ligatures were prevented from slipping by the cellular membrane through which they passed.

Afterwards, however, he preferred a different mode of securing the ligature, suggested to him by Mr. H. Cline, and it was put to the test of experiment in operating for a popliteal aneurism on Henry Figg, aged 29. "An incision being made on the middle of the inner part of the thigh, and the femoral artery exposed, the artery was separated from the vein and nerve, and all the surrounding parts, to the extent of an inch; an eye-probe, armed with a double ligature, having a curved needle at each end, was conveyed under the artery, and the probe cut away. The ligature nearest the groin was first tied; the other was separated an inch from the first and also tied. Then the needles were passed through the coats of the artery, close to the ligatures between them, and the ends of each thread were again tied over the knots, made in fastening the first circular application of the ligatures. Thus, a barrier was formed, beyond which the ligature could not pass." The event of this operation was successful. *(Med. and Phys. Journ. Vol. 8.)*

A similar proposal appears to have been mentioned by Dionis, and to have been noticed by some subsequent writers. In the 13th chapter, in Richter's *Anfangsgründe der Wundarzneykunst*, we read the following passage:

"The artery, when drawn out, is to be twice surrounded with the common ligature. This is to be tied in a knot, and when the artery is large, one end of the ligature is to be passed, by means of a needle, through the vessel before the knot, then both ends are to be tied together, and left hanging out of the wound, as in the ordinary way." Ed. 3. 1799.

What power can possibly force the ligature, when tied with due tightness, off the extremity of the vessel? No action of the heart, or artery itself, no turgid state of this vessel, could do so. If a piece of string were tied round any tube for the purpose of preventing a fluid from escaping from its mouth, provided the string were applied with due tightness, and the knot in such a manner as not to yield, no fluid could possibly escape, however great the propelling power might be, as long as the string and structure of the tube did not break. And, if a ligature were applied so slackly as to slip, who can doubt, that hemorrhage would still follow, even though the ligature were carried through the end of the vessel, and tied in the foregoing way?

Where ligatures have slipped off, very soon after being applied, I conclude, that the arteries either could not have been tied with sufficient tightness, perhaps through an unfounded fear of the ligature cutting its way completely through all the coats of an artery, or else that the knot, or noose, became slack, from causes, which will be understood by considering what is said on this matter in the article *Hemorrhage*. The inner coats of the artery, we know from the experiments of Dr. Jones, ought to be cut through when the artery is properly tied, because the circumstance is always useful in promoting the effusion of lymph, within the vessel, and the process of obliteration by the adhesive inflammation.

The preceding method is so contrary to the grand principle of always avoiding the detachment of the artery from its surrounding connexions, and is so inconsistent with the wise maxim of doing the operation with as little disturbance of the vessel as possible, that it is not surprising that it should have met with only a small number of followers. In fact, it is not only liable to every objection which can be urged against the double ligature and division of the artery, as formerly proposed by Celsus, and a few of the moderns, but, on account of its greater tediousness, more extensive separation and destruction of the vessel, and other reasons, is still less worthy of imitation.

With respect to ligatures of reserve, the interposition of agaric, cork, and other hard substances between the knot and the artery, these contrivances are now so fully rejected by all good surgeons, for reasons which will be quite intelligible, after the perusal of another part of this work, (See *Hemorrhage*) that I shall not at present detain the reader with animadversions on their danger. As for several kinds of metallic compressors intended to be applied to the exposed artery, for the purpose of rendering it impervious, they are inventions which have been made and extolled by some surgeons of high repute, whose names would give importance even to a less meritorious proposition.

Dubois conceived, that hemorrhage might sometimes proceed from the circumstance of a ligature making its way too fast through the artery. He thought, also, that the sudden stoppage of the current of blood by a tight ligature might bring on gangrene of the limb, particularly, when the aneurism was not of long standing, so that the collateral branches had not had time to enlarge. Dubois, therefore, proposed a method of *gradually* stopping the flow of blood through the artery; and, by this ingenious imitation of the process of nature, to promote the gradual dilatation of the collateral arteries, and obviate all risk of gangrene in the lower part of the limb. This gentleman put his plan in execution, and two instances of success are recorded. The cases were popliteal aneurisms. A ligature was passed under the artery in the manner of Hunter; its two ends were then put through an instrument called a serre-nœud, with which the compression was gradually increased. It is stated, that, in one of these cases, the plan made the artery inflame and become impervious, in the course of the first night, so that on the following day the throbbing of the tumor had ceased. (*Richerand, Nosogr. Chir. T. 4, p.* 109, *Edit.* 4.) Here, however, it is to be suspected, that the pressure of the apparatus was greater than was calculated; and that the stoppage of the pulsation was more owing either to this cause, or to the coagulation of the blood, in the sac, and adjoining portion of the artery, than to the process of obliteration, which could hardly have been so rapidly accomplished.

Assalini's compressor is an instrument, calculated, as its inventor states, to produce an obliteration of the trunks of arteries, without dividing, or injuring their coats. It is nothing more, than a small pair of silver forceps, the blades of which are broad and flat at their extremities, between which the artery is compressed. A spring, composed of a piece of elastic steel, is attached to the inside of one of the handles, and by pressing against the opposite handle, retains the flat ends of the blades in contact. This spring is intended to be very weak in its operation; but, by means of a screw, which passes through the handles, the pressure admits of being regulated and increased at the option of the surgeon.

A representation of Assalini's compressor may be seen in his *Manuale di Chirurgia, parte prima, p.* 113. In the same book, or, in my friend Mr. Hodgson's valuable *Treatise on the Diseases of Arteries and Veins,* which every practical surgeon ought to possess, a case may be perused, in which this instrument was successfully employed by Professor Monteggia, and withdrawn entirely, as early as sixty hours after its application. This last distinguished surgeon also used the compressor in an example, in which the femoral artery was wounded, and bled in an alarming degree. After forty hours, the pressure was lessened, and, in four hours more, as not a drop of blood issued from the vessel, and there seemed to be no good in leaving an extraneous body in the wound any longer, the instrument was taken out altogether. (See *Assalini's Manuale di Chirurgia, p.* 110.)

When Assalini was in England, he acquainted Mr. Hodgson, that, in two cases of popliteal aneurism, in which he had himself employed this means of obliterating the femoral artery, the instrument was removed at the expiration of twenty-four hours; no pulsation returned in the tumors; and the patients were speedily cured.

With respect to the particular merit of this invention, it certainly possesses the recommendation of ingenuity; but, it operates much in the same manner, as several other mechanical contrivances, the *serre-nœud* of Desault, the *presse-artère* of Deschamps, that of Mr. Crampton, (See *Med. Chir. Trans. vol.* 7) the pincers of Baron Percy, &c. If there be a real advantage in the division of the internal coats of an artery by the ligature, as the experiments of Jones seem to prove, and as many of the best surgeons in this country inculcate (See *Hemorrhage* and *Ligature)*, then the compressor cannot be an eligible means of obliterating an artery. It may be said, however, that experience has proved its efficacy; but, let it be recollected, that almost every method of operating for aneurisms has sometimes answered. Further experience is requisite to determine, whether Assalini's compressor would succeed as often as, or more frequently, than, the scientific application of the right kind of ligatures (See *Ligature*) which may perhaps seem slower in their effect, only because they are not in general removed as early as Assalini's instrument. In fact, the experiments of Mr. Travers have now proved, that the ligature is the quickest in its operation. (See *Med. Chir. Transl. vol.* 6, *p.* 643, *&c.)*

In 1816, some ingenious observations were published by Mr. Crampton, on the effects of the ligature and of compression in obliterating arteries. The purport of his remarks is to prove, like the later observations of Scarpa: 1st, That the obliteration of an artery can *very certainly* be effected, independently of the rupture, or division of any of its coats; 2dly, That this operation of the ligature, so far from being essential to the process, not unfrequently defeats it. (See *Med. Chir. Transl. vol.* 7. *p.* 344, 345.)

With respect to the first of these assertions, I presume that all practical surgeons have known and admitted it, especially, if the words *very certainly* be left out. Every system of surgery, for half a century past, has recorded the occasional cure of aneurism by different modes of compression, by which the adhesive inflammation is excited in the artery, or the coagulation of the blood in the aneurismal sac brought about. As, however, the most experienced surgeons have found the method less certain, than the use of the ligature, it is not represented by any modern writers, as deserving equal confidence; though there are circumstances, in which simple pressure may be sometimes tried, with the hope of doing away all occasion for an operation. The cases, however, in which compression is applied directly to the artery itself by means of ligatures, with the intervention of other substances as advised by Scarpa, &c. or by various contrivances, like those of the serre-nœud, the presse-artère, and Assalini's forceps, all require the exposure of the artery; and if commendable, therefore, cannot be so on the principle of saving the patient the pain of an operation, but because they are more effectual, than the employment of the ligature. This last point remains to be proved. From the comparatively small number of instances, in which the preceding modes of compression have been practised, several examples of failure might be quoted.

With regard to Mr. Crampton's second assertion, that the division of the inner coats of the vessel, so far from being essential to the process of obliteration, not unfrequently defeats it, I think the last part of the observation is altogether unproved. We must admit, that the division of the inner coats is not essential, because arteries sometimes become obliterated under a variety of circumstances, in which such division is not made; but still, the great question remains, whether it renders the process more certain. Mr. Crampton founds his conclusion, that it not unfrequently prevents the obliteration, and gives rise to secondary hemorrhage, upon a few very uncommon cases, in which aneurismal swellings have taken place above the ligature. (See *Warner's Case, p.* 123 *of this Dictionary.)* Here Mr. Crampton presumes, without proof, that the occurrence happened from the division of the inner coats of the artery, though Mr. Warner himself suspected, with more probability, that it proceeded from a diseased state of the vessel. Besides, this event, be it produced in whatever manner it may, is so rare, that I only know of three examples of it on record, and have never known it occur during the last 27 years, that I have been in the constant habit of seeing numerous operations performed. In Mr. Warner's time, such large ligatures were also in use, that it appears to me, they were more likely merely to press the sides of the artery together, like Mr. Crampton's *presse-artère*, than effect a complete division of the inner coats of the vessel, as is accomplished by the small ligatures in modern use.

Those metallic instruments, intended to be applied directly to an exposed artery, for the purpose of obliterating it by compression, are liable, as Scarpa remarks, to all the inconveniences, which are inseparable from the presence of hard bodies, introduced, and kept for several days in the bottom of a wound; especially when this is recent, in which case, they cannot be retained in a proper direction without difficulty, or exactly at such a depth, as will not be attended with hurtful pressure upon the wound itself, and important parts in its vicinity. And, with regard to the forceps of Assalini, Morteggia has observed, "*if the obliteration of the artery is retarded, the forceps equally divides the artery by causing the death of the included portion. I also saw, in one case the extremity of the instrument resting at the bottom of the wound on the subjacent femoral vein, rupture its anterior half also, although we were sure it had not been included by it.*" *(Instituz. di Chir. Ed.* 2, *T.* 2.) And although Cumano, in a case of popliteal aneurism, obtained on the fourth day, the closure of the femoral artery, by means of Assalini's forceps, he does not conceal, that the cure of the wound was rather difficult; and, in comparing the ligature with the forceps, he adds his belief, that if an equal result is derived from both, the preference will be given to the ligature, unless the other instrument be brought to such perfection, that the inconveniences will be removed, from which he found it not exempt, though the operation succeeded. *(Annali di Med. del Dottore Omodei, Settembre*, 1807, *p.* 309, *and Scarpa on Aneurism, p.* 45, *Ed.* 2.) Some experiments were a few years ago instituted by Mr. Travers, in order to determine the merit of Assalini's forceps, compared with the ligature: and his conclusion from the facts elucidated in the investigation is, that the ligature is a more powerful means of effecting the obliteration of the tube of an artery. (See *Med. Chir. Trans. vol.* 6, *p.* 643, *&c.*)

My friend, Mr. Lawrence, a few years ago, extended to operations for aneurism the method of tying the artery with a very small firm silk ligature, the whole of which is immediately afterwards cut off, with the exception of the noose and knot, and an endeavour then made to heal the wound by the first intention. In a case of popliteal aneurism, Mr. Carwardine, late of Thaxted, tied the femoral artery in this manner, and the wound united entirely by the first intention, not a particle of pus having been formed at any time; and the part continued perfectly sound at the distance of some months from the operation. On the 29th of March, 1817, I saw Mr. Lawrence try the practice in a similar case: with the exception of the integuments, the wound united by adhesion. However it continued to discharge a small quantity of matter till the end of May, when the ligature came away, and it healed firmly. In an aneurism of the humeral artery, Mr. R. Watson, of Stourport, Worcestershire, tied that vessel and cut off the ends of the ligature, as proposed by Mr. Lawrence. The operation was done on the 2d of March, and the wound was quite healed by the 10th of April. On the 3d of May, a small tubercle which had been felt under the skin, in the centre of the cicatrix, appeared above the skin, and proved to be the knot of the ligature. There was no inflammation, nor discharge; but the ring of the ligature was firmly impacted in the centre of the cicatrix. In about a week from this time, the whole of it was expelled. In another case, where Mr. Hodgson tied the ulnar artery, and cut off the ends of the small ligature, the skin healed over the vessel, but a firm almost cartilaginous knot gradually formed, from the centre of which the bit of ligature was extracted five or six months afterwards by a small puncture. For additional observations on this part of the subject, See *Med. Chir. Trans. vol.* 8, *p.* 490, *&c.*

Mr. Carwardine's case is a strong one in favour of this method: but, I am not aware, that sufficiently numerous trials of it have been made to enable one to form a correct estimate of its merits. With the exception of the example, communicated by Mr. Carwardine to Mr. Lawrence, I apprehend, that, on the whole, the cures on record cannot be said to have been completed sooner, than others generally have been, in which one end of the small circular ligature was left for the removal of the noose. Thus, in two cases, where the practice was tried by Mr. Norman, of Bath, the results were by no means encouraging. In one of these instances, a part of the wound appeared to have united by the first intention, but *matter afterwards formed, and it was a considerable time before the ulcer healed.* The ligature was never seen to come away; but from the circumstance of the suppuration, Mr. Norman apprehends, that it must have been voided. In a second example, the attempt to procure a permanent adhesion of the parts over the ligature did not succeed; a *long and troublesome suppuration ensued*, and the wound was not healed till the latter end of April, though the operation was done on the 7th of March. (*Norman, in Med. Chir. Tran. vol.* 10, *p.* 120—121.) As catgut, however, was employed for the ligatures in these two operations, I do not know, that it is fair to consider the method exactly as that recommended by my friend Mr. Lawrence, who particularly directs very small ligatures of dentist's silk to be used. But, besides the different material employed, we are left uninformed of the thickness of the catgut; and, in this respect also there would probably be no greater similarity between the ligatures of these gentlemen, than there is in regard to the substances, of which such ligatures were made. In favour of catgut, as a ligature, when the ends of it are to be cut off, a case published by Sir A. Cooper deserves particular notice. The wound was found completely united on the fourth day after the operation, notwithstanding the patient was eighty years of age. The catgut, previously to its application, was softened in warm water. The recovery was complete; a fact, strongly proving the propriety of not rejecting an operation on account of age, if no other objections exist. (See *Surgical Essays, part* 1, *p.* 126.)

From what has been stated, in the *Lancet*, however, it seems that Sir Astley has renounced both the use of catgut ligatures, and the plan of cutting off both ends of each ligature. With respect also to silk ligatures, in particular, if we take into the account the little ulcerations, suppurations, and hard knots, which occurred even after their use in this manner, I fear, that, though these complaints might be attended with no severe inconvenience, they will deter many surgeons from adopting the innovation; unless it can be proved that these inconveniences, slight as they were, were counterbalanced by the quicker healing of the incision, or some other decided benefit. As a mode, attended with the least possible risk of being followed by secondary hemorrhage, however, I consider it inferior to no practice, which has yet been suggested; nor do I know of any serious objections to it in any point of view, provided, exactly such ligatures are used as Mr. Lawrence recommends.

In cases of aneurism, a single small ligature, composed of dentist's silk, inkle, or twine, is now usually preferred by the majority of the best surgeons in England; but, as the right qualities of ligatures are elsewhere considered, (See *Hemorrhage* and *Ligature*) I need not here dwell upon the subject. It is not meant to assert, that the use of a single ligature is never followed by secondary hemorrhage; for this would be untrue. The accident I believe will sometimes happen after this, or any other mode, under certain circumstances, and in unfavourable subjects. A fact of this kind we find recorded, which happened in the practice of a truly eminent and experienced surgeon; (See *A. Burns on Diseases of the Heart*, *p.* 230) but, from the inquiries, which I have made, it appears to me proved, that, *cæteris paribus*, a single small ligature, *applied with as little disturbance and detachment of the artery as possible*, will be more rarely followed by secondary hemorrhage, abscesses, sinuses, &c. than any other known method. Thus, in the several cases, reported by Mr. Norman, the single ligature was never followed by any of those inconveniences, which, he justly thinks, will be rarer after this practice, than any other, "if the artery be not removed from its situation, or more detached, than the ligature separates it." (See *Med. Chir. Trans. Vol.* 10. *p.* 123.)

Before entering into the consideration of particular aneurisms, I wish to mention a few other circumstances, worthy the attention of every practical surgeon. The first is the partial entrance of blood into the aneurismal sac, after the artery has been tied at some distance from the tumor. This fact was first particularly pointed out, and its reasons explained by Sir E. Home, who published three examples of its occurrence. (See *Trans. for the Improvement of Med. and Chir. Knowledge, vol.* 1, *p.* 173, *& vol.* 2, *p.* 239.) But, the circumstance had never, I believe, been considered with due attention, until Mr. Hodgson made it one of the subjects of his reflections in his valuable treatise.

"When an artery is tied close to an aneurismal sac, the ingress of blood into the latter is in most instances prevented; the coagulum, which it contains, is absorbed, and the membranes of which the sac is composed, gradually contract, until its cavity is permanently obliterated. But, when the artery is tied at a distance from the disease, the ingress of blood into the latter is not altogether prevented; for, the anastomosing branches, which open into the trunk, below the seat of the ligature, convey a stream, which passes through the aneurism. The impulse of this current, however, is so trifling, that the enlargement of the sac not only ceases, but the deposition of coagulum in it increases, in consequence of the languid state of the circulation. The coagulum accumulates, until the cavity of the sac, and the mouth of the artery leading into it, are obliterated," &c. (See *Hodgson on the Diseases of Arteries*, *p.* 266.)

This fact, which is of great importance, both in a practical and pathological point of view, is proved, (says this gentleman) 1st, by the occasional recurrence of pulsation in the tumor after the operation; 2dly, by cases in which the cavity of the sac has been exposed, and hemorrhage has been the consequence; and 3dly, by dissection, in which it has been found, that the cavity of the aneurism, as well as that of the artery, from which it originated, was pervious, from the part which was obliterated by the direct operation of the ligature.

For a detail of the facts relative to this interesting point, the reader is referred to Mr. Hodgson's valuable publication. (*P.* 267, *et seq.*)

Some very uncommon instances are recorded, in which the return or continuance of pulsation in the tumor is said to have prevented the cure; the aneurismal sac having begun to enlarge again. The two cases of this kind, however, which happened in the practice of Pott and Guèrin, (*Tran. of a Soc. for the Impr. of Med. & Chir. Know. vol.* 1, *p.* 172. *& Journ. de la Soc. de Santé, No.* 3, *p.* 197.) cannot be well depended upon, as it may be doubted, whether the artery was really tied. Some better established facts, relating to this part of the subject, have been very recently published. One is a case by Dr. Monteath, jun. of Glasgow, which is very remarkable; as the disease, viz. a popliteal aneurism, recurred nine months after the femoral artery had been unequivocally tied in the upper third of the thigh. On the 27th of February, 1819, this gentleman performed the operation, using a single ligature; the pulsation of the tumor in the ham instantly ceased; and the wound healed by the first intention, except where the ligature was situated, which came away on the thirtieth day. By this time, the tumor was diminished to one half of its original size, and, in two months more, only a hard knot was perceptible, in which no pulsation whatever could be felt. After the considerable lapse of time, above specified, the patient informed Dr. Monteath, that the tumor had reappeared, being rather larger than a plum. The pulsation in it was distinct, though not so strong as in ordinary aneurism. As the size of the swelling, and strength of the pulsation, increased gradually, a compress and bandage were applied, without confinement; but, as this treatment was ineffectual, the patient was afterwards kept in bed, bled, and put on a spare diet. A thick compress was placed over the tumor, and the limb was firmly bandaged from the toes to the groin. A trial of this plan for three days not having produced any benefit, a tight tourniquet was applied over the tumor; but the pain was such in half an hour, that the instrument was taken off, from which moment no pulsation was felt. Next day the tumor not only did not throb, but had a firm feel; and, the bandage being continued, the cure was gradually completed. Had the disease not yielded to these means, Dr. Monteath meant to have tied the inguinal, or external iliac artery, with the view of cutting off the supply of blood to the sac, through the anastomosing branches. (*Scarpa on Aneurism by Wishart, p.* 510—512, *Ed.* 2.)

The following cases were lately mentioned by Sir Astley Cooper: some months ago, a man underwent the operation for aneurism; the femoral artery was tied; the pulsation ceased; and the patient in a little while was supposed to be cured of the aneurism and discharged. Upon his return to labour, however, a swelling arose in the ham, without pulsation. The swelling subsided in consequence of rest; but afterwards, while the man was at work, the swelling returned with great pain. At length, as Sir Astley conceived, that there was no prospect of the limb becoming useful again, it was amputated. Upon an examination of the parts, he found that the femoral artery, below the place of the ligature, had been conveying blood. It does now and then happen, (says he) that a blood-vessel will arise from the artery close above the ligature, and pass into the artery immediately below it, by which means the circulation is produced. Sir Astley then referred to a specimen in the hospital museum, where this fact is illustrated in the brachial artery. (See *Lancet, Vol.* 1, *p.* 298.)

The external iliac artery was taken up by Mr. Norman, of Bath, for the cure of an inguinal aneurism, and when the collateral circulation was fully established a few days after the operation, the tumor was again supplied with blood in sufficient quantity to produce a distinct pulsation; "a fact, (says Mr. Norman) of practical importance, as it shows, that though the ligature on the iliac artery stops the direct influx of blood into the tumor, and is the means, by which the disease is cured, yet that there exists a necessity for employing strict rest, the antiphlogistic regimen, and in some cases, the abstraction of blood, to assist nature in her operation of obliterating the aneurism." And, in another instance, after the same gentleman had tied the femoral artery for the cure of popliteal aneurism, the pulsation, though stopped for a time in the tumor, afterwards recurred in such a degree, that much doubt was entertained whether the disease would have been cured by the ligature, on the femoral artery, had not continued and rather powerful pressure been adopted. (*Med. Chir. Tran. Vol.* 10, *p.* 99, 118, *&c.*)

. M. Roux, in a late work, has offered some criticisms on the English method of operating for aneurisms. It would hardly be fair play to endeavour to offer a serious refutation of them, because when he wrote, it was his misfortune not to be duly informed of all the facts and experiments recorded in the inestimable treatise on hemorrhage by the late Dr. Jones. "Still less confident, than we are (says Roux) in the treatment by compression, and in the use of topical remedies for the cure of external aneurisms, the English surgeons have immediate recourse to the operation with the ligature. Hunter's method is that which they universally practise. They will not even allow, that there are any cases, in which the operation by opening the sac should be preferred, &c. And it is singular, the very same motive, which would incline us in some cases of aneurisms, properly so called, to adopt the operation of opening the sac, is alleged by the English surgeons as a circumstance in favour of the Hunterian method. Let us suppose an aneurism so formed, that near the centre of the tumor, or rather near the opening, by which the artery communicates with the swelling, are situated the orifices of the collateral arteries, which would be useful for the reestablishment of the circulation. Here, it is clear, that in practising the operation by the Hunterian method, that is to say, in tying the artery above the tumor, the last ramifications are not indeed sacrificed; but the orifices and first branches of these collateral arteries. Let there be, for example, at the upper part of the femoral artery an aneurism, which, though formed originally below the origin of the profunda, now extends above it. Here it is manifest that, in tying the femoral artery above the swelling, we should lose the important resource of the profunda for reestablishing the circulation in the lower part of the limb. The desire and hope of saving the profunda would, in such a case, make us adopt the operation of opening the sac, in preference to the Hunterian method; and Scarpa himself, so great an advocate for this last mode, Scarpa, who seems only to have composed his work to cry up this method, makes an exception of the case, which I have just been supposing. The English surgeons, on the contrary, would urge the following objection to the operation by opening the sac in this, and other analogous examples. They contend, that the ligatures would be applied too near to the origin of the collateral arteries, which are to receive the blood after the operation. They are prepossessed with the idea, that, when an arterial trunk is tied at a given point, the too great proximity of the principal collateral arteries disposes to subsequent hemorrhage; &c." (*p.* 256, 257.) a circumstance, which M. Roux seems to doubt.

Now, before attempting to reply to these observations, we ought to know what exact distance Roux means, when he speaks of the profunda, or a large collateral artery, originating near the opening by which the aneurism communicates with the main artery. Here he is not at all precise; and were he to tie the femoral artery immediately below the point, where the profunda arises, he would expose his patient to great danger of bleeding. I say this, well aware of the case which he has adduced to prove the contrary. In the example brought forward, he applied several ligatures; (*p.* 260) some of which were the *ligatures d'attente*, or loose ligatures left ready to be tightened in case of need These were of course higher up, than the ligature, which was tightened. It is therefore impossible, that this last could have been close to the origin of the profunda. There must have been room left for the application of the *ligatures d'attente*; and be it also recollected, that the French still persist in the use of large flat cords, and not small firm round ligatures, which are now found to be most advantageous. (See *Hemorrhage.*) In this part of the dictionary, we shall find, that the nearness of a collateral vessel impedes the formation of the internal coagulum, which has a material share in the process by which the artery is closed.

With respect to the circumstance of hemorrhage being more likely to follow, when the ligature is placed close below, than at some distance from a great collateral artery, there cannot be a doubt of the fact. Roux, when in London, saw an occurrence of this kind himself, and has published it in his book. It was a case, in which Sir A. Cooper tied the external iliac artery; but the patient died of hemorrhage a fortnight afterwards, and on opening the body, it was ascertained, that the obturator artery, which usually arises either from the trunk of the internal iliac, or from the epigastric, proceeded from the external iliac, and arose immediately above the point, to which the ligature was applied. (See *Parallèle de la Chir. Angloise avec la Chir. Françoise, &c. p.* 278-279.)

From a preparation, spoken of by Mr. Travers, and some experiments made by the same gentleman, it would appear, that the presence of a collateral branch hinders the formation of the internal coagulum, but will not always prevent the closure of the vessel by the adhesive inflammation. In the preparation referred to, a ligature was applied to the external iliac, between the epigastric and circumflex iliac arteries, "and having been in contact with the former at the angle which it makes at its origin from the iliac, ulceration had taken place, and the bleeding had proved fatal. *There was no coagulum formed in the iliac trunk*, though the operation had been performed several days, the circulation through the epigastric having continued. *But the lymph-plug at the seat of the ligature on the iliac artery was complete.*" (*Med. Chir. Trans. Vol.* 6, *p.* 656.) Indeed, it must be allowed, with this gentleman, that the fluidity of the blood does not prevent the adhesive process, a fact, which, he observes, is also proved in the indirect obstruction of a vessel, by means of a temporary ligature, or compressor. When, therefore, the vicinity of a large branch to the ligature is spoken of as a circumstance conducive to secondary hemorrhage, I mean, that it is so inasmuch as the internal coagulum is useful in promoting the closure of the vessel, and its formation is prevented.

Brasdor first, and afterwards Desault, conceived, that, when an aneurism was so situated, that a ligature could not be applied to the artery leading to the swelling, a cure might possibly arise from tying the vessel, on that side of the tumor, which was most remote from the heart. Desault conjectured, that by this means, the circulation through the sac would be stopped, the blood in it would coagulate, that the circulation would go on by the collateral arteries, and that the tumor would be finally absorbed. These speculations, however, were not found to answer in practice. Deschamps tied the femoral artery below an inguinal aneurism; but the progress of the disease, instead of being checked, seemed to be accelerated by this novel experiment. The operator was obliged, as a last resource, to open the tumor, and try to take up the vessel. In this attempt, the patient lost a large quantity of blood, and died eight hours afterwards. (See *Œuvres Chir. de Desault par Bichat, T.* 2, *p.* 563, and *Recueil Périodique de la Societé de Médecine de Paris, T.* 5, *No.* 17.)

The operation of tying the artery below the tumor was some time ago repeated by Sir A. Cooper, not for an aneurism of the femoral artery in the groin, but for an aneurism of the external iliac, where tying the artery above the swelling was impracticable. The femoral artery was therefore tied immediately below Poupart's ligament, between the origins of the epigastric and the profunda. The pulsations of the tumor continued; but, the progress of the disease was checked. After a time, indeed, the swelling decreased, and this in so considerable a manner, that hopes began to be entertained, that perhaps the external iliac artery might soon admit of being tied above the disease. The ligatures came away without any unfavourable occurrence, and when the wound was healed, the patient was sent into the country for the benefit of the change of air. Afterwards, however, the tumor gave way; an extravasation of blood took place in the abdomen and cellular membrane of the pelvis, and the patient died. Sir A. Cooper had no opportunity of seeing the case, and as the body could not be opened, further particulars were not obtained.

The memorable instance, in which this gentleman tied the aorta, in a case of inguinal aneurism, extending very high up, and already burst, I shall notice under the head *Aorta.*

I shall finish these general observations on the treatment of external aneurisms, or such as admit more particularly of surgical treatment, with observing, that, in England, surgeons now lose few patients either from gangrene of the limb or secondary hemorrhage; and this notwithstanding they may sometimes prefer applying a ligature above the profunda to cutting open the aneurismal tumor. I firmly believe, that such matchless success is to be totally ascribed to the perfections in their mode of operating; the choice of a proper kind of ligature; the right plan of applying it; the rejection of the employment of several ligatures at a time; and the great care which is taken to promote the healing of the wound, as quickly as possible; the avoidance of all unnecessary and hurtful extraneous substances in the wound; and above all, the relinquishment of the formidable proceeding of cutting open the tumor.

In the consideration of particular aneurisms, I shall begin with those which may be cured by a surgical operation; and, here we shall be fully satisfied, that, "*l'art de guérir ne triomphe jamais plus heureusement que lorsqu'il peut employer la médecine efficace, c'est à dire, les moyens chirurgicaux ou opératoires.*" (*Pelletan, Clinique Chir. T.* 1, *p.* 110.)

OF THE POPLITEAL ANEURISM, AND OPERATION FOR ITS CURE.

Notwithstanding the solitary example in which M. A. Severinus, early in the 17th century, tied the femoral artery near Poupart's ligament in a case of aneurism, (*De Efficac. Med. Lib.* 1, *p.* 2, *c.* 51.) the practice of tying arteries, wounded either by accident or in the performance of surgical operations, and even the plan of tying the humeral artery for the cure of the aneurism at the bend of the arm, were known long before the operation for the relief of the popliteal aneurism was attempted. The considerable size of the femoral artery; its deep situation, the urgent symptoms of the disease, and ignorance of the resources of nature for transmitting blood into the limb, after the ligature of the vessel, are the circumstances, which appear to have deterred former surgeons from this operation.

Valsalva treated popliteal aneurisms on the debilitating method, and published one or two equivocal proofs of its success. In Pelletan's first memoir on aneurism, and in the third vol. of Sabatier's Médecine Opératoire, as I shall hereafter notice again, are two cases of axillary aneurisms, which were cured by Valsalva's treatment. But, encouraging as such examples may be, experience is not yet sufficiently favourable to this practice to allow it to bear a comparison, in point of efficacy, with the surgical operation, or to justify the general rejection of this last more certain means of cure. As Pelletan admits, Valsalva's treatment is extremely severe; the event of it doubtful; and should the plan fail, the patient might not be left in a condition to bear an operation, for the success of which it seems necessary, that a certain strength of vascular action should exist, in order that the blood may be freely transmitted through such arterial branches, as are to supply the places of the main trunk, after it has been tied.

The time, therefore, has not yet arrived, when surgical operations for the relief of aneurisms should be relinquished. (*Clinique Chir. T.* 1, *p.* 114.)

The cure of popliteal aneurisms by means of compression is occasionally effected; but, it happens too seldom to claim a great deal of confidence, or to lessen in any material degree the utility and importance of operative surgery in this part of practice. Pelletan records the cure of one popliteal aneurism by compression and absolute repose, during eleven months (*T.* 1. *p.* 115), Boyer relates two instances (*Traité des Mal. Chir. p.* 204, *T.* 2), one is mentioned by Richerand (*Dict. des Sciences Méd. T.*2,*p.*96); the practice of Dubois is said to have furnished several examples of the same success (*Vol. cit. p.* 97); and a case, in which Dupuytren effected a cure by compressing the femoral artery by means of an instrument applied just above the place where the vessel perforates the tendon of the triceps muscle, is detailed by Breschet. (*Fr. Transl. of Mr. Hodgson's work, T.* 1, *p.* 249, *&c.*)

The circumstances, under which the employment of compression affords the best chance of success, have been already mentioned, as well as the prudence of assisting this plan with perfect quietude, venesection, spare diet, and cold astringent applications, especially ice, which was first recommended by Donald Monro, and subsequently highly praised by Guerin.

Aneurisms in general, and, among them, the popliteal case, are all attended with some little chance of a spontaneous cure; yet this desirable event is too uncommon to be a judicious reason for postponing the operation, especially, as it is the usual course of the disease to continue to increase; while, in the early stage, the cure may be more speedily accomplished. In fact, the experience of modern operators leaves no room for apprehending, that the anastomoses will not suffice for the due nourishment of the leg, and consequently proves, that waiting beyond a certain time for the enlargement of the collateral vessels to take place is altogether an unnecessary and disadvantageous method. Popliteal aneurisms, as well as other external tumors of the same nature, stand the best chance of a spontaneous cure, when any cause induces a general, violent, and deep inflammation all over the swelling; for, then the communication between the sac and the artery is likely to become closed with coagulating lymph, and the pulsation of the tumor to be suddenly and permanently stopped. If, in this state, the disease sloughs, and the patient's constitution holds out, the coagulated blood in the sac and the sloughs are gradually detached, leaving a deep ulcer, which ultimately heals. An example, in which a popliteal aneurism was cured by such a process, is related in the *Trans. for the Improvement of Med. and Chirurgical Knowledge, Vol.* 2, *p.* 268.

In former times, when all hopes of curing a popliteal aneurism by Valsalva's method, by compression, or a natural process, were at an end, amputation of the limb was considered as the sole and necessary means of saving the patient's life. But, about fifty years ago, the confidence of surgeons in the sufficiency of the anastomosing vessels or the continuance of the circulation began to increase, and, in opposition to the tenets of J. L. Petit and Pott, experience soon proved, that, in general, not only might the patient's life be saved, but his limb also, and this without any operation, that could be compared with amputation, in regard to severity. On looking back to the history of amputation, we shall find, that A. N. Guenault was one of the earliest writers, who disapproved of amputation as not truly indispensable for the cure of popliteal aneurism.

It is alleged, that Teislere, Molinelli, Guattani, Mazotti, and some other celebrated Italian surgeons, were the first, who ventured to tie the popliteal artery for the cure of aneurism. The path, as Pelletan remarks, had been pointed out to them by Winslow and Haller, whose valuable descriptions and plates of the arterial anastomoses about the knee joint, showed by what means the lower part of the limb would be nourished, after a ligature had been placed on the principal arterial trunk. For almost thirty years, however, the practice of tying the popliteal artery was confined to the Italian surgeons. Pelletan believes, that he was the first, who attempted such an operation at Paris nearly thirty years ago, (alluding to about the year 1780, the Clinique Chirurgicale being dated 1810.)

However, this operation of opening the tumor and tying the popliteal artery itself, was a severe and often a fatal proceeding, and does not admit of being compared with the Hunterian operation, in point either of simplicity, safety, or success, as I shall explain, after the detail of a few particulars relating to the popliteal aneurism.

On whatever side of the artery the tumor is produced, it can be plainly felt in the hollow between the hamstrings, and in general its nature is as easily ascertained by the pulsation in every part of the tumor. Though the disease may not occur in the popliteal artery so often as in the aorta itself, it certainly is seen more frequently in the former vessel, than any other branch, which the aorta sends off. As Sir E. Home has observed, this circumstance has never been satisfactorily explained; and, what is rather curious, in many recent instances of this disease, the patients have been coachmen and postilions. Morgagni found aneurisms of the aorta most frequent in guides, post-boys, and other persons, who sit almost continually on horseback; a fact, which he imputes to the concussion and agitation to which such persons are exposed. Some allusion to this subject has already been made in the foregoing pages. Whether an explanation of the frequency of popliteal aneurisms can be correctly referred to the obstruction, which the circulation in the artery must experience, when the knee is in a state of flexion, may be questioned, though it is on a similar principle, that the great frequency of aneurisms of the curvature of the aorta is attempted to be solved. (*Home in Trans. for the Improvement of Med. and Chir. Knowledge, Vol.* 1, *&c. and Monro in Ed. Med. Essays, Vol.* 5.)

Were this the only, or even the principal cause, surely one would have reason to expect aneurisms to be at least as frequent in the axilla, and at the bend of the elbow, as in the ham.

The popliteal aneurism was generally supposed to arise from a weakness in the coats of the artery, independently of disease. If this were true, we might reasonably conclude, that, except at the dilated part, the vessel would be sound. Then the old practice of opening the sac, tying the artery above and below it, and leaving the bag to suppurate and heal up, would naturally present itself. As the arterial coats were found to be altered in structure higher up than the tumor, and the artery, immediately above the sac, seldom united when tied, but, when the ligature came away, the patient was destroyed by hemorrhage, Mr. Hunter concluded, that some disease affected the coats of the vessel, before the actual occurrence of aneurism. Dissatisfied with Haller's experiments on frogs, showing that weakness alone could give rise to aneurism, he tried what would happen in a quadruped, whose vessels were very similar in structure to the human. Having denuded above an inch of the carotid artery of a dog, and removed its external coat, he dissected off the other coats, layer after layer, till what remained was so thin, that the blood could be seen through it. In about three weeks, the dog was killed, when the wound was found closed over the artery, which was neither increased nor diminished in size.

It being conjectured, that the prevention of aneurism, perhaps, arose from the parts being immediately laid down on the weakened portion of the artery, Sir E. Home stripped off the outer layers of the femoral artery of a dog, placed lint over the exposed part of the vessel to keep it from uniting to the sides of the wound, and, in six weeks, killed the animal, and injected the artery, which was neither enlarged, nor diminished, its coats having regained their natural thickness and appearance.

These experiments strengthened Mr. Hunter's belief, that aneurismal arteries are diseased; that the morbid affection frequently extends a good way from the sac along the vessel; and that the cause of failure in the old operation, arose from tying a diseased artery, which was incapable of uniting, before the ligature separated. These reflections led him to propose taking up the artery in the anterior part of the thigh, at some distance from the diseased portion, so as to diminish the risk of hemorrhage, and be enabled to get at the vessel again, in case it should bleed. The stream of blood into the sac being stopped, he concluded, that the sac and its contents would be absorbed, and the tumor gradually disappear, so as to render any opening of it unnecessary.

The first operation of this kind, ever done, was performed on a coachman, by Mr. Hunter, in St. George's Hospital, December, 1785. An incision was made on the anterior and inner part of the thigh, rather below its middle, which wound was continued obliquely across the inner edge of the sartorius muscle, and made large, in order to facilitate the performance of whatever might be necessary. The fascia, covering the artery, was then laid bare, for about three inches, after which the vessel itself could be felt. A cut, about an inch long, was then made through the fascia, along the side of the artery, and the fascia dissected off. Thus the vessel was exposed. Having disengaged it from its connexions by means of the knife and a thin spatula, Mr. Hunter put a doubled ligature under it with an eye-probe. The doubled ligature was then cut, so as to make two separate ones. The artery was now tied with both these ligatures, but *so slightly as only to compress the sides together*. Two additional ligatures were similarly applied a little lower, with a view of compressing some length of artery, so as to make amends for the want of tightness, as it was wished to avoid great pressure on any one part of the vessel. The ligatures were left hanging out of the wound, which was closed with sticking plaster. On the second day, the aneurism had lost one third of its size, and, on the fourth, the wound was every where healed, except where the ligatures were situated. On the ninth, there was a considerable discharge of blood from the apertures of the ligatures, but it ceased on applying a tourniquet, and did not recur. On the fifteenth day, after the operation, some of the ligatures came away, followed by a small quantity of matter, and about the latter end of January, 1786, the man went out of the hospital, the tumor having become still less. In the course of the spring, abscesses in the vicinity of the cicatrix followed, and some pieces of ligature were occasionally discharged. In the beginning of July, a piece of ligature, about one inch long, came away, after which the swelling went off entirely, and the man left the hospital again on the 8th perfectly well, there being no appearance of swelling in the ham.

This subject died of a fever in March, 1787, and, on dissection, the femoral artery was found impervious from the giving off of the arteria profunda down to the place of the ligature, and an ossification had taken place for an inch and a half along the course of this part of the vessel. Below this portion, the vessel was pervious, till just before it came to the aneurismal sac, where it was again closed. What remained of the sac was somewhat larger than a hen's egg, and it had no remains of the lower opening into the popliteal artery. The rest of the particulars of this dissection are very interesting. (See *Trans. for the Improvement of Med. and Chir. Knowledge, Vol.* 1, *p.* 153.)

This celebrated case completely established the important fact, that simply taking off the force of the circulation is sufficient to cure an aneurism, as the tumor is afterwards diminished and removed by the action of the absorbent vessels.

In order to confirm the same fact, Sir E. Home related a case of femoral aneurism, which got well without an operation, but, on a similar principle, to what occurs, when the artery is tied. A trial of pressure had been made without avail. The tumor became very large, and such inflammation took place in the sac and integuments, that mortification was impending: no pulsation could now be felt in the tumor, or the artery above it. The correct inference of Sir E. Home was, that a coagulum, which we know always occurs in an artery previously to mortification, seemingly to prevent bleeding, had formed in this instance, and in conjunction with the effusion of coagulable lymph about the root of the aneurism, had kept the blood from entering the sac.

Mr. Hunter's second operation was on a trooper. Instead of using several ligatures, which were found hurtful, he tied the artery and vein with a single strong one; but, unluckily, the experiment was made of dressing the wound from the bottom, instead of attempting to unite it at once, and the event was, that the man died of hemorrhage.

After this case, Mr. Hunter's practice was to tie the artery alone with one strong ligature, and unite the wound as speedily as possible.

Having recorded Mr. Hunter's cases, which first established the present method of operating for the cure of popliteal aneurisms, I shall not repeat the strong reasons which exist against the employment of reserve-ligatures, metallic compressors; two ligatures, with the division of the vessel between them; the interposition of pieces of linen, wood, cork, agaric, &c. between the knot and the vessel; the use of large ligatures; and other contrivances, the merits, or rather demerits, of which have been already fully considered in the preceding section. My next duty is to explain the method of performing the Hunterian operation, as brought to its modern state of improvement, and adapted to the wise principles, which first emanated from the valuable experiments and investigations of Dr. Jones. (See *Hemorrhage.*)

In the arrangement of the assistants, one of them should be so placed, that if required, in consequence of any accidental wound of that vessel in the operation, he can compress the femoral artery as it passes over the brim of the pelvis: but, as Scarpa justly observes, no pressure of this kind is to be made, unless the accident referred to should happen, because the pulsations of the artery, inasmuch as they indicate the track of the vessel, must tend materially to facilitate the operation. The surgeon, says Scarpa, is to explore with his forefinger the course of the artery from the crural arch downwards, and when he comes to the place, where the vibration of this vessel begins to be less distinctly felt, this point is to be fixed upon for the lower end of the external incision. This angle of the wound will fall nearly on the inner edge of the sartorius, just where this muscle crosses the track of the femoral artery, and at the very apex of the triangle formed by the convergence of the triceps and vastus internus. A little more than three inches above the place here fixed upon, the surgeon is to begin, with a convex-edged bistoury, the incision through the integuments and cellular substance, and carry the wound down the thigh, in a slightly oblique line, from without inwards, so as to make it follow the course of the artery, as far as the apex of the above-mentioned triangular space, or the point where the vessel passes under the inner edge of the sartorius muscle. In order to make this first external incision with correctness, I consider it a good rule always to take particular notice of the line described by the sartorius on the thigh, the inner margin of which muscle at the place where it meets the artery, as we have seen, forms at once the lower boundary of the incision, and an important guide to the vessel itself. By observing the track of the sartorius attentively, we shall likewise avoid all chance of making the wound too low down, so as to have this muscle intervening between the incision and the artery; a greater source of embarrassment in the operation, and of troublesome consequences afterwards than, perhaps, any other error; for, when this has happened, and the surgeon has not room enough afforded by the higher part of the wound to get at the artery above the sartorius, he is compelled to dissect and raise up this muscle from its natural connexions, ere he can plainly discover the vessel. This inconvenience made a deep impression on me in the first case, where I tied the femoral artery, for the intervention of the sartorius in a stout soldier, upon whom the operation was done, threw me into the dilemma of either dissecting at the outer edge of this muscle, and drawing it inwards, or of enlarging the wound upwards. The latter proceeding was that to which I gave the preference, because it seemed to me an excellent maxim in this operation, to avoid making any further detachment of parts from their natural connexions, than is absolutely necessary, and I knew, that when the wound was extended a little higher up, the artery would present itself more superficially, quite unconcealed by any muscle whatever. Strongly, therefore, as my principles have led me to condemn Scarpa's modification of the ligature, his use of from four to six threads, and his interposition of a roll of linen between the knot and the vessel, I feel pleasure in expressing my conviction of one excellence in his mode of operating; an improvement, which is now obtaining, if it has not already obtained, the universal approbation of the surgical profession. This amendment consists in making the incision in the upper third of the thigh, or a little higher, than the place, where Mr. Hunter used to make the wound. Scarpa's reason for this practice is to avoid the necessity of removing the sartorius muscle too much from its position, or of turning it back, to bring the artery into view, so as to be tied. I have seen the best operators, even professors of anatomy, embarrassed, by having the sartorius muscle immediately in their way after the first incision, and as the vessel is more superficial a little higher up, the place is further from the diseased part of the artery, and there is no hazard of the anastomoses failing to keep up the circulation; this part of Scarpa's practice is highly deserving of imitation.

"The part of the limb (observes Mr. Hodgson), in which the femoral artery can be tied with the greatest facility, is between four and five inches below Poupart's ligament. The profunda generally arises from the femoral artery an inch and a half, or an inch and three quarters, below Poupart's ligament; it very rarely arises so low as two inches. If, therefore, the ligature be applied to the femoral artery at the distance of four or five inches below Poupart's ligament, the surgeon will not be embarrassed by meeting with the profunda during the operation, and the chance of causing secondary hemorrhage, by tying the artery close to the origin of this vessel, will be obviated." (*On the Diseases of Arteries, &c. p.* 434.)

The trouble, arising from cutting too low down, so as to have the sartorius intervening between the outer wound and the artery, may be more accurately estimated, when it is known, that Desault for the removal of this inconvenience considered it right actually to make a complete transverse division of that muscle, a thing, which, it is said, may be done, without any ill consequences. (*Boyer, Traité des Mal. Chir. t.* 2, *p.* 145.) I shall not presume, however, to second this last piece of advice, because, though it may have been done by Desault, it appears to me, that the artery can always be taken up very well, without the proceeding here recommended.

A few years ago, Mr. C. Hutchison published a tract, in which he is an advocate for the practice of making the incision at the outer edge of the sartorius, and then raising that muscle, and drawing it inwards, in order to arrive at the artery. This advice proceeded from the apprehension, that the plan of taking up the femoral artery at the inner edge of the sartorius was attended with risk of injuring the saphena vein, and large lymphatics. (*Letter on the Operation for popliteal Aneurism*, 1811.) The same method is commended by Boyer, and Roux (*Nouveaux Elemens de Méd. Operatoire, t.* 1, *p.* 729) when the operation is done low down in the thigh.

But, as operating in this situation is liable to the several objections of approaching too near the disease, of aiming at taking up the artery where it lies more deeply, than it does higher up, and, of every inconvenience which may arise from the interposition, dissection, and reflection of the sartorius muscle, the method must be rejected, unless it can be proved, that so many disadvantages are fully counterbalanced by other considerations. If the plan which I shall presently recommend be adopted, there will never be the slightest risk of wounding the saphena vein: and, therefore, I do not consider it advisable or necessary, for the avoidance of this accident, to make the wound *precisely upon the sartorius*, as my intelligent friend Mr. Hodgson suggests; a method, attended with the inconvenience of having the fibres of that muscle between the external wound, and the artery, and perhaps inconsistent with the excellent directions which he afterwards delivers, concerning the right mode of performing the external incision, when he says, with Scarpa, that this cut should be "continued down to the fibres, which form the inner margin of the sartorius." (*On Diseases of Arteries, &c. p.* 436.)

Now, if the point, where this margin first lies over the artery, be the proper place for the lower termination of the external incision, we shall clearly be deviating from the precise course of the vessel by letting the higher portion of the wound be over the fibres of that muscle. And, when it is further reflected, that the serious evils of wounding the trunks of the lymphatics in this operation are not demonstrated in modern practice, while the saphena vein may always be avoided with certainty and facility, I cannot admit, that there is any solid reason for letting the situation and direction of the external wound be determined by such apprehensions. At all events, for the motives above explained, it should be a fixed maxim in this operation never to extend the wound lower than the point, where the inner margin of the sartorius crosses the artery; and then all detachment and displacement of this muscle will be unnecessary, and every embarrassment, which might proceed from its interposition between the outer wound and the artery, will be completely avoided.

With the view of preventing injury of the femoral vein, Mr. Carmichael recommends the needle to be introduced on the pubal side of the artery, where the vein presents itself to view, and can be most easily avoided. He remarks, that the only part of the thigh, from Poupart's ligament to the tendon of the triceps, in which the femoral vein is not completely covered by the artery, lies within the space, which extends from Poupart's ligament to the point where the artery meets the sartorius muscle. At the part of this space, most distant from Poupart's ligament, the vein begins to disclose itself at the pubal side of the artery, from beneath which it emerges more and more as it ascends. (See *Trans. &c. of the Fellows, &c. of the King's and Queen's College of Physicians, Ireland, vol.* 2, *p.* 357.)

The skin and cellular substance are to be divided, in the situation, and to the extent above specified down to the femoral fascia, under which the artery lies, and may be felt beating. The next object, therefore, is to divide the fascia, which is here much thinner than at the outer side of the limb, and may be cut with another stroke of the bistoury; or (what is safer with the view of abstaining from all chance of wounding the artery) a slight cut may first be made in the fascia, the division of which may then be made to the requisite extent by introducing under it a grooved director, on which the further incision may be made with perfect security. The fascia is to be divided in the direction of the external wound; but, to what extent is a point on which surgical writers differ, and, indeed, they must here differ, as long as they are not unanimous about the method of applying the ligature round the artery; because, if it be intended to use a broad ligature, with a cylindrical piece of linen interposed between it and the artery, or especially if it be designed to apply two ligatures and divide the vessel in the interspace, more of the artery must be exposed, and of course more of the fascia must be cut, than when it is simply meant to surround the vessel with a single small ligature. Such operators also as have contracted the pernicious habit of insulating the artery all round sufficiently far to let them thrust their fingers under it, will likewise require an extensive opening in the fascia. Such detachment of the vessel for an inch or more, for the purpose of placing the finger under it, is a measure, which deserves to be condemned in the strongest terms, as it is the very thing, which produces some risk of injuring the saphena vein, and has a tendency to bring on secondary hemorrhage, inasmuch as it occasions unnecessary handling, stretching, and disturbance of the artery and surrounding parts, and an inevitable division of the vessels, by which the arterial coats are supplied with blood.

According to Mr. Hodgson, the extent of the cut in the fascia should be about an inch; for he wisely avoids all unnecessary separation of the artery from its surrounding parts. On the contrary, Scarpa, who insulates and raises the vessel, previously to tying it, insists upon the prudence of cutting the fascia, the whole length of the external wound; for, says he, if this practice be neglected, it most frequently happens, that, in the succeeding inflammatory stage, the bottom of the wound swells and becomes very tense, and the matter, which is formed under the fascia, not finding a ready exit, occasions abscesses which seriously retard the cure. But, Scarpa, instead of planning a method of relieving the consequences, might have employed himself more to the purpose in considering how they were to be prevented, and why in his method they most frequently happen. Now, without laying any stress upon two waxed ligatures, each composed of six threads, with an additional extraneous substance, viz. a roll of linen in the noose, we should be more surprised to hear, that the wound after his method did not become affected with swelling, tension, and suppuration, than that these were the usual effects. After describing the division of the fascia, he observes; "*With the point of the forefinger of the left hand, already touching the femoral artery, the surgeon will separate it from the cellular substance, which ties it laterally and posteriorly to the contiguous muscles; and making the point of the same finger pass gradually under and behind the femoral artery (supposing the* *surgeon has not enormously large fingers) he will raise it alone from the bottom of the wound, or (when it cannot be avoided) along with the femoral vein. If it is along with the femoral vein, the surgeon, holding the artery and vein thus raised, and almost out of the wound, will cautiously separate the vein from the artery with a bistoury, or spatula, or simply with his fingers, &c.*" (See *Scarpa on Aneurism, p.* 280, *Ed.* 2.)

When we combine the irritation and mischief of all this work with the ill effects of filling the bottom of the wound with soft lint, I would ask, what more certain plan could Scarpa or any other person have suggested for bringing on the unpleasant state of the wound, which he describes as most frequently taking place?

I shall suppose the fascia has now been divided, under which the surgeon distinctly feels the pulsations of the femoral artery, which is still invested by the cellular sheath. The femoral vein lies directly under this vessel, while the branches of the anterior crural nerve, separated from it by dense cellular substance, are more externally, yet somewhat more deeply situated. The next object, therefore, is to pass a single ligature round the artery, without including, or, in any manner meddling with the subjacent femoral vein, or, detaching and disturbing the artery. For this purpose, the best direction is that given by my friend Mr. Lawrence, especially when combined with Mr. Carmichael's plan of letting the needle be introduced on the pubal side of the artery: "after dissecting down to the artery, a slight scratch or incision may be made through the sheath, close to the side of the vessel. Then, with a narrow aneurism needle, nearly pointed at the end, and made as thin at its edge as it can be without cutting, a single silk ligature is to be conveyed round it, the point of the needle being kept in contact with the artery. A needle of this form makes its way easily through the cellular substance, and the vessel is detached only in the track of the instrument." (See *Med. Chir. Trans. vol.* 6.)

Of the kind of ligature to be employed, I need only say here, that it should be a single one, composed of firm materials, in order to avoid the necessity for increasing its diameter more, than would be desirable for reasons elsewhere considered. (See *Hemorrhage* and *Ligature.*) The ligature having been put under the artery, one end of it is to be drawn completely through the track made for it by the needle, which instrument is then to be taken away, leaving the ligature under the vessel. The ligature is now to be tied in a steady firm manner, but without any immoderate force, which can never be necessary even for the division of the inner coats of the vessel. In this part of the operation, a few practitioners give the preference to what is termed the *surgeon's knot;* and commend this plan of fastening the ligature; a plan, which consists in putting the end of the cord twice through the noose, before the constriction is made. The only good of the surgeon's knot is, that it does not so readily slip and loosen as a common one; but Scarpa thinks a simple knot best, as it does not, like the other, prevent the surgeon from calculating the force with which the artery is constricted. (*On Aneurism, p.* 281, *Ed.* 2.) And, besides this reason against the surgeon's knot, another objection to it is the irregularity, with which a ligature in this form will lie round the vessel. A simple noose should therefore be first made and tightened, and then a second one, so as to form a common knot; and now, as a matter of precaution against the possibility of the ligature slipping and becoming loose, the surgeon, if he pleases, can tie the knot once again. One end of the ligature is next to be cut off near the knot; and the sides of the wound are to be brought together with strips of adhesive plaster, the irritation of sutures being carefully avoided. The remaining end of the ligature should always be brought out at the nearest point of the external wound to the knot on the artery.

The effects, which in general immediately follow the operation, are a total cessation of the pulsation of the aneurismal tumor; a manifest sinking and flaccidity of the swelling; a diminution of pain in the seat of the disease; and a strong vibration of the articular arteries round the knee. As Mr. Hodgson has remarked, the unusual influx of blood into the minute ramifications, when a main artery is suddenly rendered impervious, is generally attended with a remarkable increase in the temperature of the limb. After tying the femoral artery for the cure of popliteal aneurism, the same phenomenon occurs, at least after a short time, during which the temperature of the leg and foot frequently continues lower, than that of the sound limb. But, in a few hours, it generally rises, and is sometimes several degrees higher, than that of the opposite member. This state lasts several days, at the end of which time, the heat of the limb, which has been operated upon, will be found to be about the same as that of other parts of the body. (*Hodgson on Diseases of Arteries, &c. p.* 256.) It is only while the limb is colder than natural, that it ought ever to be fomented, or covered with flannel. In particular examples, there is no increase of temperature in the limb at any period after the operation; a fact, which Mr. Hodgson refers to the probability of a collateral circulation having already been established, in consequence of the obstruction to the passage of the blood through the main artery by the accumulation of the coagulum in the aneurismal sac. Of course, unless a collateral circulation be established, the operation cannot succeed, as the limb will mortify: it behoves us, therefore, to be aware of the circumstances, which may prevent the due transmission of the blood to the inferior part of the limb. These are ably explained and commented upon in Mr. Hodgson's work; 1st, An extensive transverse wound, by which the principal anastomosing branches are divided. 2dly, Tight bandages, and pressure, operating so as to obstruct the same vessels. 3dly, The immense bulk of the tumor, and the pressure upon the principal collateral arteries. 4thly, Calculous depositions in the coats of the arteries of the limb. 5thly, Advanced age. 6thly, A languid state of the circulation; a fact, indicating the wrongness of venesection, as a general practice after the operation, though it may yet be right to adopt this treatment, where the pulsations return in the tumor with unusual strength, and appear to stop the diminution of the swelling, as already mentioned. 7thly, The abstraction of heat from the limb by cold evaporating lotions; a plan, which can only be right, when there is a great increase of heat in the limb, a tendency to inflammation, or a return of strong pulsations in the tumor.

Sir Astley Cooper saw a case, in which the application of white-wash occasioned mortification, and the patient's death. In cold weather, he always covers the limb with flannel, or a stocking, and sometimes puts jars filled with hot water to the feet. (See *Lancet, vol.* 2, *p.* 42.)

When the operation is done, according to the principles laid down in this article, the patient is not too old, nor enfeebled, and the after-treatment is properly conducted, mortification may now be said to be a rare event. In one case, operated upon by Sir Astley Cooper in 1823, the whole of the foot and part of the leg mortified; but it should be noticed, that, in this instance, the whole limb was extremely swollen previously to the artery being taken up. (See *Lancet, vol.* 1, *p.* 436.) I have seen but one example of gangrene, and in that, only one toe, and a portion of the skin of the instep, sloughed in a very debilitated subject. This partial gangrene of the foot has been particularly noticed by Deschamps and Scarpa, the latter of whom regards it as an unusual thing, only likely to happen in old, weak, or unhealthy subjects; and " at any rate (says he), if this should happen in any of these enervated individuals, the patients may console themselves for the loss of one, or two of their toes, with the cure of a popliteal aneurism, and the avoidance of a painful and dangerous incision in the ham, and of the tedious suppuration, which would have followed it."

When the operation succeeds, a considerable portion of the artery above the aneurismal tumor is rendered impervious, the vessel indeed being sometimes converted into a solid cord from the origin of the profunda to that of the tibial arteries. (*A. Cooper, Med. Chir. Trans. vol.* 2, *p.* 254.) In general, however, the obliteration of the artery is less extensive; a fact, particularly noticed in one of Mr. Hunter's cases (*Trans. of a Soc. for the Improvement of Med. and Chir. Knowledge, vol.* 1, *p.* 153,) and vainly urged by Deschamps, as a proof of the insufficiency of the ew method. (See *Observations et Reflexions sur la Ligature des principales Arières blessés, et particulièrement sur l'Aneurisme de l'Artère poplitée, p.* 76, *Paris,* 1797.) It appears from the observations of Mr. Hodgson, that the artery generally becomes impervious, for the space of three, or four fingers' breadth, at the place where the ligature is applied; below which part its tube is unclosed, and continues so for some distance, when the obliteration again commences, and descends along a considerable extent of the popliteal artery to the origin of the inferior articular, or tibial arteries. Thus, says this author, an insulated portion of the femoral artery preserves its cavity, from each of which considerable anastomosing branches arise: the upper branches convey blood into the vessel, and the lower transmit it into anastomosing channels, that originate below the knee. (*On Diseases of Arteries, &c. p.* 278.) Now, as Mr. Hodgson is unacquainted with any case, except that recorded by Sir Astley Cooper, where, after the modern operation, the artery was obliterated from the seat of disease in the ham to the part, at which the ligature was applied, he thinks it probable, that, in most instances, a double collateral circulation exists in the limb, after this method of cure.

In consequence of the motion of the blood being more or less impeded in the aneurismal sac by the application of the ligature to the femoral artery, the aneurismal cavity soon becomes completely filled with coagula, which even block up the adjoining portion of the arterial tube. The coagulated blood in the sac is afterwards absorbed; and a gradual diminution, and final disappearance of the aneurism in the ham ensue; with the exception of a slight induration, which sometimes remains, composed of a remnant of the sac itself, or of the fibrous part of the blood. This slight hardness in the cavity of the ham occasions no inconvenience, and does not hinder the patient from performing the motions of the knee and leg with quickness and safety. (*Scarpa, p.* 257, *Edit.* 2.)

When the advantages of the foregoing method of operating are contrasted with the dangers and severity of the practice of laying open the aneurismal tumor, and applying ligatures round the diseased part of the vessel, it is surprising to find any living surgeons still expressing a preference to the latter mode of treatment under any circumstances whatsoever. Yet, Boyer, Roux, and a few of the modern French surgeons are in this way of thinking, which reminds me of their slowness to adopt, at every opportunity, union by the first intention, one of the greatest and most decided advances to perfection ever made in the practice of surgery. The severity and difficulties of the old method of operating, in cases of popliteal aneurism, are most faithfully depicted by Scarpa. In the ham, says he, the artery lies very deep. The space is limited and narrow, within which it can be brought into view and tied, without risk of tying along with it, or of destroying, some of the principal anastomoses formed by the articular arteries of the knee. On account of the depth of the artery, it is difficult to pass any instrument round it, without including other parts; and it is no less difficult to draw the ligature on the vessel with a proper degree of tightness. Scarpa then comments on the disadvantages of tying the lacerated, diseased part of the vessel, which is sometimes so high up, that, in order to apply the ligature above it, it is necessary to cut through the long head of the triceps, and make a passage through into the thigh. Or, the diseased, or lacerated part of the artery is situated so low down in the calf of the leg, that it is impossible to avoid including, either in the incision, or the ligature, the lower anastomosing articular arteries, on the preservation of which the circulation and life of the subjacent part of the limb in a great measure depend. We must add to all this the violence, which must be done to the great sciatic nerve, which an assistant must hold drawn to one side of the wound nearly the whole time of the operation. The proceeding is also liable to other great difficulties, as may be seen from a case reported by Masotti, (*Dis. sul Aneurysma, p.* 53,) where the popliteal artery was so firmly united, and, as it were, confused with the vein, the nerve, the tendons of the neighbouring muscles, and the periosteum, that the cavity of the ham presented the appearance of an intricate mass of parts, not easily separable from one another. Lastly, the operation leaves a large deep wound, laying open the whole cavity of the ham, and followed by copious suppuration, sinuses, and necrosis of the heads of the femur and tibia. If the patient be not hurried into his grave by these affections, and even if the parts in the ham heal, he is almost always left with an incurable contraction of the knee, and perpetual lameness. Thus, Masotti (*Op. cit. p.* 17,) relates one case, where the subsequent effects caused such destruction of the soft parts in the ham, that not a vestige of artery, vein, or sciatic nerve was left, and the patient remained all the rest of his life with a paralytic leg, and ulcers and fistulæ all round the knee. (*Scarpa on Aneurism, p.* 251-253, *Ed.* 2.)

I shall now advert to a few facts in the history of surgery, which eventually led to the bold and successful operations, adopted in modern times, for the cure of aneurisms of the femoral and popliteal arteries. The earliest case, of which the particulars are recorded, amounting to a satisfactory proof, that the lower extremity might be duly supplied with blood, notwithstanding the femoral artery had been tied high up in the thigh, is the example, related by M. A. Severinus, of a false aneurism of the thigh, about eight fingers' breadth below the groin, caused by a musket-ball wound. In this instance, Severinus tied the femoral artery above and below the aperture in it, and not only was the patient's life saved, but the use of the limb also preserved. (*Chirurgiæ Efficacis, p.* 2, *Enarratoria.*) The next authentic case of the ligature of the femoral artery, is that reported by Saviard, where Bottentuit, in 1688, tied this artery on account of a false aneurism, the result of a sword-wound at the inner and upper part of the thigh. The surgeons, called into consultation, were immediately convinced, that the only thing to be done was to take up the femoral artery; but they were fearful, lest the patient should perish of bleeding, ere the opening in the vessel could be found, and, in case the artery were secured, they apprehended the obstruction of the circulation would be followed by mortification of the limb. The patient was therefore first prepared for his fate by the administration of the sacrament. A band was then applied round the upper part of the limb, and tightened by means of a stick, with which it was twisted, a piece of pasteboard being put under the knot, in order to render the constriction less painful. The tumor was then opened, the clotted blood extracted, and the opening in the artery detected by slackening the tourniquet. A curved needle, armed with a double ligature, was then introduced under the femoral artery, and one of the cords was tied above, and the other below, the wound in the vessel. Then follows a curious passage, showing the operator's judgment at that time, respecting the impropriety of interposing any cylinder of linen between the knot of the ligature and the artery, as some of the old surgeons at that time used to do, as well as a few of the moderns. "*On ne mit point de petites compresses sur le corps de l'artère au dessus du nœud, comme font quelques uns, parceque l'on jugea qu'il etoit d'une grande consequence, de lier très-etroitement une artère si considerable, ce que l'on n'auroit pas été sûr de faire en interposant la petite compresse, &c.*" For greater security, assistants, who relieved each other in turn, kept up constant pressure on the tied part of the vessel for twenty-four hours. In six weeks, the patient recovered, and afterwards enjoyed such good health, that he went through several campaigns. (*Saviard, Nouveau récueil d'Observations Chir. Obs.* 63, 12*mo. Paris*, 1702.)

Now, with respect to these two cases, it merits attention, that, though Heister, Morgagni, and others, endeavoured to explain the success, by supposing, that each of the patients in question must have had two femoral arteries, both Severinus, and Saviard, were wise enough to avoid making any such erroneous inference themselves. At a later period, Guattani laid bare the femoral artery, as it passed under Poupart's ligament, compressed it against the ramus of the pubes, by means of graduated compresses, retained with a firm roller, and thus obtained the speedy obliteration of the vessel, and cured the aneurism, which had been first injudiciously opened. (*De Externis Aneurysmatibus, Hist.* 15, 4*to. Romæ*, 1772.) In the same book is given the case of an inguinal aneurism, which, when it had continued three months, and become equal in size to a large fist, was attacked with gangrene, whereby the aneurismal sac was quickly destroyed, and the femoral artery was obliterated for a considerable extent from the crural arch downwards. The sloughs were thrown off, however, and the ulcer had in a great measure healed, when the patient fell a victim to debility. (*Hist.* 17.) Here it is to be remarked, that, during the five weeks this man lived after the obliteration of the femoral artery, above the origin of the profunda, not only the circulation and life of the whole limb were preserved, but the auxiliary arteries, coming from within the pelvis, proved capable of limiting the progress of the mortification of the parts round the aneurism, and of commencing the healing process, in a manner, which raised great hopes of a cure. A similar fact is also recorded by Dr. Clarke. (*Duncan's Med. Comment. vol.* 3.)

These, and other cases, which might be quoted, furnished ample proof of the efficiency of the anastomosing vessels in the support of the limb, though the femoral artery had been tied, or obliterated in a very high situation.

Besides these facts, surgeons derived every encouragement to attempt the cure of popliteal aneurism, by the ligature of the artery above the tumor, from the elucidations given by Winslow and Haller concerning the numberless inosculations, which exist between the upper and lower articular arteries. Haller even drew the conclusion, that, if the course of the blood were intercepted in the popliteal artery, between the origins of the two orders of articular branches, such anastomoses would suffice for carrying on the circulation in the leg. And at length, Heister, weighing the anatomical observations of Winslow and Haller, and the facts recorded by Severinus and Saviard, first proposed applying to popliteal aneurisms, an operation, which, with the exception of those two cases, had until his time been restricted chiefly to aneurisms of the brachial artery. (*Dis. de genuum Structurâ eorumque morbis. Disp. Chir. Halleri, T.* 4.)

It was in Italy that the earliest operations were undertaken for the cure of popliteal aneurisms, by Guattani, or rather by a German surgeon, named Keysler, as would appear from a letter written by Testa, to Cotunni. (See *Pelletan, Clinique Chir. T.* 1.) The success, obtained by those surgeons, soon led others to imitate them, and by degrees the practice of tying the femoral artery became common both in cases of aneurism and wounds; and from the observations of Heister, *(Haller Disp. Chir. T.* 5.) Acrell, (*Murray de Aneurysm. Femoris*,) Leslie, *(Edinb. Med. Comment.)* Hamilton, *(B. Bell's Surgery, vol.* 1,) Burschall, (*Med. Obs. and Inq. vol.* 3,) Leber, (*Dehaen, Ratio, Medendi, T.* 7,) and Jussy, (*Ancien. Journ. de Med. T.* 42,) it was proved beyond the shadow of a doubt, that the circulation might continue in the limb, after the obliteration of the femoral artery, whether such obliteration were effected by direct pressure, or the ligature.

The exact period when the first operation of laying open the tumor and tying the popliteal artery was performed in England, is not, as far as I know, particularly specified. However, judging from the observations made on this practice in the writings of Pott, (*Remarks on Palsy, &c. 8vo. Lond.* 1779,) of Wilmer, (*Cases and Remarks in Surgery, 8vo. Lond.* 1779,) of Kirkland, *(Thoughts on Amputation, 8vo. Lond.* 1780,) and of others, it is clear, that this method of treatment had been often done in this country earlier, than the dates of those works, and as would appear with little, or no success. The earliest attempt of this kind in France was made by Chopart in 1781, (*Roux, Nouveaux Elémens de Med. Opératoire, T.* 1, *p.* 556,) about five and twenty years after the examples set by Guattani in Italy; but, Chopart failed in his endeavours to repress the bleeding from the exposed cavity of the tumor, and was therefore obliged to amputate the limb. Subsequently to this attempt, the operation was undertaken by Pelletan in two instances, the terminations of which were successful: consequently, this surgeon may be regarded as entitled to the honour of having proved to his countrymen the possibility of curing the popliteal aneurism by laying open the tumor, and securing the artery in the ham.

The severity and frequent ill success of this method of operating I have already noticed, nor shall I repeat the objections to it. With respect to the Hunterian practice, the great peculiarities of which were tying the artery at some distance above the disease, and not opening the swelling at all, Richerand seems offended, that Hunter's name should be affixed to an operation, which he conceives was in reality the invention of Guillemeau. Here we observe, Ætius again puts in a prior claim, and with much more effect, because the method, of which he speaks, truly resembled Mr. Hunter's, inasmuch as the vessel is directed to be tied at some distance above the swelling, while Guillemeau only tied the artery close above the disease, and *opened the swelling, a serious deviation from the Hunterian practice.*

Guillemeau, a disciple of Ambrose Paré, having to treat an aneurism, at the bend of the arm, the consequence of bleeding, exposed the artery above the tumor, tied this vessel, then opened the sac, took out the coagulated blood, and dressed the wound, which healed by suppuration. After more than a century, Anel, on being consulted about a similar case, tied the artery above the swelling, which was left to itself. The pulsations ceased, the tumor became smaller, and hard, and after some months, no traces of the disease were perceptible.

In 1785, Desault operated in the same manner for a popliteal aneurism: the swelling diminished by one half, and the throbbings ceased; on the 20th day, it burst, coagulated blood and pus were discharged in large quantities, and the wound, after continuing a long time fistulous, at length healed. Towards the end of the same year, says Richerand, Hunter applied the ligature somewhat differently; instead of placing it close to the swelling or directly above it, he put it on the inferior part of the femoral artery. (See *Nosogr. Chir. T.* 4, *p.* 98, 99, *edit.* 2.)

Unquestionably, Anel did, in one solitary instance, tie the humeral artery immediately above an aneurism at the bend of the arm, and effected a cure without opening the swelling. (*Suite de la Nouvelle Méthode de guérir les fistules lachrymales, p.* 251, *Turin,* 1714;) but, he did not think of applying the plan to the femoral artery, or draw the attention of French surgeons sufficiently to the matter, to make them imitate his operation: on the contrary, the method fell into oblivion, and was never repeated. With regard to Desault's operation, said to have been done in an earlier part of 1785, than Mr. Hunter's first operation, it is only necessary to say, that Desault tied the popliteal artery itself, while the grand object in Mr. Hunter's method was to take up the femoral artery, at a distance from the disease, and that it is this last mode alone, which has gained such approbation, and been attended with unparalleled success.

The French surgeons have not practised the Hunterian operation with the same degree of success, with which it is now performed in England, and, consequently, they very commonly pursue the old method of opening the sac, &c. Even Boyer avers his relinquishment of what he calls Anel's plan. (*Traité des Mal. Chir. T.* 2. *p.* 148.) But, we shall not be surprised at their ill success, when we hear that they neglect the right principles, on which ligatures ought to be applied to arteries, as explained by Dr. Jones in his work on hemorrhage. Even Baron Dupuytren adheres to the use of ligatures of reserve; and Boyer applies four loose ligatures round the artery, besides two tight ones; and consequently a large portion of the vessel lies separated from its natural connexions, and irritated by these extraneous substances. Hunter's first operation nearly failed also on account of so many ligatures, none of which were tightened so as to cut through the inner coats of the artery, and thus promote its closure. (See *Hemorrhage.*) With reference to the operation for popliteal aneurism, *Rosenmuller's Chir. Anat. Plates* deserve to be consulted, *Part* 3, *Tab.* 8 *&* 9. Scarpa's matchless engravings, and Haller's Icones, should likewise be examined.

ANEURISMS OF THE LEG, FOOT, FOREARM, AND HAND.

Doubts were not long ago entertained, respecting the possibility of curing an aneurism at the upper part of the calf of the leg by tying the femoral artery in the middle of the thigh. (*Instituto Ital. di Scienze ed Arti, Vol.* 1, *Parte* 2, *p.* 266.) The author, here referred to, was led by this uncertainty to have recourse in one instance to the severe method of laying open the tumor, in order to get at the vessel lower down. On this case, Scarpa makes some correct reflections: the operator (says he) assured himself, that, *on compressing the femoral artery at the upper part of the thigh, the tumor at the top of the calf ceased to pulsate; and that, when the compression was continued for some time, the swelling partly disappeared, and became softer,* It ought to have been evident, therefore, that the aneurism might have been cured by tying the trunk of the femoral artery, as described in the foregoing section. In Scarpa's work is a case, in which an aneurism at the bifurcation of the popliteal artery was cured by the ligature of the femoral artery. (See *p.* 451, *Ed.* 2.) Mr. Hodgson has seen three aneurisms, situated at the commencement of the tibial arteries, cured by the same operation. (*On Diseases of Arteries, &c. p.* 437.) But, as Scarpa remarks, though the Hunterian operation answers in the cure of aneurism in the bend of the arm, and at the upper part of the calf of the leg, it is not so effectual for aneurisms situated on the back or palm of the hand, or the dorsum, or sole of the foot. The free communication, which the ulnar and radial arteries keep up with each other in the hand, and the tibial arteries have in the foot, prevent the operation from succeeding, whether the brachial, or femoral artery, or one of the two large arteries of the forearm, or leg, be tied. In proof of this statement Scarpa cites two cases of aneurism seen by himself; one on the instep; the other in the sole of the foot; and a third case of the same disease in the latter situation; all of which were found to be incurable by the ligature of the anterior tibial artery. (*P.* 311.) He thinks, however, that the operation of tying this vessel where it passes over the dorsum of the foot might succeed, if aided by compression, applied so as to stop the current through the other main channel; and he seems to approve of this practice, because the plan of tying the artery above and below the disease (which is the most certain means of cure) could not be done, without extensive incisions in the sole of the foot. In an aneurism at the lower part of the leg, Mr. Hodgson judiciously insists upon the prudence of tying the artery, as near as possible to the tumor, because the recurrent circulation, through the large inosculations in the foot, might still cause the swelling to enlarge, in consequence of the blood sent into the sac from the lower extremity of the vessel, passing through the aneurismal cavity into branches arising from the artery between the aneurism and the ligature. (*P.* 438.) However, in one case of aneurism of the anterior tibial artery, Mr. H. Cline applied a ligature just above the tumor without success, and Sir Astley Cooper expressly recommends making an incision on the sac, and applying a ligature both above and below the swelling. (*Lancet, vol.* 2, *p.* 44.) When an aneurism arises from the radial, ulnar, or interrosseous arteries near the elbow, tying the brachial will suffice; but, if the disease be lower down, the vessel from which it proceeds must be taken up near the swelling, (*Hodgson, p.* 393.) Scarpa mentions a case, where the dorsal artery of the thumb was wounded; but, as the hemorrhage returned several times, and pressure failed in suppressing it, the surgeon took up the radial artery at the wrist. After cutting off this direct current of blood towards the injured vessel, pressure on the wound proved effectual. Three months afterwards, the patient having died, the radial artery was found impervious for three fingers' breadth below where the ligature had been applied, and the dorsal artery was likewise obliterated from the root of the thumb to the beginning of the palmar arch.

The manner of exposing, and tying, the principal arteries of the leg and forearm will be described under the term, *Arteries.*

OF ANEURISMS HIGH UP THE FEMORAL ARTERY.

Several facts, already specified in the preceding columns as having occurred many years before the operation of tying the external iliac artery was attempted, amounted to a full proof, that the circulation might go on in the lower extremity, notwithstanding the artery in the groin were tied, or obliterated. On this point, some of Guattani's cases were most decisive.

The ligature of the external iliac artery, for aneurisms of the femoral artery in the bend of the groin, has now been practised so frequently, and the instances of success are so numerous, that all doubt concerning the propriety and utility of the attempt has entirely ceased. The French, who have evinced great backwardness in espousing the Hunterian method of operating for aneurisms, though it is decidedly one of the greatest improvements in modern surgery, have also shown great reluctance even to believe, much less to practise, the operation of tying the external iliac artery. A Parisian surgeon, however, who was in London a few years ago, saw the thing done, and the eyes of his brethren in the capital of France have since been a little more open. Still, as Roux remarks, " We cannot but blame the indifference, with which the operation is mentioned in some of the latest French surgical publications. At this moment (1815,) we can reckon twenty-three facts, relative to tying the external iliac artery, and, on fifteen of the patients, it has perfectly succeeded. In these twenty-three operations, I comprehend the two which were done in France; one at Brest, by Delaporte, and the other at Lyons, by Bouchet; cases, the authenticity of which cannot be doubted. In the number of successful cases, is to be comprised Bouchet's operation, since the patient lived more than a year afterwards, and then died of the consequences of an inguinal aneurism of the opposite side. Of the other twenty-one operations, fifteen were performed in London only, in the several hospitals of this metropolis, by Abernethy, Ramsden, A. Cooper, Brodie, and Lawrence, gentlemen who would never publish forged cases.

" Sir A. Cooper alone had tied the external iliac artery six times before my journey to London, and during my stay there, I saw him perform the operation once. Four of his patients were entirely well; one of the three others died, the thirteenth week after the operation, of the bursting of an aneurism of the aorta. At this period, the circulation in the limb had been re-established. I saw the limb after it had been injected, amongst Sir A. Cooper's anatomical preparations. Large and beautiful anastomoses existed round the pelvis, between the dilated branches of the internal iliac and femoral arteries. With respect to the sixth patient, the leg mortified, and the thigh was amputated without success. The seventh died of hemorrhage, which took place the fourteenth or fifteenth day after the operation." (*Parallèle de la Chir. Angloise avec la Chir. Françoise, p.* 275, 276.) Sir Astley Cooper has now tied the external iliac artery in nine cases. (See *Lancet, vol.* 2, *p.* 44.)

The many facts, already published, exemplifying the propriety of this operation, must be highly gratifying to Mr. Abernethy, by whose judgment it was first suggested, and by whose enterprising hand it was first practised.

Mr. Abernethy has been called upon in several cases to take up the external iliac artery, and they all prove, that the anastomosing vessels were fully capable of conveying blood enough into the limb below, and that a vessel even of this size could become permanently closed after being tied. Three of the operations done by this gentleman, I was an eye-witness of, and it is therefore with confidence that I can speak of the ease and simplicity of the requisite measures for securing the external iliac artery. (See *Abernethy's Surg. and Physiol. Essays; and Surgical Observations*, 1804; *Edinb. Med. and Surg. Journal for January*, 1807.)

In Mr. Abernethy's first operation, performed in 1796, an incision, about three inches in length, was made through the integuments of the abdomen, in the direction of the artery, and thus the aponeurosis of the external oblique muscle was laid bare. This was next divided, from its connexion with Poupart's ligament, in the direction of the external wound, for the extent of about two inches. The margins of the internal oblique and transverse muscles being thus exposed, Mr. Abernethy introduced his fingers beneath them to protect the peritoneum, and then divided them. Next he pushed this membrane with its contents upwards and inwards, and took hold of the external iliac artery with his finger and thumb. It now only remained to pass a ligature round the artery, and tie it; but, this required caution, on account of the contiguity of the vein to the artery. These Mr. A. separated with his fingers, and introducing a ligature under the artery with a common surgical needle, tied it about an inch and a half above Poupart's ligament. (*Surg. Essays.*)

The following was the method, which Mr. Abernethy adopted, the second time of tying the external iliac artery.

An incision, three inches in length, was made through the integuments of the abdomen, beginning a little above Poupart's ligament, and extending upwards; it was more than half an inch on the outside of the upper part of the abdominal ring, to avoid the epigastric artery. The aponeurosis of the external oblique muscle being exposed, was next divided, in the direction of the external wound. The lower part of the internal oblique muscle was thus uncovered, and the finger being introduced below the inferior margin of it and of the transversalis muscle, they were divided with the crooked bistoury for about one inch and a half. Mr. Abernethy now introduced his finger beneath the bag of the peritoneum, and carried it upwards by the side of the psoas muscle, so as to touch the artery about two inches above Poupart's ligament. He took care to disturb the peritoneum as little as possible, detaching it to no greater extent than was requisite to admit his two fingers to touch the vessel. The pulsations of the artery made it clearly distinguishable, but Mr. Abernethy could not put his finger round it with facility. In order to be able to do so, he was obliged to make a slight incision on each side of it. Mr. A. now drew the artery gently down, so as to see it behind the peritoneum. By means of an eye-probe, two ligatures were conveyed under the vessel; one of these was carried upwards as far as the artery had been detached, and the other downwards: they were firmly tied, and the vessel was divided in the interspace between them. (*Surg. Observ.* 1804.)

In a third instance of tying this vessel, Mr. Abernethy operated exactly as in the foregoing case, and with complete success. (See *Edinb. Surg. Journ. Jan.* 1807.)

Mr. Freer, of Birmingham, who may be said to claim the honour of having seconded Mr. Abernethy in this new practice, made an incision about one inch and a half from the spine of the ilium, beginning about an inch above it, and extending it downwards about three inches and a half, so as to form altogether an incision four inches and a half long, extending to the base of the tumor. The tendon of the external oblique being exposed, was carefully opened, and also the internal oblique, when the finger, being introduced between the peritoneum and transversalis, served as a director for the crooked bistoury, which divided the muscle. Avoiding all unnecessary disturbance, Mr. Freer separated the peritoneum with his finger, till he could feel the artery beating, which was so firmly bound down, that he could not get his finger under it without dividing its fascia. The vessel having been separated from the surrounding parts, a curved blunt needle, armed with a strong ligature, was put under it, and tied very tight, with the intention of dividing the internal coats of the vessel. The operation led to a perfect cure. (*Freer on Aneurism, p.* 83; 4*to.* 1807.)

Mr. Tomlinson, of the same town, was also an early performer of the operation: he applied only one ligature, and, of course, left the artery undivided: the event was attended with perfect success.

The following is Sir Astley Cooper's mode of operating, as described by Mr. Hodgson. A semilunar incision is made "through the integuments, in the direction of the fibres of the aponeurosis of the external oblique muscle. One extremity of this incision will be situated near the spine of the ilium: the other will terminate a little above the inner margin of the abdominal ring. The aponeurosis of the external oblique muscle will be exposed, and is to be divided throughout the extent and in the direction of the external wound. The flap, which is thus formed, being raised, the spermatic cord will be seen passing under the margin of the internal oblique, and transverse muscles. The opening in the fascia, which lines the transverse muscle, through which the spermatic cord passes, is situated in the midspace between the anterior superior spine of the ilium, and the symphysis pubis. The epigastric artery runs precisely along the inner margin of this opening, beneath which the external iliac artery is situated. If the finger, therefore, be passed under the spermatic cord, through this opening in the fascia, it will come into immediate contact with the artery, which lies on the outside of the external iliac vein. The artery and vein are connected together by dense cellular membrane, which must be separated to enable the operator to pass a ligature, by means of an aneurism needle, round the former." (*On Diseases of Arteries, p.* 421, 422.)

The foregoing incision, the convexity of which is turned outward, and downward, extends from within and a little above the anterior superior spinous process of the ilium to above, and a little within, the middle part of Poupart's ligament. As soon as the tendon of the external oblique muscle has been divided, the knife may be put down, and the internal oblique and transverse muscles raised from Poupart's ligament by introducing the finger behind them. Care must be taken to avoid the epigastric artery, which runs from the pubic side of the external iliac to the inner side of the incision. Baron Dupuytren, when performing the operation at the Hôtel-Dieu in Paris, in the autumn of 1821, wounded the epigastric artery. (See *Averill's Operative Surgery, p.* 37.) The hemorrhage was so copious, that two ligatures were required. The patient afterwards died of peritonitis, which, in all probability, was brought on by the disturbance of the parts in the proceedings requisite for securing the ends of the wounded vessel. The external iliac vein must also not be included in the ligature, as such a proceeding would cause a dangerous interruption to the return of the blood. When little of the artery is exposed, one ligature will suffice; in the contrary circumstance, it is best to apply two. (See *Lancet, vol.* 2, *p.* 44, 45.)

Mr. Norman, of Bath, who has tried both modes of operating, found that proposed by Sir A. Cooper a more easy way of finding the external iliac artery, than the longitudinal incision practised by Mr. Abernethy. "The objection, (says Mr. Norman,) to Sir A. Cooper's mode of operating in cases, where the tumor extends high up, is by no means well founded; for the lower part of the bag of the peritoneum, lying on the edge of Poupart's ligament, must in every case be exposed and detached, in order to get at the artery, which lies behind the posterior part of that membrane, and this is most easily effected by an incision in the direction of Poupart's ligament; whilst two-thirds of the longitudinal incision are made on a part of the peritoneum, which lines the abdominal muscles, and the lower portion only of the incision reaches that part of the membrane, which is to be separated. The consequences of this are, that the peritoneum is in much greater danger of being wounded, and that the probability of a hernia forming after the cure, is much increased by the extensive division of the oblique muscles." (See *Med. Chir. Tran. vol.* 10, *p.* 101.) As far as I am able to judge, these remarks are well founded, and they coincide with some observations, which were made some years ago by Roux, who, while he inclined to Mr. Abernethy's method, saw the disadvantage of letting the direction of the wound in this instance correspond to the course of the artery. Hence, after many trials on the dead subject, he laid down the rule, that the beginning of the wound should never be further, than half an inch from, and a very little higher, than the anterior superior spine of the ilium, and that it should be carried very obliquely downwards, to the middle of Poupart's ligament. (See *Nouveaux Elémens de Méd. Op. T.* 1, 747, *&c.*)

In a case, operated upon by Mr. Kirby, a hernia followed, in the situation where the abdominal muscles had been divided. (See *Cases with Observations, p.* 109, *8vo. Lond.* 1819.)

In one case, Dr. Post found the peritoneum so thickened and diseased, that he could not raise it from the subjacent parts, and he was obliged to make an opening in it. The protruding viscera were then pushed back, and, with a needle, a ligature was introduced under the artery, the peritoneum being also included in the ligature. Notwithstanding the disadvantageous method of operating, and the return of pulsation in the swelling, the patient had so far recovered in three months, that he had regained the use of the limb. (See *American Med. and Phil. Reg. vol.* 4, *p.* 443.)

In one remarkable case, Mr. Newbiggin, by tying the external iliac artery, cured both an inguinal and a popliteal aneurism together. (See *Edin. Med. & Surg. Journal, for Jan.* 1816, *p.* 71, *&c.*)

The many operations, which have now been done on the external iliac artery, have impressed me with a conviction, that in subjects under a certain age, there is no reason to fear, that the anastomoses will not generally suffice for the supply of the lower extremity. Out of twenty-five cases, I only know of three, in which the limb was attacked with gangrene. These three were patients of Sir A. Cooper, Bouchet, of Lyons, and Mr. Collier. The proportion is not so much as one in eight. The three instances of gangrene were not all in the circumstances, which permitted the event to be imputed to the anastomoses not having had sufficient time to enlarge, though perhaps Mr. Collier's case was such. On the other hand, we are to notice, that Dr. Cole's patient was operated upon a few days after the wound, and yet the limb was duly supplied with blood, and did not become gangrenous. It appears therefore to me, that the occasional occurrence of gangrene cannot be admitted as a just reason for delay, until the collateral vessels have had time to enlarge. I believe, that in all aneurismal diseases, early operating is the best, and most judicious practice. This was one principal cause, as Kirkland observes, which occasioned the bad success of the old surgeons in the treatment of popliteal aneurisms, and he foretold many years ago, that operations for the cure of aneurisms would answer better, if not deferred so long as formerly. (See *Thoughts on Amputation, &c. 8vo. Lond.* 1780.) I join Kirkland in this sentiment, not without recollecting, that all aneurisms are attended with a chance of getting well spontaneously in the course of time. I saw the inguinal aneurism which did so, under Dr. Albert, in the York hospital;

but as this also is a rare incident, I do not believe, that it ought to influence us against having speedy recourse to an operation. Besides, the cure by inflammation and sloughing appears to me to be attended in reality with more peril, than a well executed operation, and consequently, has less recommendations, than many may imagine. Had not Dr. Albert's patient been a very strong man, he would certainly have fallen a victim to the extensive disease, which the bursting and sloughing of the tumor created. Thus, Delaporte's patient died of the mass of disease, which the tumor itself made; for it had been suffered to attain too large a size, so that when it inflamed, the effects were fatal. (See *Richerand, Nosog. Chir. T.* 4, *p.* 113, *edit.* 4.)

I believe Dr. Wilmot's observation is perfectly correct, that, if a comparison were made, between the operation of tying the external iliac artery and that of tying the artery in the thigh, we should find the recoveries after the first more frequent, in proportion to the number of times it has been done, than after common operations lower down. (See *Dublin Hospital Rep. &c. vol.* 2, *p.* 214.)

The greatest artery that conveys blood into the lower extremity, after the external iliac has been tied, is the gluteal; but, besides it, the ischiatic, the obturator, and the external pudic, which anastomoses freely with the internal pudic, are important vessels in keeping up the circulation.

I subjoin a list of some of the successful examples of this operation. Mr. Abernethy, two cases, (*Surgical Works, vol.* 1.) Freer and Tomlinson, 2, (*Freer on Aneurism,* 1807.) Mr. A. Cooper, 4, (*Hodgson on Diseases of Arteries, p.* 417.) Goodlad, 1, (*Edin. Med. & Sur. Journ. vol.* 8, *p.* 32.) Mr. Brodie, 1, (*Hodgson. op. cit. p.* 419.) Lawrence, 1, (*Med. Chir. Trans. vol.* 6, *p.* 205.) J. S. Soden, 1, (*Same work, vol.* 7, *p.* 536.) G. Norman, 1, (*Same work, vol.* 10, *p.* 95, *&c.*) E. Salmon, 1, (*Same work, vol.* 12.) Bouchet, 1, (*Roux Med. Opératoire, T.* 1, *p.* 744.) J. S. Dorsey, (*Elements of Surgery, vol.* 2, *p.* 180, *Philadelphia,* 1813.) Mouland, 1, (*Bulletins de la Faculté de Médécine de Paris, T.* 5, *p.* 535.) Dupuytren, 1, (*French Transl. of Mr. Hodgson's Work, T.* 2, *p.* 215.) Dr. Cole, 1, (*Rapport des Travaux de la Societé d'Emulation de la Ville de Cambrai,* 1817, or *Lond. Med. Repository.*) Dr. Wilmot, 1, (*Dublin Hospital Reports, vol.* 2, *p.* 208, *&c.*) Kirby, 1, (*Cases with Observations, &c. 8vo. Lond.* 1819.) Dr. Post, 1, (*American Med. & Philos. Register, vol.* 4.) Newbiggin, 1, (*Edin. Med. & Surg. Journ. January,* 1816.) J. C. Warren, (*New England Journal, or Anderson's Quarterly Journ. vol.* 1, *p.* 136.) In this case the epigastric artery arose from the anterior and inner part of the sac, and gave origin to the obturator, while the circumflex ilii originated from the outer part of the sac. All these vessels were greatly enlarged, and the epigastric rendered the necessary detachment of the external iliac troublesome.

Some particulars of the case of ruptured inguinal aneurism, in which Sir A. Cooper tied the aorta, will be hereafter noticed. (See *Aorta.*)

Rosenmuller's Chir. Anat. Plates, in illustration of the operation of tying the external iliac artery, merit notice. (See *part* 3, *tab.* 2, 7, *and* 9.)

CASES OF GLUTÆAL ANEURISM CURED BY TYING THE INTERNAL ILIAC ARTERY.

The glutæal artery is large; from its situation, liable to wounds; from its size, subject to aneurism. Dr. Jeffray, of Glasgow, was consulted in a case, where the glutæal artery had been wounded. He urged the propriety of tying the vessel where it had been injured. This sensible advice was at first rejected, and when the friends at last consented, the operation was too late, as while preparation was making for it, the tumor burst, and the patient expired in a few moments.

Theden also mentions an instance, in which the glutæal artery was wounded in the dilatation of a gunshot wound, and the patient lost his life. (See *Scarpa on Aneurism, p.* 407, *Ed.* 2.)

Mr. John Bell, however, tied the glutæal artery in a case where it was wounded, and the patient was saved.

Mr. Stevens, surgeon in Santa Cruz, the gentleman who has proved the practicableness of putting a ligature round the internal iliac artery, informs us, that " one of the first surgeons in London had a patient with glutæal aneurism. The tumor was large; allowed to burst; and the person bled to death.

" I sincerely trust, says he, that the following case may be the means of preventing such an occurrence in future.

" Maila, a negro-woman, from the Bambara country in Africa, was imported as a slave into the West Indies in the year 1790. She was purchased for the estate Enfield Green; now the property of the heirs of P. Ferrall, Esq. I saw her first in the beginning of December, 1812. She had a tumor on the left hip, over the sciatic notch. It was nearly as large as a child's head, and pulsating very strongly. She could assign no cause for the disease. It had commenced about nine months before, with slight pain in the part; and had gradually increased to its present size. She was now much reduced, in great misery, and ready to submit to any operation." (See *Medico-Chir. Trans. vol.* 5, *p.* 425.) Mr. Stevens had tied the internal iliac on the dead body, and believed that it might be done with safety on the living. The following is some account of the operation: " On the 27th of December, 1812, (says Mr. Stevens), I tied the artery in the presence of Dr. Lang, Dr. Van Brackle, Mr. Nelthropp, and Mr. Ford, the manager of the estate. An incision, about five inches in length, was made on the left side, in the lower and lateral part of the abdomen, parallel with the epigastric artery, and nearly half an inch on the outer side of it. The skin, the superficial fascia, and the three thin abdominal muscles, were successively divided; the peritoneum was separated from its loose connexion with the iliacus internus and psoas magnus; it was then turned almost directly inwards, in a direction, from the anterior superior spinous process of the ilium, to the division of the common iliac artery. In the cavity, which I had now made, I felt for the internal iliac, insinuated the point of my fore-finger behind it, and then pressed the artery betwixt my finger and thumb. Dr. Lang now felt the aneurism behind; the pulsation had entirely ceased, and the tumor was disappearing. I examined the vessel in the pelvis; it was healthy, and free from its neighbouring connexions.

I then passed a ligature behind the artery, and tied it about half an inch from its origin. The tumor disappeared almost immediately after the operation, and the wound healed kindly. About the end of the third week, the ligature came away, and in six weeks the woman was perfectly well."

This is the first example, in which the internal iliac was tied. The operation was not attended with much difficulty, or pain, and not an ounce of blood was lost.

Mr. Stevens had no difficulty in avoiding the ureter, which, when the peritoneum was turned inwards, followed it. Had it remained over the artery, Mr. Stevens says, that he could easily have turned it aside with his finger. (See a particular history of this case in *Medico-Chirurg. Trans. vol.* 5, *p.* 422, *&c.*)

A second instance, in which the internal iliac artery was tied, was some time ago communicated to the public. The operation was performed by Mr. Atkinson, of York, on account of a glutæal aneurism. The following are a few of the particulars, as related by this gentleman: Thomas Cost, aged 29, presented himself at the York County Hospital, April 29th, 1817. He was a tall, strong, active bargeman, not corpulent, but very muscular. He was enduring great pain from a large renitent, pulsating tumor, situated under the glutæus of the right side; an obvious aneurism. It had existed about nine months, and was the consequence of a blow from a stone. In a consultation with Dr. Lanson and Dr. Wake, the necessity of the operation was determined upon, and it was performed on the 12th of May, without any material difficulty, or interruption, except such as was the consequence of the division of, and bleeding from, the small muscular arteries. Having got command of the internal iliac artery within the pelvis, which, says Mr. Atkinson, required the complete length of the fingers to accomplish, it was tied. Sufficient proof of its being the identical artery was repeatedly obtained, by the pressure upon it stopping the pulsation, and causing a subsidence of the tumor. Dr. Wake, Mr. Ward, and all the pupils, were quite assured of the circumstance. The artery being then tied, the pulsation of the swelling entirely ceased. Some delay in placing the ligature arose from the needle not being sufficiently pliable; but, for future operations of this kind, Mr. Atkinson very properly recommends the ligature to be put round the artery by means of an instrument, resembling a catheter, the wire of which has a little ring at its extremity, and can be pushed out some way beyond the end of the tube.

The patient went on tolerably well for some time after the operation; the pulse never exceeded 130, and after a time sunk to 85 or 90. He became exhausted, however, partly by the discharge, and partly by hemorrhage, and died on the 31st of May, about nineteen days after the operation. In the dissection, the cavity, on the external part of the peritoneum, in the situation of the incision, was completely filled with coagulated blood. "The ligature, on moving a part of this (blood) with a sponge, readily followed it, and, without doubt, had been disengaged for some days." The internal iliac, which appeared to have been tied, had separated about an inch and a half from the bifurcation with the external iliac. By "separated" I conclude Mr. Atkinson means, that the upper part of the internal iliac was separated from the continuation of the same vessel. (See *Medical and Phys. Jour. vol.* 38, *p.* 267, *&c.*) Although this gentleman has not given a very clear account of some part of the dissection, and he has also omitted to describe the place of his external incision, or the exact parts, which he divided in the operation, yet, I think that all the circumstances of the case taken together, leave not the smallest doubt of the internal iliac artery having been actually tied. The complete stoppage of the pulsation, as soon as the ligature was applied, and the testimony of several respectable practitioners, who were present, seem, indeed, to remove all ambiguity. The profession is much indebted to Mr. Atkinson for this important communication, which was in some measure required, in order to confirm Mr. Stevens's similar case, as, it is well known, that some distinguished anatomists and surgeons in this metropolis formerly expressed very strong doubts of the practicable nature of the operation.

The internal iliac artery is also said to have been tied, with success, by an army-surgeon in Russia, upon whom the Emperor Alexander has settled a pension, as a reward for the skill displayed in the treatment of the case. (See *Averill's Operative Surgery, p.* 39.)

In a modern publication are given a few particulars of a case, which was supposed to be an aneurism of the glutæal artery, and cured by means of pressure, a light vegetable diet, gentle laxatives, and digitalis. (See *Trans. of the Fellows, &c. of the King's and Queen's College of Physicians in Ireland, vol.* 1, *p.* 41, *8vo. Dub.* 1817.) From the very imperfect account here given of the tumor, it is impossible to form any conclusion respecting its nature.

Sandifort has recorded an instance of an aneurism of the internal iliac artery itself. (See *Tabulæ Anatomicæ, &c. Præcedit Obs. de Aneurysmate Arteriæ Iliacæ internæ, rariore ischiadis Nervosæ causa. fol. Ludg.* 1804.)

ANEURISMS OF THE BRACHIAL ARTERY.

Surgical writings contain many histories of aneurisms in the bend of the arm, produced by the puncture of the brachial artery in venesection, or caused by a deep wound inflicted at the bend of the arm, along the inner side of the humerus, or in the axilla. Such cases must indisputably be formed by effusion. Although Morand and others have found, that, along with aneurisms, caused by a wound of the brachial artery, the diameter of the vessel is sometimes unusually enlarged through its whole length, above the seat of the tumor, this enlargement, which is very rare, might have existed naturally, before the puncture occurred. Even were it frequent, such an equable longitudinal expansion of the tube of the artery could not explain the formation of the aneurismal sac in the bend of the arm, along the inner side of the humerus, or in the axilla, after wounds. (*Scarpa, p.* 160.)

The proximate cause of these cases may invariably be traced to the solution of continuity in the two proper coats of the artery, and the consequent effusion of blood into the cellular substance. The effect is the same, whether from an internal morbid affection, capable of ulcerating the internal and fibrous coats of the artery, the blood be effused into the neighbouring cellular sheath surrounding the artery, which it raises after the manner of an aneurismal sac; or, the wound of the integuments having closed, the blood issue from the artery, and be diffused in the surrounding parts. The cellular substance, on the outside of the wounded vessel, is first injected, as in ecchymosis; the blood then distends it, and elevates it in the form of a tumor, and, the cellular divisions being destroyed, converts it at last into a firm capsule, or aneurismal sac. (*Scarpa*, *p.* 167.)

The circumscribed or the diffused nature of the aneurism, and the rapidity or slowness of its formation, depend on the greater or less resistance to the impetus of the blood, during the time of its effusion, by the interstices of the cellular substance surrounding the artery, and by the ligamentous fasciæ and aponeuroses, lying over the sac. The aponeurosis of the biceps muscle, being only half an inch broad, and situated lower than the common place for bleeding, cannot, at least in most cases, materially strengthen the cellular substance surrounding the artery, as is commonly supposed. (*Scarpa*, *p.* 168—170.) This author refers the greatest resistance to the intermuscular ligament, which after having covered the body of the biceps muscle, extends over the whole course of the humeral artery, and is implanted into the internal condyle. This ligamentous expansion has a triangular shape, the base of which extends from the tendon of the biceps, to the internal condyle, while the apex reaches upward along the inner side of the humerus towards the axilla, in the course of the artery. The humeral artery and median nerve, kept in their situation by the cellular sheath and this ligamentous expansion, run in the furrow, formed between it and the internal margin of the biceps. (*Scarpa*, 171.) This author anatomically explains many circumstances relative to the diffusion, circumscription, shape, &c. of brachial aneurisms, by this intermuscular ligament. While aneurisms, from an internal cause, are not unfrequent in the aorta, thigh, and ham, they are very rare in the brachial artery; though a few such instances are recorded. (*Scarpa*, 174. *Pelletan*, *Clinique Chir. T.* 2, *p.* 4.)

The mode of distinguishing a wound of the brachial artery, in attempting to bleed, and the method of trying to effect a cure by pressure, are described in the article *Hemorrhage*.

Anel was the first, who tied the brachial artery, for the cure of the aneurism at the bend of the arm, in the same way that Hunter did the femoral, for the cure of aneurisms in the ham, viz. with one ligature above the tumor, without making any incision upon, or into, the sac itself.

The operation is performed as follows:—the surgeon having traced the course of the brachial artery, and felt its pulsations above the aneurism, he may either cut down to the vessel immediately above the tumor, or much higher in the long space between the origins of the superior and inferior collateral arteries. The integuments are to be divided in the course of the artery, and also the cellular sheath for the space of about two inches and a half. The surgeon now introducing his left fore-finger to the bottom of the wound, will feel the denuded vessel, and, if it is not sufficiently bare, he must divide the parts which still cover it, observing to introduce the edge of the knife, on the side next to the internal margin of the biceps, to avoid dividing any of the numerous muscular branches, which go off from the opposite side of the artery. He is then to insulate, with the point of his finger, the trunk of the vessel, alone if he can, or together with the median nerve and vein, and raise it a little from the bottom of the wound. He is to separate the median nerve and vein, for a small space from the artery, and with an eyed needle is to pass a ligature under the latter, and then tie it with a simple knot.

In the operation, it should always be recollected, that the median nerve lies on the inside of the artery, and therefore, that the instrument, used for putting the ligature under the vessel, should be passed from within outwards, by which means the inclusion of the nerve may be most easily avoided. (*Boyer*, *Traité des Maladies Chirurgicales*, *&c. T.* 2, *p.* 193.)

The operation is well described by Mr. Hodgson: "The surgeon divides the integuments along the ulnar margin of the biceps muscle by an incision two inches and a half in length. The thin fascia, which surrounds the arm, will thus be exposed, and must be cautiously divided in the direction of the external wound. The artery lies immediately under the fascia, close to the margin of the biceps. The median nerve is situated on the ulnar side of the artery, which lies between its two venæ comites. The internal cutaneous nerve is also situated under the fascia in the middle of the arm, and lies on the ulnar edge of the median nerve. The cellular membrane which connects these parts is to be divided, until the coats of the artery are fairly exposed. This part of the operation will be effected with facility, if an assistant compress the artery above the wound, so as to stop the circulation through it, and render it in some degree flaccid. The point of an aneurismal needle is then to be introduced close to the ulnar, and brought out on the radial side of the artery, so as to avoid including the median nerve, or the veins which accompany the artery." (*On Diseases of the Arteries*, *&c. p.* 391.)

Whoever, after the above directions, says Scarpa, shall have the treatment of a *circumscribed* aneurism in the bend of the arm, will no longer, it is to be hoped, follow the method of those, who, supposing the tumor to be formed by the dilatation of the artery, used first to divide the integuments over the tumor, insulated the sac, and sought for the vessel above and below the aneurism, in order to tie it in two places; and then endeavoured to make the sac slough away. The operation is now reduced to the greatest simplicity, viz. tying the artery merely above the tumor. (See *Scarpa*, *p.* 358, 359.)

When the aneurism is *diffused* and accompanied with violent inflammation and swelling of the whole arm, from the excessive distention of the clots of effused blood, Scarpa recommends the old operation of opening the tumor, and tying the artery at the bottom of the sac, above and below the wound made by the lancet. In this method, a tourniquet must be applied to the upper part of the arm, near the axilla; or, if the limb be very painful and swelled, it is better to let an assistant compress the artery from above the clavicle, against the first rib. The incision having been made into the tumor, and the blood discharged, a probe is to be introduced into the puncture in the vessel, from below upwards, so as to raise the artery. This, being separated from the parts beneath, and the median nerve, for a small extent, is to have two ligatures put under it, one of which is to be tied above, the other below, the wound in the vessel. Then the tourniquet, or pressure, is to be taken off, and if there be no bleeding the wound is to be brought together. (See *Scarpa, p.* 359.) With reference to this operation, Rosenmuller's Chir. Anat. Plates, Part 2. Tab. 11. and Camper's Demonstr. Anat. Pathol. Lib. 1. are worth consulting.

It was on the brachial artery, that Mr. Lambert, (*Med. Ob. & Inquiries, Vol.* 2.) made the experiment of closing the puncture in the vessel by means of the twisted suture, under an idea, that the plan would not, like compression, obliterate the arterial tube, and therefore, that the risk of gangrene would be lessened. Now, although in the trial which was made, the bleeding was permanently stopped, Lambert was mistaken in supposing, that the previous state of the wounded part of the artery was preserved by the adoption of the twisted suture, instead of pressure, or the ligature. If ever a small puncture in an artery heal, so as to leave the tube of the vessel pervious, it is under the circumstances pointed out by Dr. Jones. (See *Hemorrhage.*) Had Lambert had an opportunity of examining the state of the vessel, some time after the above operation, he would have found its canal obliterated; and had he known the freedom with which the collateral arteries anastomose with the recurrent arteries of the forearm, he would have known how to explain more correctly the re-establishment of the pulse. I need merely add, that as the false idea of preserving the perviousness of the artery was the only foundation for the method, the practice ought never to be revived, as not affording equal security from hemorrhage to what is obtained by the ligature, or even compression.

AXILLARY ANEURISMS.

Aneurisms occasionally take place in the axilla, and make it necessary to tie the subclavian artery. A question, here naturally presenting itself, is, whether the surgeon should attempt the operation in an early period of the disease, or wait till circumstances are urgent; the aneurism large and far advanced; the arm œdematous and insupportably painful; from the stretching of the axillary plexus of vessels; the patient worn out by suffering and loss of rest; and the tumor in danger of bursting? In all cases of aneurism, unquestionably, there is a certain chance of the disease getting well spontaneously; and one axillary aneurism, in a man in St. Bartholomew's Hospital a few years ago, had certainly disappeared of itself, as was proved by the account which the patient while living gave of his case, and by the obliteration of the artery, found on inspection after death.

I believe, however, we ought not to suffer our conduct to be too much influenced by the hope of so unfrequent an event, and, from the observations which I have made on this subject, it is my decided opinion, that the operation should never be delayed, so as to allow the tumor to acquire an immoderate size. The operation is always difficult; but, the difficulty is seriously increased, when the swelling has extended far towards the breast, and has become so large as to push the clavicle considerably upwards. The several examples, in which the subclavian artery has now been successfully tied, furnish abundant proof, that the anastomoses are fully competent to the supply of the limb with blood. The plan, therefore, of delaying the operation long, with the view of allowing the inosculating arteries to enlarge, must be as questionable here, as in some other cases of aneurism, and, at all events, the maxim may be safely advanced, that previously to the operation, the tumor should never be suffered to acquire an enormous size.

That the limb would receive an adequate supply of blood was well proved, even without the performance of the operation, by cases in which the axillary and subclavian arteries had been rendered impervious by disease, as, for instance, by the pressure of an aneurism of the aorta. (For an account of such facts, the reader is particularly referred to *Hodgson's Treatise on the Diseases of Arteries, p.* 111; *Journal de Médecine by Corvisart, Leroux and Boyer, T.* 2, *p.* 29; *Corvisart, Essai sur les Maladies du Cœur, p.* 215.)

"In these cases (says Mr. Hodgson) the only unusual circumstance, which was observed during the life of the patients, was the deficiency of the pulse at the wrist. The limbs were well nourished, although a considerable extent of the main artery (the subclavian) was obliterated even before it had given off any branches." (P. 47.)

This vessel was tied by a Mr. Hall, in Cheshire, when it had been wounded with a scythe, and its ends exposed; the arm was preserved, though it remained somewhat weakened, which might be owing to the division of some large nerve, (See *J. Bell on Wounds, p.* 60. *edit.* 3, and *Scarpa. p.* 372.) Mr. White, of Manchester, relates another instance of this vessel being tied, in the case of a wound; but, mortification of the limb, and death followed. Three of the nerves were found included in the ligature. (*Lond. Med. Journ. V.* 4.) In cases of wounds of the axillary, or any other large arteries of the extremities, the surgeon, before proceeding to apply a ligature, should first ascertain the precise place of the wound in the artery; and, for this purpose, it may sometimes be proper, in certain wounds of the shoulder, to make an incision in the axilla so as to expose the injured part of the vessel; or if circumstances do not forbid it, the external wound may be dilated, until the exact part where the artery has been wounded is discovered. In proof of the propriety of acting in this manner, and applying a ligature above and below the wound in the vessel, Scarpa quotes a case, in which such practice was successful on a patient under M. Maunoir, of Geneva: the artery had been injured with a sabre near the head of the humerus: but, after the wounded part of the vessel had been traced, and secured in the way above suggested, the patient, a boy fourteen years of age, was saved from the dangers of hemorrhage and recovered the use of his arm, as fast as this was possible, with the loss of the first phalanges of the three last fingers from gangrene. (See *Scarpa on Aneurism*, *p.* 412, *Ed.* 2, *and Journ. de Méd. T.* 40, *Mars* 1811.)

There are two modes of operating for axillary aneurisms; one by cutting below the clavicle, in order to take up the axillary artery itself; the other, by making the wound above the bone, for the purpose of securing the subclavian artery at the point where it emerges from behind the anterior scalenus muscle.

The first of these methods has been attempted by Desault, Pelletan, the late Mr. Keate, Mr. Chamberlaine, &c. It was in a case of wound of the axillary artery, that Desault operated. An incision, six inches long, was made below the external third of the clavicle; two thoracic arteries cut were immediately tied; the two lower thirds of the great pectoral muscle were next divided with a bistoury guided on a director: a large quantity of coagulated blood was now discharged; and the artery was directly taken hold of, and tied, together with the brachial plexus of the nerves. The arm mortified, and the patient died. This case, we must agree with Scarpa, was not a fair trial of the operation, inasmuch as the inclusion of the plexus of nerves in the ligature was an improper measure, and must have promoted the occurrence of sphacelus. It seems also probable from the account, that the vein was likewise tied; another serious and objectionable proceeding. Besides, it is worthy of notice, that the case was a wound of the axillary artery, attended with a copious effusion of blood in the cellular membrane. In all examples of this kind, gangrene is more readily induced, than when the case is a mere circumscribed aneurismal tumor. (See *Œuvres Chir. de Desault par Bichat, T.* 2, *p.* 553.) As for Pelletan's example, it hardly deserves recital, because the operation in fact was not achieved. His colleagues objected to dividing the pectoral muscle; a random thrust was made with a needle and ligature; but the artery was not included, and the experiment was not repeated. (See *Clinique Chir. T.* 2, *Obs.* 7, *p.* 49.)

In a case of axillary aneurism, which had actually burst, and the hemorrhage from which could only be stopped by pressing the artery against the first rib, Mr. Keate, the surgeon-general, practised the following operation, which was attended with complete success. His plan was to take up the artery, above the diseased and ruptured part, in its passage over the first rib. Accordingly, he made an incision obliquely downwards, divided the fibres of the pectoral muscle, that were in his way, and, when he came to the artery, passed a curved, blunt-pointed, silver needle, armed double, as he conceived, under the artery, and tied two of the ends. After a careful examination, finding that the artery pulsated below the ligature, he determined on passing another ligature higher up, and nearer to the clavicle: he, therefore, passed the needle more deeply, so as evidently to include the artery. In a few days the swelling of the arm began to subside, the wound suppurated, and the ligatures came away with the dressings. The arm afterwards recovered its feeling, and the patient regained, in a great measure, the entire motion of the shoulder, &c. (See *Med. Review and Magazine for* 1801.)

Mr. Keate's operation is objectionable, inasmuch as it was a dive made with a needle, and attended with great danger of wounding and tying parts, which should be left undisturbed.

Mr. R. Chamberlaine, of Kingston, Jamaica, took up the axillary artery below the clavicle, in a patient, who had an aneurism in the left axilla, occasioned by a wound with a cutlass on the 5th of October, 1814. On the 10th of January, the tumor had considerably increased, and was less compressible, than it had been when first seen by Mr. Chamberlaine. The operation was done on the 17th of January, 1815: "a transverse incision, of three inches in length, was made through the skin and platysma myoides, along and upon the lower edge of the clavicle, three fingers' breadth from the sternal end of that bone, and terminating about an inch from the acromion scapulæ. This incision divided a small artery, which was immediately secured. A second incision, of three inches in length, was also made obliquely through the integuments over the deltoid and pectoral muscles, meeting the first nearly in the centre. The cellular membrane and fat, lying between them at the upper part, were now removed. The next step consisted in detaching the clavicular portion of the pectoralis major, and taking away the fat and cellular membrane lying over the subclavian vessels. The artery was now brought into view, and its pulsations made it clearly distinguishable from the contiguous parts." After several ineffectual efforts, Mr. Chamberlaine succeeded in conveying a ligature under it, by means of an eye-probe, curved for the purpose, and the point of which was brought up with the aid of a pair of forceps. On the 22d of February, the wound was completely healed; the aneurismal tumor reduced to the size of a turkey's egg, and very solid; the arm smaller, than its fellow, but its muscular power improving. (See *Medico Chir. Trans. Vol.* 6, *p.* 128, *&c.*) Mr. Chamberlaine expresses his conviction, that the operation would have been much facilitated, had he been furnished with the instruments described in Mr. Ramsden's work for passing the ligature under the artery: a still better invention, however, for passing a ligature under a deep artery, is the needle lately constructed by Mr. Weiss, surgeon's instrument-maker, in the Strand. An engraving and description of this valuable instrument may be found in the *Edinb. Med. and Surgical Journal, No.* 76.

The subclavian artery might be got at below the clavicle, as follows: the surgeon is to begin an incision in the integuments, about an inch from the sternal end of this bone. The cut is to run towards the acromion, deviating a little downward from a line parallel to that of the clavicle. This wound will bring into view some fibres of the great pectoral muscle originating from the last-mentioned bone. These are next to be divided. Some cellular substance will be found underneath, which is to be carefully raised with a pair of dissecting forceps, and cut. The operator will thus arrive at the great subclavian vein, and cephalic vein uniting with it. Under the subclavian vein, and a little further backward, more under the clavicle, the subclavian artery may be felt and tied. (See *C. Bell's Operative Surgery, Vol.* 2, *p.* 370.)

On the whole, however, I think, Mr. Hodgson's directions for the performance of this operation are the best which have been given: A semilunar incision through the integuments, which is to have its convexity downwards, and to begin about an inch from the sternal end of the clavicle, being continued towards the acromion for the extent of three or four inches, so as to end near the anterior margin of the deltoid muscle, without reaching into the space between the deltoid and pectoral muscle, in order to avoid wounding the cephalic vein. This incision will expose the fibres of the pectoral muscle, which are now to be divided in the direction and extent of the external wound. The flap is then to be raised, by dividing the loose cellular membrane, which connects the pectoral muscle to the parts underneath it. The pectoralis minor will now be seen crossing the inferior part of the wound; and by introducing his finger between the upper edge of this muscle and the clavicle, the surgeon may feel the pulsations of the axillary artery. Here one of the cervical nerves lies above, but in contact with the artery; the other nerves are behind it. In the dead subject, the axillary vein is situated below it; but, in the living, the vein is distended, and conceals the artery. The cellular membrane, connecting these parts, is to be separated by careful dissection, or by lacerating it with a blunt instrument. A ligature having been drawn under the artery with an aneurism-needle, the ends of the cord are to be raised, and a finger passed down, so as to compress the part surrounded by the ligature. If the artery be included, the pulsation in the aneurism will immediately cease. This precaution is highly necessary, lest one of the cervical nerves should be tied, instead of the artery. (See *Hodgson on Diseases of Arteries, &c. p.* 362.)

When an aneurism extends a certain way inwards, or towards the trachea, the operation below the clavicle becomes impracticable, and it is now requisite to make the incision above that bone, and take up the subclavian artery at the point, where it comes out from between the scaleni muscles, and lies on the flat surface of the first rib.

In the dead subject, without any tumor under the clavicle, this operation is easy enough; but in a living patient, the difficulty is much increased, by a large axillary aneurism, for then the clavicle is sometimes so much elevated, and the artery lies so deeply, that a ligature can hardly be carried under it, without a particular needle for the purpose. This was the case in an attempt which I once saw made to tie the artery, and in which one of the cervical nerves, affected by the pulsation of the artery, was mistaken for it, and tied, so that the aneurism soon afterwards burst, and a fatal hemorrhage arose. Hence, the advice given by my friend Mr. Hodgson always to operate in this case while the tumor is small, cannot be too well remembered. The chief difficulty in the operation is that of passing the ligature round the artery; but, it may be done either with an ingenious needle, which Mr. Ramsden has described, and which is exactly similar in principle to Desault's *aiguille à ressort*, or with the still preferable instrument constructed by Weiss. Another very ingenious contrivance for tying deep arteries has also been recently proposed by Dr. Prevost, of Geneva. (See *Edinb. Med. and Surgical Journ. No.* 79.) The instruments, used by Dr. Mott, when he took up the arteria innominata, will be presently noticed.

In order to avoid the inconveniences of the needles ordinarily used for conveying ligatures under deep arteries, Desault (says Bichat) invented "une aiguille à ressort," composed of a silver tube, or sheath, which was straight at one end, and bent at the other in a semicircular form. This sheath enclosed an elastic wire, the projecting extremity of which was accurately fitted to the end of the sheath, and perforated with a transverse eye. The instrument was passed under the artery, and, as soon as it had reached the other side of the vessel, the sheath was kept fixed, while an assistant pushed the elastic wire, which, rising from the bottom of the wound, presented the aperture or eye to the surgeon, who now passed the ligature through this opening. The wire was next drawn back into its sheath again, and the whole instrument brought from beneath the artery, by which means, the ligature was conveyed under the vessel. (See *Œuvres Chir. de Desault, par Bichat, T.* 2, *p.* 560.)

The invention of the foregoing instruments makes a material diminution in the difficulty of taking up the subclavian artery from above the clavicle; nor can it be wondered, that without such an instrument, the operation should have baffled even so skilful a surgeon as Sir A. Cooper. (See *Lond. Med. Review, Vol.* 2, *p.* 200.)

The following example is the first, in which the attempt to tie the subclavian artery by cutting above the clavicle, was ever accomplished.

John Townly, a tailor, aged thirty-two, addicted to excessive intoxication, of an unhealthy and peculiarly anxious countenance, was admitted into St. Bartholomew's Hospital on Tuesday, the 2d of November, 1809, on account of an aneurism in the right axilla. The prominent part of the tumor in the axilla was about half as big as a large orange, and there was also much enlargement and distention underneath the pectoral muscle, so that the elbow could not be brought near the side of the body.

"The temperature of both arms," says Mr. Ramsden, "was alike, and the pulse in the radial artery of each of them was correspondent. After the patient had been put to bed, some blood taken from the left arm, and his bowels emptied, his pulse, which, on his admission, had been at 130, became less frequent; his countenance appeared more tranquil; and he experienced some remission of the distressing sensations in the affected arm: this relief, however, was of short duration."

The pulsation of the radial artery of the affected arm gradually became more obscure, and soon after either ceased, or was lost in the œdema of the forearm and hand. On the evening of the twelfth day, a dark spot appeared on the centre of the tumor, surrounded by inflammation, which threatened a more extensive destruction of the skin. A farther postponement of the operation being deemed inadmissible, Mr. Ramsden performed it the next day in the following manner:

"A transverse incision was made through the skin and platysma myoides along, and upon the upper edge of the clavicle, about two inches and a half in length, beginning it nearest to the shoulder, and terminating its inner extremity at about half an inch within the outward edge of the sterno-cleido-mastoideus muscle. This incision divided a small superficial artery, which was directly secured. The skin, above the clavicle, being then pinched up, between my own thumb and finger, and those of an assistant, I divided it, from within, outwards and upwards, in the line of the outward èdge of the sterno-cleido-mastoideus muscle, to the extent of two inches.

"My object, in pinching up the skin for the second incision, was to expose at once the superficial veins, and by dissecting them carefully from the cellular membrane, to place them out of my way, without wounding them. This provision proved to be useful, for it rendered the flow of blood during the operation very trifling, comparatively with what might otherwise have been expected; and thereby, enabled me with the greatest facility to bring into view those parts, which were to direct me to the artery.

"My assistant having now lowered the shoulder, for the purpose of placing the first incision above the clavicle, (which I had designedly made along and upon that bone) I continued the dissection with my scalpel, until I had distinctly brought into sight the edge of the anterior scalenus muscle, immediately below the angle, which is formed by the traversing belly of the omo-hyoideus, and the edge of the sterno-cleido-mastoideus, and having placed my finger on the artery, at the point where it presents itself between the scaleni, I found no difficulty in tracing it without touching any of the nerves to the lower edge of the upper rib, at which part, I detached it with my finger nail for the purpose of applying the ligature.

"Here, however, arose an embarrassment, which (although I was not unprepared for it) greatly exceeded my expectation. I had learned from repeatedly performing this operation, many years since, on the dead subject, that to pass the ligature under the subclavian artery, with the needle commonly used in aneurisms, would be impracticable; I had, therefore, provided myself with instruments of various forms and curvatures to meet the difficulty, each of which most readily conveyed the ligature underneath the artery; but, would serve me no farther; for, being made of solid materials, and fixed into handles, they would not allow of their points being brought up again at the very short curvature, which the narrowness of the space, between the rib and the clavicle, afforded, and which, in this particular case, was rendered of unusual depth, by the previous elevation of the shoulder by the tumor.

"After trying various means to overcome this difficulty, a probe of ductile metal was at length handed me, which I passed under the artery, and bringing up its point with a pair of small forceps, I succeeded in passing on the ligature, and then tied the subclavian artery at the part, where I had previously detached it for that purpose. The drawing of the knot was unattended with pain, the wound was closed by the dry suture, and the patient was then returned to his bed." (See *Practical Observations on the Sclerocele, &c. to which are added four cases of operations for Aneurisms, p.* 276, *&c.)*

It only seems necessary for me to add, that immediately the artery was tied, the pulsation of the swelling ceased; that the arm of the same side continued to be freely supplied with blood, and was even rather warmer than the opposite arm; that the operation, which was severe from the length of time it took up, was after a time followed by considerable indisposition; that the patient died about five days after its performance; that, after the artery had been tied, the œdema of the arm and the aneurismal tumor partly subsided; and, that on examination after death, nothing, but the vessel, was found included in the ligature.

In this publication are descriptions of instruments, which will be of great service to any future performer of this operation. The chief one is a needle, resembling that, which was invented and used by Desault, and of which I have already endeavoured to give an idea. By means of this instrument, I conceive, that the main difficulty of the operation will not in future be experienced. Had Mr. Ramsden had its assistance, his patient would have been detained a very little time in the operating theatre, and the event of the case might have been completely successful. Having witnessed all the circumstances of the case, the inference that I drew from them was, that, if the operation could have been done in a moderate time, which now seems practicable with the aid of the aiguille à ressort, or the instrument sold by Mr. Weiss, the case in all probability would have ended well. The preceding case is particularly memorable, as being the first instance, in which the subclavian artery was scientifically tied, without any random thrust of a needle, and without the inclusion of any part besides the artery in the ligature. It furnished encouragement to repeat the experiment; held out the hope, that axillary aneurisms might be cured as well as inguinal ones; and confirmed the competency of the anastomosing arteries to nourish the whole upper extremity, when the subclavian is tied where it emerges from behind the anterior scalenus muscle.

In the year 1811, the subclavian artery was tied in the London Hospital, in a case of axillary aneurism, by Sir W. Blizard, who found no difficulty in getting the ligature under the artery, with a common aneurism needle. A single ligature was applied. At first, hopes of recovery were entertained; but the patient, who was old and debilitated, afterwards sunk, and died on the fourth day. (See *Hodgson's Treatise, p.* 375.)

In the year 1815, Mr. Thomas Blizard tied the subclavian artery, in the same hospital. The case was an aneurism in the left axilla, and, like all the other examples of this kind upon record, was attended with great pain in the tumor and limb. There was no pulse in the left radial artery, though there was scarcely any difference in the temperature of both arms. "An incision, about three inches in length, was made through the integuments at the root of the neck, on the acromial side, and parallel with the external jugular vein. The platysma myoides being divided, the cellular membrane was separated with the finger, until the pulsation of the subclavian artery was felt where the vessel passes over the first rib. The finger being pressed upon this part of the artery, the cellular sheath investing it was carefully opened with the point of a knife. A ligature was then conveyed underneath the artery, by means of a common aneurism-needle, with the greatest facility." As soon as the ligature was tied, the pulsation in the tumor ceased. On the second day after the operation, the left arm began to have more feeling, and was as warm as the right. However, difficulty of breathing, twitchings, delirium, &c. afterwards ensued, and the patient died on the evening of the eighth day, previously to which event the ring and middle fingers turned black. On opening the body, the pericardium exhibited the effects of a high degree of inflammation, and the heart was covered with flakes of lymph, its posterior surface being of a deep red colour. The inner membrane of the ascending aorta was of a bright scarlet hue, much diseased, and studded with white patches. A reddish appearance was also noticed in the lining of the right carotid, left subclavian, and even the abdominal aorta. The boundaries of the aneurismal tumor were in a state of sphacelation. These are all the circumstances which I wish here to notice; but more particulars may be perused in Mr. Hodgson's work, p. 602.

It is remarkable, that in the cases operated upon in the London Hospital, and some others on record, no difficulty was experienced in passing the ligature under the artery with a common aneurism-needle, a circumstance which must have depended upon the space between the clavicle and the first rib having been less deep in these instances, than the two which fell under my own observation, or in others which occurred in the practice of Dr. Colles, Sir Astley Cooper, and Mr. Liston. (See *Lond. Med. Review, vol.* 2, *p.* 200, *and Edinb. Med. and Surg. Journal, January,* 1815, *No.* 64.)

In Dr. Colles's first case, the artery was tied before it reached the scaleni muscles, as the tumor, which was in the right subclavian artery, extended from the sternal origin of the sterno-mastoid muscle along the clavicle, a little beyond the arch of that bone, and rose nearly two inches above it, in a conical form, the apex of the cone being situated at the outer edge of the foregoing muscle. After a tedious dissection, it was found, that only a quarter of an inch of the artery was sound, and on this portion the ligature was placed. Great difficulty was encountered in passing it round the artery, and the pleura was supposed to have been slightly wounded. Before tightening the ligature, the breathing became laborious, and the patient complained of oppression about the heart. These symptoms, indeed, were so violent, that it was judged prudent not immediately to tighten the ligature. On the fourth day, however, the artery was constricted, when the pulse at the wrist ceased, the patient not seeming to suffer much from what had been done. The patient then went on pretty well till the ninth day, when he was seized with a sense of strangling, and pain about his heart, and becoming delirious, died in nine hours after the beginning of this attack. On dissection, the aorta was found diseased, and the disease extending into the subclavian artery.

In another instance, Dr. Colles tied this vessel at the point, where it emerges from between the scaleni muscles, without any particular difficulty. The operation, however, was soon followed by a train of severe symptoms, delirium, and mortification, and the patient died on the fifth day. (See *Edinb. Med. and Surg. Journ. January,* 1815.)

The first case, in which complete success attended the operation of tying the subclavian artery, where it first comes from behind the anterior scalenus muscle, was that under the care of Dr. Post, of New York. The patient was a gentleman, with an aneurism in the left axilla. Dr. Post performed the operation on the 8th of September, 1817, in the following manner. "An incision, commencing at the outer edge of the tendon of the mastoid muscle, was carried through the integuments about three inches in length, in a direction deviating a little from a parallel line with the clavicle. This divided the external jugular vein, the bleeding from which required a ligature for its suppression; and, in proceeding with the operation, three or four arterial branches were cut, which it was also necessary to secure. The subclavian artery was then sought immediately on the outside of the scaleni muscles, and was easily laid bare. Passing over the artery at this place, in contact with it, were three considerable branches of nerves, running downwards towards the chest from the plexus above. These were separated, and a ligature passed under the artery, with great facility, by the instrument well adapted to this purpose, invented by Drs. Parrish, Hartshorne, and Hewson, of Philadelphia. On tying the ligature, all pulsation ceased in the limb." In the afternoon, the temperature of the limb was observed to be rather higher than that of the other arm. On the 17th of September, the aneurismal tumor burst, and about three ounces of dark coagulated blood were discharged. On the 26th the ligature came away from the subclavian artery. Oct. 11, the wound was entirely healed; and, on the 16th of the same month, the patient required no further attendance, his only complaints being now a little occasional pain in the fingers, and a superficial sinus at the part where the tumor burst. — (See *Med. Chir. Trans. vol.* 9, *p.* 185, &c.)

Mr. Liston, of Edinburgh, has the honour of being the surgeon that first succeeded, in Great Britain, in curing an axillary aneurism, by taking up the subclavian artery from above the clavicle, on the 3d of April, 1820. The particulars of the case are very instructing. They prove the risk there always is of tying one of the axillary nerves, instead of the artery, unless great caution be employed; and, in fact, Mr. Liston himself first passed his ligature under a nerve, and would have tied it, had he not wisely tried what effect constricting the included part would have upon the pulsation of the tumour. As the subclavian artery seemed diseased at the point where it emerges from behind the anterior scalenus, Mr. Liston cautiously divided this muscle to about its middle, so as not to injure the phrenic nerve. At length, with the aid of an aneurism-needle, he passed a strong round silk ligature under the artery, and laying hold of the loop with a small hook withdrew the needle. In consequence of the great depth of the artery, the knot could not be made with the fingers; but, with the assistance of a kind of forceps, each extremity of which had a little notch in it, the business was accomplished. (See *Edinb. Med. and Surgical Journ. No.* 64.)

At least three other successful operations of this kind have subsequently been done by English surgeons. One by Dr. Gibbs, in the General Naval Hospital of St. Petersburgh, (See *Med. Chir. Trans. vol.* 12, *p.* 531); another by Mr. Bullen, in the Lynn Dispensary, (See *London Med. Repository for Sept.* 1823); and the third by Mr. Wishart at Edinburgh. (See *Edinb. Med. and Surg. Journ. No.* 78.)

The instructions, delivered by Mr. Hodgson for the performance of this operation, are the best with which I am acquainted. When the subclavian artery (says this gentleman) has emerged from behind the anterior scalenus muscle, it passes obliquely over the flat surface of the first rib, with which it is in immediate contact. The cervical nerves are situated above and a little behind the artery: the subclavian vein passes before it, and underneath the clavicle. If the finger be passed down the acromial margin of the anterior scalenus muscle, the artery will be found in the angle, formed by the origin of that muscle from the first rib. The shoulder being drawn down as much as possible, the skin is to be divided, immediately above the clavicle, from the external margin of the clavicular portion of the mastoid muscle, to the margin of the clavicular insertion of the trapezius. No advantage whatever is gained by cutting the clavicular attachment of the sterno cleido-mastoideus. The exposed fibres of the platysma myoides are now to be carefully divided, without wounding the external jugular vein, which lies immediately under them, near the middle of the incision, and should be detached, and drawn towards the shoulder with a blunt hook. The cellular membrane, in the middle of the incision, is then to be cut, or separated with the finger, until the surgeon arrives at the acromial edge of the anterior scalenus. He passes his finger down the margin of this muscle, until he reaches the part where it arises from the first rib, and in the angle, formed by the origin of the muscle from the rib, he will feel the artery. The ligature is now to be conveyed under the vessel with an aneurism-needle, or that recommended by Desault. *(Hodgson on Diseases of Arteries, &c. p.* 376, *&c.)*

Breschet thinks, that the safest and easiest method is that adopted by Dupuytren. An incision, three or four inches long, is to be made at the lower and outer part of the neck, and extended to the clavicle. This first incision, situated behind the external edge of the sterno-mastoid muscle, should go through the skin, the cellular membrane, and platysma myoides. Some venous branches, running into the jugulars, will then be met with, which should be surrounded by a double ligature, and divided in the interspace. A director is then to be introduced under the omohyoideus muscle in order to facilitate its division, and the surgeon will at length reach the external edge of the anterior scalenus. A curved probe-pointed bistoury is then to be gradually and cautiously passed behind that muscle, with the flat surface of the blade against it, and deeply enough to divide the external third, or half of the fibres of the same muscle, or even all of them, if requisite. The insulated artery will then be felt at the bottom of the wound, situated in the area of a triangle, the upper side of which is formed by the brachial plexus, the lower by the subclavian vein, and the inner by the scalenus. A ligature is then conveyed under the artery, by means of the needle invented by Deschamps. (See *French Transl. of Mr. Hodgson's work, T.* 2, *p.* 126.) Whether cutting the anterior scalenus and omohyoideus will facilitate the operation is questionable; but the assertion, that these measures increase its safety, is what I cannot understand.

With respect to tying the subclavian artery on the tracheal side of the scalenus, we have seen, that it was performed by Dr. Colles, and the event was fatal. Descriptions of the operation may be found in Mr. Hodgson's work, p. 382. When I consider the manner in which the subclavian artery, before it passes behind the anterior scalenus, is surrounded by parts of great importance, I can scarcely bring my mind to think, that the measures, requisite for taking up the vessel in this situation, will ever leave the patient much chance of recovery. "Between the aorta and scaleni muscles (says Mr. A. Burns) the subclavian arteries are connected with several important vessels and nerves. They are in the vicinity of the nervus vagus, of the recurrent laryngeal nerve, of the sympathetic nerve, of the phrenic nerve, and the subclavian vein; and, on the left side, the subclavian artery is intimately connected with the termination of the thoracic duct. These parts are all grouped together in a very narrow space, and the perplexity of their dissection is further increased by the interlacement of the different nerves with one another. The natural connexions of these parts are best shown by merely raising the sternal extremity of the sterno-mastoid muscle. If this be done, the nervus vagus will be brought into view, lying on the fore part of the subclavian artery, almost directly behind the sternal end of the clavicle; and, exactly opposite to the nervus vagus, but behind the artery, the lower cervical ganglion of the sympathetic nerve will be brought into view. The recurrent nerve, on the right side, hooks round the subclavian artery, and, in its course towards the larynx, ascends along the tracheal side of the sympathetic nerve. On the left side, it twines round the arch of the aorta, and, in mounting upward, is interposed between the subclavian artery and œsophagus. The subclavian vein lies anterior to the artery, and, in the collapsed state, sinks nearer to the thorax;" but, when distended in the living body, it overlaps the artery. The thoracic duct enters the subclavian vein, about the eighth of an inch nearer to the acromion than the point, where the internal jugular vein empties itself into the subclavian vein. The termination of the thoracic duct is situated between the sternal and clavicular portions of the sterno-mastoid muscle. (*A. Burns, on the Surgical Anatomy of the Head and Neck, p.* 28.)

A case, in which an axillary aneurism, unattended with pulsation, was punctured, and the child bled to death, is noticed in a modern periodical work. (See *Med. Chir. Journ. vol.* 4, *p.* 78.)

For anatomical views of the parts concerned in the operation of taking up the subclavian artery, consult *Rosenmüller's Chir. Anat. Plates, part* 2, *tab.* 8 *and* 9.)

Some valuable anatomical remarks, in relation to the operation, are given by Mr. A. Burns. (*Surgical Anatomy of the Head and Neck, p.* 28, *&c.*)

In certain cases of subclavian aneurism, it has been proposed to tie the arteria innominata. In the dead subject, Mr. Allan Burns applied two ligatures to it, and after cutting through the vessel in the interspace, he injected the aorta, when the injection was found to pervade the anastomosing vessels of the right arm, and all those of the head. But, notwithstanding this fact, and others noticed by Mr. Hodgson, tending to show the probability, that a ligature upon the arteria innominata would not prevent the arm and head from receiving an adequate supply of blood, other objections were made to the practice. The principal of these were founded upon the difficulty of the operation in the living body; the inflammation, likely to be excited by it in neighbouring important organs; the danger of hemorrhage from the adhesion of the vessel being likely to be broken by the force of the circulation; and the equal practicableness, in most cases, of tying the subclavian artery on the tracheal side of the scalenus.

Dr. Mott, an eminent surgeon at New York, impressed with the value of Mr. Allan Burns's remarks, upon this subject, has, ever since he became acquainted with them, maintained in his lectures the propriety of attempting to tie the arteria innominata, under particular circumstances of subclavian aneurism. At length, Dr. Mott put this new operation to the test of experience in the New York Hospital, on the 11th of June, 1818. The case was a subclavian aneurism on the right side, and the patient, a sailor, aged 57, to whom 70 drops of tinct. opii. were first given. Dr. Mott began the first incision directly over the swelling above the clavicle, extended it along this bone, and ended it at the treachea, just above the upper portion of the sternum. Here he commenced the second incision, of about the same length as the first, and reaching along the inner margin of the sterno-cleido-mastoideus. Dr. Mott next detached the skin from the subjacent platysma myoides, cut through the latter, and cautiously divided the sternal portion of the mastoid muscle, in the direction of the first incision. The internal jugular vein now presented itself close to the swelling, and adherent to it; a circumstance, that rendered the subsequent part of the operation very difficult. After detaching a portion of the latter vein from its connexion, Dr. Mott cut through the sterno-hyoideus and sterno thyroideus, and turned them back over the trachea. The carotid was now exposed a few lines above the sternum, and after he had separated the par vagum and internal jugular vein from it, they were drawn towards the outer side of the neck. Dr. Mott then laid bare the subclavian artery, which part of the operation he chiefly accomplished with the handle of the scalpel, as there was nothing to be separated but cellular membrane. The subclavian artery was found to be very much enlarged and diseased, and, as Dr. Mott recollected that this state of the vessel had seemingly hindered its successful closure, in the example operated upon by Dr. Colles, of Dublin, he decided to take up the arteria innominata itself. In detaching the cellular membrane from the lower surface of the subclavian artery, a small branch, situated about half an inch from the innominata, was injured, and the wound was six or eight times filled with blood from it. The hemorrhage was soon suppressed, however, by means of a little pressure. Had not the bleeding been so easily stopped, Dr. Mott would have concluded, from the situation of the vessel, that it was the internal mammary, but, if it were not this branch, he conceives, it must have been an artery not regularly originating in this situation: perhaps the superior intercostal.

Dr. Mott continued the operation with a small, round-ended, sharp scalpel, until hecame to the division of the arteria innominata, which great vessel he traced below the sternum, and after freeing it from all the cellular membrane with the handle of the scalpel, and drawing aside the recurrent and phrenic nerves, he tied it with a round silk ligature, about half an inch from its bifurcation.

Most surgeons, says Dr. Mott, complain of the difficulty of tying large arteries in a deep small wound. Hence, he recommends a set of instruments invented for the purpose, in Philadelphia, by Drs. Parish, Hartshorn, and Hewsons consisting, 1st. Of several blunt-pointed needle, of various sizes and curvatures, furnished with an eye at each end, and calculated at one end to screw into a strong handle. 2dly. Two strong instruments, with handles, having at one end an eye, or hole: they resemble those sometimes used for applying a ligature to the tonsils. 3dly. A small round-pointed scalpel. 4thly. A small hook, fixed in a very strong handle. (*Parish, in Eclectic Rep. vol. 3, p. 229.*)

After Dr. Mott had introduced the ligature into the eye of one of the above-described needles, and screwed the needle into a handle, he pressed with its convexity the cellular membrane and pleura carefully downwards, while he carried it from below upwards round the artery. As the point now appeared on the other side of the vessel, the above-mentioned hook was passed into its eye, and the handle unscrewed from the other end of it, when it was easily drawn out from under the artery, and the ligature left under the vessel.

In this part of the operation, Dr. Mott urges the necessity of being particularly attentive to two important circumstances; one is, to convey the ligature round the artery from below upwards, as the only way to prevent injury of the pleura; and the other is, to fix the hook in the eye of the needle, before the handle is unscrewed from its other end, because after this has been done, the needle loses all steadiness, and it is then difficult to get the hook into the eye.

With respect to the foregoing instruments, I may observe, that they are now superseded by the needle lately constructed by Mr. Weiss.

Dr. Mott now made a noose, pressed it with the fore-finger down to the artery, and tightened it very gradually, in order not to stop the flow of blood through the vessel all at once. A moderate constriction was kept up some seconds, so that the effect of the ligature upon the heart and lungs might be observed; and as no disturbance was produced in the functions of these organs, Dr. Mott tightened the ligature, and stopped the current of blood through the vessel. At this instant, the pulsation of the right temporal and radial arteries ceased. The noose was tightened still more with the above-mentioned ligature irons, and then a second knot was made. Dr. Mott was greatly pleased at finding his patient's countenance remain perfectly unchanged, and no complaint made of pain in any other part. Immediately after the ligature had been applied, the aneurismal swelling lost one-third of its size, and the clavicle could be felt throught its whole extent. The divided muscles and detached skin were now brought into their natural situation, the wound closed with three sutures and adhesive plaster, and a compress applied. In the operation, three small arteries were tied; the first lay under the sternum, and seemed to be a branch of the internal mammary; the second was a descending branch of the superior thyroideal; and the third, a branch of the inferior thyroideal. From two to four ounces of blood were lost, most of which came from an injured small branch of the subclavian. The operation took up about an hour. The curved spatulæ, recommended by Dr. Colles, were found very useful for holding the carotid and par vagum aside, while, by their uniform pressure, they materially assisted in restraining the effusion of blood from small vessels, and, as taking up little room, were infinitely more convenient in a deep narrow wound, than the fingers of an assistant.

The day after the operation, the veins of the right forearm and hand had a turgid appearance. When the circulation in them was promoted by pressure, they became empty for some distance above the pressed part, but filled again immediately the pressure was removed; a circumstance, that seemed to show, that the circulation in this arm, notwithstanding the ligature of the arteria innominata, still went on with great celerity, though no pulse could be felt in the brachial and radial arteries. On the contrary, the pulse was very plain in the front branch of the temporal artery, just above the outer angle of the orbit. The left external carotid beat with unusual force. In a few days, however, the pulse became perceptible again at the right wrist.

My limits will not allow me to enter into all the details of this interesting case: suffice it to mention, that the patient suffered considerable febrile disturbance at some periods after the operation, and it was necessary twice to have recourse to venesection. He was also afflicted with a severe cough. The discharge from the wound was copious and fetid. The main ligature separated on the fourteenth day. On the twentieth day, the patient was sufficiently recovered to walk in the garden. On the twenty-first day, the wound was almost closed; the patient could move his right arm with the same facility as his left, and he was gaining such strength, that no doubts were entertained about the successful result of the operation. On the twenty-third day, hemorrhage came on from the wound: it was stopped by the introduction of lint, and the employment of pressure. About twenty-four ounces of blood were lost, whereby the patient was so depressed, that the pulse was no longer distinguishable. On the twenty-fourth day, in the evening, he lost four ounces more blood; on account of his restlessness and the painful state of his arm, two grains of opium were administered to him. After one or more returns of bleeding, he died on the twenty-sixth day.

When the body was opened, no traces of inflammation or its consequences were found either in the arch of the aorta, the origin of the innominata, or the lungs. The aorta was now slit open longitudinally, and a probe then cautiously passed through it into the innominata, when the instrument went through the latter vessel into the cavity of the wound. The inner coat of the innominata was smooth and soft; but, about half an inch from the place, where the ligature had cut through the vessel, marks of inflammation were noticed, and a coagulum adhered to the sides of this artery with considerable firmness, so that nature had probably endeavoured, by means of adhesive inflammation, to close the vessel, but had been prevented from completing the salutary process by the destructive ulceration. One portion of the parietes of the innominata was thickened by inflammation, and an anomalous branch, as large as a crow's quill, arose from this artery.

The ulcer was twice as extensive inwardly, as it was superficially, reaching laterally to the trachea, and under the clavicle to the swelling. The tripod of great vessels, viz. the innominata, the subclavian, and the carotid, was destroyed by ulceration to the extent of about an inch, and the ends of both the last vessels opened into the wound. At this place, the pleura was considerably thickened by a layer of organized lymph.

The inner surface of the carotid was covered with a coagulum, and its coats so much thickened that a probe could hardly be passed into it. The consolidation reached up to the division into the external and internal carotid. The subclavian was pervious as far as the situation of the disease. The diameter of the brachial and other arteries of the right arm was natural. The external mammary artery was enlarged, but not the internal. The clavicle was carious, and several lymphatic glands under it in the state of suppuration.

Though the result of the operation was unsuccessful, it proves, as Dr. Mott correctly remarks, some interesting points: namely, that tying an artery of such magnitude, and so near the heart, may be done without occasioning any disturbance either in the functions of the brain, the heart, the lungs, or the right arm.

The suppuration, which continually extended itself more and more deeply, is set down by Dr. Mott as the cause of the patient's death; for, as no bleeding took place for several days after the detachment of the principal ligature, it is plain, that this must have fulfilled its duty, and that the artery had been closed. (See *New York Med. and Surgical Register*, 1818, *vol.* 1.)

The arteria innominata was also tied by Graefe on the 5th of March, 1822, in the Clinical Hospital of the University of Berlin, on account of a subclavian aneurism. The carotid was exposed, and traced down to the innominata, to which a ligature was applied by means of a blunt tenaculum constructed for the purpose, the vessel being tied at most about an inch from the curvature of the aorta, and two inches from the heart. As soon as the ligature was tightened, the pulsation of the arteries of the right arm, right carotid, and right temporal artery ceased: at the same instant, the throbbing of the aneurism stopped, and the tumor became flaccid. The constriction of the cord produced no disturbance of any function. The patient went on so well for several weeks afterwards, that no doubt was entertained of his recovery. However, when the wound was nearly healed, hemorrhage came on, and though it was suppressed, and hope began to be again indulged, the bleeding recurred, and the patient died on the sixty-seventh day. Below the ligature, the innominata was found closed with lymph. Graefe has written a distinct essay on the method in which the operation was done: the daily particulars of the case, and preparation from it, are placed in the Royal Anatomical Museum at Berlin. (See *Journ. der Chirurgie von C. F. Gräfe, und Ph. v. Walther, B.* 3, *p.* 596, *&c.*, *B.* 4, *p.* 587.)

CAROTID ANEURISMS.

There is no part of the body where the diagnosis of aneurisms is more liable to mistake, than in the neck. Here the disease is particularly apt to be confounded with tumors of another nature. We have already cited, in this article, examples in which aneurisms of the arch of the aorta so resembled those of the carotid, as to have deceived the surgeon who was consulted. The swelling of the lymphatic glands, or of the cellular substance which surrounds the carotid artery; the enlargement of the thyroid gland; and especially abscesses, may resemble an aneurism by the pulsations, communicated to them by the neighbouring artery. On the other hand, aneurisms of long standing, which no longer throb, and the integuments over which are changed in colour, and likely to burst, may the more easily be mistaken by an inattentive practitioner for chronic abscesses, as the neck is remarkably often the seat of such diseases. (*Boyer, Traité des Maladies Chirurgicales, t.* 2, *p.* 185.)

Scarpa mentions one unfortunate patient, who was killed by a knife being plunged in a carotid aneurism, on the supposition that the case was an abscess.

I need scarcely observe, that by opening a carotid aneurism, a surgeon would expose himself to the disgrace and mortification of seeing the patient die under his hands, as happened in the example cited by Harderus. (*Apiar. Observationum, Obs.* 86.)

The possibility of tying the carotid artery, in cases of wounds and aneurisms, without any injurious effect on the functions of the brain, is now completely proved. Petit mentions, that the advocate Vieillard had an aneurism at the bifurcation of the right carotid, for the cure of which he was ordered a very spare diet, and directed to avoid all violent exercise. Three months afterwards, the tumor had evidently diminished; and, at last, it was converted into a small, hard, oblong knot, without any pulsation. The patient having died of apoplexy, seven years afterwards, the right carotid was found closed up and obliterated, from its bifurcation, as low down as the right subclavian artery. (*Acad. des Sciences de Paris, an.* 1765.) Haller dissected a woman, whose left carotid was impervious. (*Opuscula Pathol. Obs.* 19, *Tab.* 1.) An example of the total closure of both carotids, in consequence of ossification, is stated by Koberwein to be recorded by Jadelot. (*German Transl. of Mr. Hodgson's work, p.* 293.) Hebenstreit, vol. 4, p. 266, ed. 3. of his Translation of B. Bell's Surgery, mentions a case, in which the carotid artery was wounded, in the extirpation of a schirrous tumor. The hemorrhage would have been fatal, had not the surgeon immediately tied the trunk of the vessel. The patient lived many years afterwards. This is probably the earliest authentic instance, in which a ligature was applied to the carotid artery. Mr. Abernethy's case is perhaps the second: and that in which Mr. Fleming, a naval surgeon, tied the common carotid in a sailor, who attempted suicide, and who was saved by the operation, is still later, not having occurred till the year 1803. (See *Med. Chir. Journ. vol.* 3, *p.* 2.)

Dr. Baillie knew an instance, in which one carotid was entirely obstructed, and the diameter of the other considerably lessened, without any apparent ill effects on the brain. (See *Trans. for the Improvement of Med. and Chir. Knowledge, vol.* 1, *p.* 121.) Sir Astley Cooper has also recorded an example, in which the left carotid was obstructed by the pressure of an aneurism of the aorta; and yet, during life, no paralysis, nor impairment of the intellects, had occurred. (See *Méd. Chir. Trans. vol.* 1. *p.* 223.) A similar case is related by Pelletan. (*Clinique Chir. t.* 1. *p.* 68.)

Mr. Abernethy was under the necessity of tying the trunk of the carotid, in a case of extensive lacerated wound of the neck, where the internal carotid and the chief branches of the external carotid were wounded. The patient at first went on well; but, in the night, he became delirious and convulsed, and died about thirty hours after the ligature was applied. This case fell under my own notice, and the inference which I drew was, that the man died more from the great quantity of blood which he lost, and the severe mischief done to the parts in the neck, than from any effect of the ligature of the artery on the brain.

In another instance, in which the common carotid was tied, on account of a wound of the external carotid, by a musket-ball, complicated with fracture of the condyle and coracoid process of the lower jaw, every thing went on favourably until the seventh day after the operation. Neither the intellectual faculties nor the functions of the organs of sense had been at all disturbed. But, at that period, stupor, confusion of ideas, restlessness, a small unsteady pulse, discoloration of the face, and loss of strength came on, followed in the evening by a violent paroxysm of fever. On the eighth day, three copious hemorrhages took place from the whole surface of the wound, and, on the ninth, the man died. In this case, however, the affection of the brain, and the other unfavourable symptoms, would be ascribed by nobody, to the effects of the ligature on the carotid, but every one would see the cause in the severe and extensive local mischief, produced partly by the musket-ball, and partly by the mode in which the operation was performed, the surgeon having extended his incisions from the parotid gland to within an inch of the clavicle! (See *Journ. Général de Med. &c. par Sedillot.*)

That the carotid may be tied without injuring the functions of the brain, and that aneurisms of this artery admit of being cured by the operation, is now fully proved. The following is the second instance, in which I have been present at the operation of tying the carotid trunk on account of a wound.

A soldier of the 44th regiment was wounded in the neck, with a pike, at the battle of Waterloo, and was brought to Brussels. After he had been some little time in the hospital, the bleeding, which had stopped, recurred with great violence, both from the mouth and the external wound itself; and it was therefore judged necessary to tie the common carotid, which was done by my friend Mr. Collier. The operation was performed by making an incision along the inner edge of the sterno-cleido-mastoideus, raising this muscle from the sheath including the artery, &c. and holding aside the jugular and lower thyroid veins, which swelled up every instant to a very large size, so as to overlap the artery. This vessel being disengaged from the nerve, was then tied. Though the operation was done by candlelight, it was skilfully performed, and reflects great credit on Mr. Collier. A detail of the case may be found in a modern work. (*Med. Chir. Trans. vol.* 7. *p.* 107.)

Another example, in which the carotid artery was tied, and the patient saved, in a case where it was wounded with a penknife, has been recently published by Dr. John Brown, surgeon to the county of Meath Infirmary. (See *Dublin Hospital Reports*, *vol.* 1, *p.* 301, *&c.*) In this instance, the internal jugular vein "did not appear, nor was it a source of the slightest inconvenience during the operation." (*P.* 305.) A case, very analogous to the foregoing, is recorded by Mr. Hodgson, and the event equally successful. "The jugular vein afforded no trouble in the operation: it was not even seen." A gradual improvement of the power of deglutition marked the gradual subsidence of the tumor, which pressed against the pharynx. Nor was any change perceived in the state of the patient's mind after this operation, who remained as she had been previously, melancholy and dejected. (*P.* 332.)

Acrel mentions an example, in which the carotid artery was wounded by a gunshot, and the hemorrhage permanently stopped by compression. A similar case is related by Van Horne, in his annotations to the work of Botallus. (*De Vuln. Selopetis.*) Baron Larrey has likewise related a case, in which the carotid was wounded by a musket-ball, and life saved by the instant application of pressure. (*Mém. de Chir. Mil. t.* 1. *p.* 309.) However, considering the size of the vessel, and its unfavourable situation for being effectually and steadily compressed, some doubts may be entertained, whether the vessel wounded might not rather have been one of its branches.

November 1, 1805, Sir Astley Cooper operated on Mary Edwards, aged forty-four, who had an aneurism of the right carotid artery: the tumor reached from the vicinity of the chin to beyond the angle of the jaw, and downward to within two inches and a half from the clavicle.

The swelling had a strong pulsatory motion. The woman also complained of a particular tenderness of the scalp, on the same side of the head, and of such a throbbing in the brain, as prevented her from sleeping.

An incision, two inches long, was made at the inner edge of the sterno-cleido-mastoideus muscle, from the lower part of the tumor to the clavicle. This wound exposed the omo-hyoideus and sterno-hyoideus muscles, which being drawn aside towards the trachea, the jugular vein presented itself to view. The motion of this vein produced the only difficulty in the operation, as, under the different states of breathing, the vessel sometimes became tense and distended under the knife, and then suddenly collapsed. Sir Astley Cooper introduced his finger into the wound, to keep the vein out of the way of the knife, and, having exposed the carotid artery by another cut, he passed two ligatures under this vessel by means of a curved aneurism-needle. Care was taken to exclude the recurrent nerve on the one hand, and the par vagum on the other. The ligatures were then tied about half an inch asunder; but the intervening portion of the artery was left undivided.

The pulsation of the swelling ceased immediately the vessel was tied, and, on the day after the operation, the throbbing in the brain had subsided, while no diminution of nervous energy in any part of the body could be observed.

The patient was occasionally afflicted with bad fits of coughing, but, upon the whole, went on at first pretty well. On the eighth day, however, a paralysis of the left leg and arm was noticed, attended with a great deal of constitutional irritation. November 8th, the patient could move her arm rather better; but became unable to swallow solids. Nov. 12th, the palsy of her arm had now almost disappeared. The ligatures came away. November 14th, she was in every respect better; she swallowed with less difficulty; and the tumor was smaller, and quite free from pain. On the 17th, she became very ill; the tumor increased in size, and was sore when pressed. The wound was as large as immediately after the operation, and discharged a sanious serum. Great difficulty of swallowing, and a most distressing cough, were also experienced. The pulse was ninety-six, and the left arm again very weak. On the 21st, the patient died, the difficulty of swallowing having previously become still greater, attended with a further increase of the tumor, the skin over which had acquired a brownish red colour.

On opening the swelling after death, the aneurismal sac was found inflamed, and the clot of blood in it was surrounded with a considerable quantity of pus. The inflammation extended on the outside of the sac, along the par vagum, nearly to the basis of the skull. The glottis was almost closed, and the lining of the trachea was inflamed and covered with coagulating lymph. The pharynx was so compressed by the tumor, which had been suddenly enlarged by the inflammation, that a bougie of the size of a goose-quill could hardly be introduced into the œsophagus. Sir Astley Cooper concludes with expressing his opinion, that *these causes of failure may, in future, be avoided by operating before the tumor is of such size as to make pressure on important parts; or, if the swelling should be large, by opening it, and letting out its contents, as soon as inflammation comes on.* (See *Med. Chir. Trans. vol.* 1.)

In one case under the care of Mr. Coates, of Salisbury, the making of an opening, about a month after the operation, gave relief by discharging seven ounces of fetid blood and pus; but, three weeks afterwards, hemorrhage came on from the sac, and the patient was carried off by repeated loss of blood. On dissection, an artery, capable of admitting a probe, was found to pass into the cavity of the sac. (See *Med. Chir. Trans. vol.* 11, *part* 2.)

In June 1808, Sir Astley Cooper operated, in Guy's Hospital, on a man, aged 50, who had a carotid aneurism, attended with pain on one side of the head, throbbing in the brain, hoarseness, cough, slight difficulty of breathing, nausea, giddiness, &c. The patient got quite well, and resumed his occupation as a porter. There was afterwards no perceptible pulsation in the facial and temporal arteries of the aneurismal side of the face.

On the opposite side, the temporal artery became unusually large. The tumor was at last quite absorbed, though a pulsation existed in it till the beginning of September. The man's intellects remained perfect; his nervous system was unaffected; and the severe pain, which, before the operation, used to affect the aneurismal side of the head, never returned.

The swelling, at the time of the operation, was about as large as a pullet's egg, and situated on the left side about the acute angle, made by the bifurcation of the common carotid, just under the angle of the jaw.

Sir Astley Cooper began the incision opposite the middle of the thyroid cartilage, at the base of the tumor, and extended the wound to within an inch of the clavicle, on the inner side of the sterno-cleido-mastoideus muscle. On raising the margin of this muscle, the omo-hyoideus could be distinctly seen crossing the sheath of the vessels, and the nervus descendens noni was also brought into view. The sterno-cleido-mastoideus was now separated from the omo-hyoideus, when the jugular vein was seen. This vessel became so distended at every expiration as to cover the artery. When the vein was drawn to one side, the par vagum was manifest, lying between that vessel and the carotid artery, but a little to the outer side of the artery. The nerve was easily avoided.

A double ligature was then conveyed under the artery with a blunt iron probe. The lower ligature was immediately tied, and the upper one was also drawn tight, as soon as about an inch of the artery had been separated from the surrounding parts above the first ligature, so as to allow the second to be tied at this height. A needle and thread were passed through the vessel below one ligature, and above the other. The artery was then divided. In a little more than nine weeks, the wound was quite healed, and the patient entirely recovered. (See *Med. Chir. Trans. Vol.* 1.)

Another successful instance, in which the carotid was tied for the cure of an aneurism, is related in a work, to which I always have the greatest pleasure in referring. (See *Hodgson's Treatise on the Diseases of Arteries, p.* 329.)

Mr. Travers, surgeon to St. Thomas's Hospital, tied the carotid artery in a woman, who had an aneurism by anastomosis in the left orbit. The disease had pushed the eye out of its socket. Two small ligatures were applied, which came away on the twenty-first and twenty-second days. No hemorrhage, nor impairment of the function. of the brain took place, and the disease in the orbit was effectually cured. (See *Med. Chir. Trans. Vol.* 2.)

Another highly interesting example, in which an aneurism by anastomosis in the orbit was effectually cured by tying the carotid artery, is recorded by Mr. Dalrymple, surgeon at Norwich. This gentleman performed the operation on the 12th of November, 1812. The patient was a female, aged 44. The protrusion of the eye was relieved in proportion as the swelling diminished. The violent headachs also subsided; but the eyesight was irrecoverably lost. (See *Med. Chir. Trans. Vol.* 6, *p.* 111.)

The carotid artery has sometimes been tied, with the view of enabling the surgeon to cut away swellings from the neck and side of the face, where from particular circumstances in the cases, there was reason to fear a fatal hemorrhage without that preliminary measure. (See *Goodlad's and Arenat's Cases, in Med. and Chir. Trans. Vols.* 7, and 12.)

An interesting case, in which my friend Mr. Vincent tied the carotid trunk for an aneurism, is published in the 10th vol. of the latter work. (*P.* 212, &c.) In this example, the internal jugular vein did not appear to be at all in the way during the operation; some of the fibres of the omohyoideus, however, could not be conveniently drawn aside, and were therefore divided. A single ligature was applied; the pulsation in the tumor did not entirely cease, at first, when the artery was tied, but it did so two days afterwards; and the swelling was rapidly diminishing. The ligature came away about three weeks after the operation, and there was every hope of a cure; but between the fourth and fifth week, a considerable swelling occurred between the wound and the jaw, impeding deglutition, but not the breathing. This state was followed by febrile symptoms, increased difficulty of swallowing, an attack of coughing, and impeded respiration. In the hope of affording relief, an incision was made in the tumor, from which a small quantity of pus and coagulum issued; but, it was in vain, for the patient was dying. On dissection, the carotid artery was found perfectly closed as far as the division of the arteria innominata. But, above where the ligature had been, the vessel was open and inflamed, and pus was found in it. The most remarkable circumstance noticed was globules of air, adhering to the inner surface of the aorta, and other large arteries, and found also under the tunica arachnoidea. The bulk of the swelling in the neck depended upon effusion of serum in the cellular membrane.

In order to get at the carotid artery in the safest manner, Mr. Abernethy has recommended making an incision on that side of it which is next the trachea, where no important parts are exposed to injury, and then to pass a finger underneath the vessel. The par vagum must be carefully excluded from the ligature; for to tie it would be fatal. (*Surgical Observations,* 1804.)

The cure of carotid aneurisms by the operation has now been so often exemplified, that even to refer to every case upon record would demand more space than I can at present afford. A successful instance is reported by Macaulay (*Edin. Med. Surg. Journ. April,* 1814); another by Dr. Post, who used two ligatures, and divided the artery in the space between them (*New England Journ. of Medicine and Surgery, Vol.* 3. *p.* 205, *Boston,* 1814); another by Mr. Giles Lyford, proving the sufficiency of a single ligature, (*Med. Chir. Trans. Vol.* 11, *p.* 97, *&c.*) The case in which Mr. Goodlad tied the carotid, in order to prevent hemorrhage in the removal of a tumor involving the parotid gland, is contained in *Vol.* 7, *p.* 112, &c. of the latter book.

The best anatomical engravings of the parts concerned in the operation of taking up the carotid artery, are those by Rosenmüller. (See *Chirurg. Anatom. Abbildungen, Thl.* 1, *tab.* 7, 8, 9.)

For the particulars of a carotid aneurism cured by the ligature of the artery by M. Dumont, (See *Diss. sur l'Ancurisme de l'Artère carotide, par P. J. Vanderhagen, Paris,* 1815.) Walther, of Landshut, in the year 1814, tied the carotid artery for the cure of an aneurism with complete success: he applied only a single ligature. (*Breschet, Fr. Transl. of Mr. Hodgson's work, T.* 2, *p.* 83.) In this translation are reported several instances, in which Dupuytren and other continental surgeons have applied a ligature to the carotid. Dr. Holscher, of Hanover, has also operated with success. (See *Lond. Med. Repository, Vol.* 16, *No.* 94.)

OF ANEURISMS OF THE AORTA AND VALSALVA'S TREATMENT.

This afflicting and fatal disease is by no means unfrequent, and the arch of the aorta is its most common situation. Dr. Hunter was of opinion, that the latter circumstance depended on the forcible manner, in which the blood, propelled from the left ventricle of the heart, must be driven against the angle of the curvature of the vessel.

Mr. A. Burns considered aneurism of the thoracic aorta more frequent, perhaps, than that of any other vessel in the body. "I have had (says he) an opportunity of examining fourteen, who had died of this disease, but have not seen more than three instances of external aneurism." (*On Diseases of the Heart, &c. p.* 215.)

These proportions, however, would not correspond to common observation, external aneurisms, taken collectively, being supposed to be about as numerous, as those of the aorta alone, a calculation long ago made by Dr. A. Monro, primus.

It was the opinion of Dr. W. Hunter, that the aneurismal sac was composed of the dilated coats of the artery, which parts nature thickened and studded with ossifications, after the origin of the disease, for the purpose of resisting its increase. Mr. Hodgson also in his late excellent publication declares his decided belief, and adduces facts to prove, that many aneurisms of the aorta are formed by dilatation. Scarpa argues, however, that the generality of aneurisms of the aorta are the consequence of a rupture of the proper coats of this large vessel; and that the cellular sheath of the artery is what becomes distended into the thickened and ossified aneurismal sac.

Dr. W. Hunter considered the ossifications of the sac as consequences of the disease; but Haller looked upon such scales of bone in the aorta as the very cause of the affection, by rendering the artery inelastic, and incapable of yielding to each pulsation of the heart.

It is unquestionably true, that aneurisms of the aorta are most common in persons who are advanced in life, and it is equally well known, that the aorta of every old subject, whether affected with aneurism, or not, is almost always marked in some place, or another, with ossifications, or, rather, with calcareous concretions. Such productions appear to occasion a decay, or absorption, of the muscular and inner coats of the vessel, so that at length the force of the blood makes the artery give way, and this fluid, collecting on the outside of the laceration, or rupture, gradually distends the external sheath of the artery into the aneurismal sac, which itself becomes at last of considerable thickness, and studded with ossified specks.

"If any person, who is not prejudiced in favour of the common doctrine, with regard to the nature and proximate cause of this disease (says Scarpa) will examine, not hastily and superficially, but, with care and by dissection, the intimate structure and texture of the aneurism of the aorta, unfolding with particular attention the proper and common coats of this artery, and, in succession, those, which constitute the aneurismal sac, in order to ascertain distinctly the texture and limits of both, he will clearly see, that the aorta, properly speaking, contributes nothing to the formation of the aneurismal sac, and, that, consequently, the sac is merely the cellular membrane, which, in the sound state, covered the artery, or that soft cellular sheath, which the artery received in common with the neighbouring parts. This cellular substance being raised and compressed by the blood, effused from the corroded or lacerated artery, assumes the form of a circumscribed tumor, covered externally, in common with the artery, by a smooth membrane, such as the pleura in the thorax, and the peritoneum in the abdomen."

Scarpa then comments upon the differences of mere dilatation of an artery from aneurism, a subject, which has been already fully considered in the foregoing pages. (*Scarpa on the Anatomy, Pathology, and Surgical Treatment of Aneurism, transl. by Wishart, p.* 55, 56.)

As I have already explained in the preceding columns, the sentiments of this eminent anatomist are not adopted by the generality of surgeons; or rather his doctrine is not carried by others to the extent, which he has insisted upon, and it would be useless repetition to bring before the reader again the facts, which prove that his statements are liable to many exceptions. A case, however, recited by Roux, which I have met with since the foregoing pages were printed, merits notice; it was an instance, in which a popliteal aneurism, unattended with pulsation, had been mistaken for an abscess and punctured, whereby the patient lost his life. On dissecting the limb, Roux says, "the three coats of the artery participated in the dilatation, and the case was one of the clearest specimens, which I have ever seen, of a true aneurism." (*Nouveaux Elémens de Med. Opératoire, T.* 1, 517.)

All arguments, brought against the possibility of a dilatation of the inner coat, and founded on the inelastic structure of that membrane, must likewise be completely refuted by another fact, demonstrated by morbid preparations, collected by Dubois and Dupuytren, where the inner coat of the aorta is alone dilated, protruding through the outer tunics, in the form of a distinct swelling, somewhat like a hernia. (*Roux Op. cit. p.* 49.)

In whatever manner aneurisms of the aorta are formed, there are no diseases, which are more justly dreaded, or which more completely fill the surgeon, as well as the patient, with despair. No affliction, indeed, can be more truly deplorable; for, the sufferings, which are occasioned, hardly ever admit even of palliation, and the instances of recovery are so very few, that no consolatory expectation can be indulged of avoiding the fatal end, to which the disease naturally brings the miserable suffer.

The existence of aneurisms of the aorta is scarcely ever known with certainty, before they have advanced so far, as to be attended with an external pulsation, and a tumor, that admits of being felt, or even seen. In very thin subjects, the throbbing of the abdominal aorta is sometimes unusually plain through the integuments and viscera, and this has occasionally given rise to the suspicion of an aneurism; a circumstance, which deserves to be remembered by every surgeon, desirous of not pronouncing a wrong opinion. The preternatural pulsations, however, which are liable to be mistaken for those of aortic aneurisms, are of various kinds, and form a subject, to which the attention of Dr. Albers of Bremen, the late Mr. A. Burns, and others, has been very usefully directed. (See *Abdomen.*)

While thoracic aneurisms of the aorta are accompanied with no degree of external swelling, the symptoms are all equivocal, and might depend on a disease of the heart, angina pectoris, phthisis pulmonalis, &c. Violent and irregular throbbings frequently occur between the fourth and fifth true ribs of the left side: the same irregularity of the pulse prevails as often proceeds from organic affections of the heart; the respiration is exceedingly obstructed; the voice altered; and, in a more advanced period of the malady, the patient is at times almost suffocated. The pressure of the internal swelling on the trachea, bronchia, and lungs, is sufficient to account for this difficulty of breathing. In many instances, the irritation and compression, produced by the tumor, occasion an absorption of the greater part of the lungs, and abscesses and tubercles throughout the portion which remains. Even the function of deglutition suffers interruption in consequence of the pressure made on the œsophagus, which may even be in a state of ulceration. Thus, in an example recently published, we read that "the cavity of the windpipe was nearly obliterated from the pressure of the aneurism; and the extremities of four of its cartilages lay in the œsophagus, having entered that canal, through an ulcer in its coats." (*Trans. for the Improvement of Med. and Chir. Knowledge*, *V.* 3, *p.* 83.)

After what has been stated, it cannot be surprising, that, ere the disease manifests itself externally, affections of the lungs, or strictures of the œsophagus, should often be suspected. (*Hodgson*, *p.* 91.)

An aneurism of the arteria innominata, not discovered till after the patient had died of suffocation, gave rise to great difficulty of drawing air into the chest, without any other symptom calculated to throw light on the nature of the disease. The aneurismal swelling was situated behind the first bone of the sternum, and pressed upon the trachea. The front of this tube was pushed in by the tumor, so as to present a convex prominence on the inner surface, which, however, diminished its area in a very slight degree. Mr. Lawrence adduces this fact to prove, that spasm of the aircells may be the cause of great distress in breathing. "The termination of this case (says he) is the more remarkable, inasmuch as in another patient, an aneurism rising out of the arch of the aorta, and pressing on the corresponding part of the trachea, so as to produce ulceration of the internal membrane, under which there was a slight appearance of coagulated blood, caused no affection of the breath at all. The person died of a different complaint, and the discovery of the aneurismal tumor, which was very small, and filled with firm laminated coagula, was quite accidental." (*Med. Chir. Trans. Vol.* 6, *p.* 227.)

Thus, we find in thoracic aneurisms, at least, previously to their attainment of a certain size, that no regularity prevails even with regard to difficulty of breathing, the symptom, which *à priori* one might suppose would invariably be present.

I have mentioned, that the symptoms of thoracic aneurisms, previously to the formation of any outward swelling, often resemble those of phthisis, and the latter is sometimes actually supposed to be the disease, under which the patient is labouring. But, there is one distinction between the cases, which is pointed out by Mr. Hodgson, and may be of use, in combination with other circumstances, in facilitating the diagnosis: "in phthisis, the expectoration is either puriform, or thick, and clotted; but, in aneurisms, which are not accompanied with disease in the lungs, as far as I have observed, it always consists of a thin frothy mucus." (*On Diseases of Arteries, &c. p.* 93.)

According to Kreysig's experience, the cough comes on at irregular periods, is violent, and attended with great efforts, the expectorated matter being forced up by the vehemence. He agrees with Mr. Hodgson, respecting the general quality of what is expectorated, where thoracic aneurisms are not complicated with diseased lungs; but, he says, that the matter coughed up, also, frequently consists of masses of lymph, blended with brick-red particles of blood, which masses, when thrown into water, seem as if they were composed of a ball of stringy substances. *German Transl. of the latter work*, *p.* 137.)

From a review of many cases of aortic aneurisms, Mr. A. Burns was inclined to think, that when the ascending aorta is aneurismal, the breathing is more affected, than when the arch of the vessel is enlarged, but, that in the latter case, the impediment to deglutition is greatest. (*On Diseases of the Heart, &c. p.* 244.)

The way, in which aneurisms of the thoracic aorta prove fatal, is subject to considerable variety. These swellings do not always destroy the patient by hemorrhage; in numerous instances, the magnitude of the disease so impedes respiration, that death seems induced by suffocation, and not a drop of blood is found internally effused. Frequently, (to use the description of Mr. John Bell) before the awful and fatal hemorrhage has had time to occur, the patient perishes of sufferings too great for nature to bear. The aneurismal tumor so fills the chest, so oppresses the lungs, compresses the trachea, and curbs the course of the descending blood, that the system, with a poor circulation of ill-oxydated blood, is quite exhausted. And, thus, though the patient is saved from the most terrible scene of all, he suffers great miseries; he experiences in his chest severe pains, which he compares with the stabbing of knives; terrible palpitations; an awful sense of sinking within him; a sound within his breast, as if of the rushing of waters; a continual sense of his condition; sudden startings during the night; fearful dreams and dangers of suffocation, until with sleepless nights, miserable thoughts by day, and the gradual decline of an ill-supported system, he grows weak, dropsical, and expires. (See *Anatomy of the Human Body, by John Bell, Vol.* 2, *Edit.* 3, *p.* 234, 235.)

Mr. A. Burns saw two examples, in which the patients died instantaneously, though their aneurismal tumors were very small, and had not burst. Both these patients were in the early stage of pregnancy. (*On Diseases of the Heart, p.* 236.)

The situations, in which aneurisms of the curvature of the aorta burst, are different in different cases. Sometimes the swelling bursts into the cavity of the chest, or that of the pericardium, and the patient drops suddenly down. When the coats of the aorta give way within the pericardium, where they only receive a slight external membranous covering, this is apt to be also ruptured at the same time, so as to bring on copious effusion of blood, which oppresses the action of the heart, and produces immediate death. In other examples, the blood is effused into the trachea, or bronchia, and the patient, after violent coughings and ejections of blood from the mouth, expires. Sometimes, after the tumour has become closely adherent to the lungs, it bursts into the aircells, through which the blood is widely diffused. An example of this termination of the disease was observed by Laennec; who also saw another case, in which, if the patient had lived a little longer, the same occurrence in all probability would have happened. Ehrhardt says, that he is not aware, that this mode of rupture has been noticed by other writers. (*De Aneurysmate Aortæ, p.* 21, 4*to. Lips.* 1820.)

In certain cases, the swelling beats its way through the ribs, destroys the vertebræ, and injures the spinal marrow, so that the patient suffers a species of death, somewhat less violent and sudden. But, although aneurisms in the chest do sometimes protrude at the back, a circumstance, that depends on the particular situation of the disease, (See *Pelletan Clinique Chir. T.* i. *Obs.* 7, *p.* 84.) they more commonly rise towards the upper part of the breast, where a throbbing tumor occurs, which has caused an absorption of the opposing parts of the ribs and sternum; and sometimes dislocated the clavicles. Corvisart saw an instance, in which an aneurism of the aorta had dislocated the sternal extremity of the clavicle; and Duverney makes mention of a case, in which, besides the displacement and injury of the clavicle, the sternum and scapula were partially destroyed. Guattani speaks of an example, in which the clavicle was bent by a large aneurism, of which a portion, as large as a pigeon's egg, projected above the bone. (*Louth, p.* 168.) And Morgagni has described a case, where the upper bone of the sternum, the sternal ends of the clavicles, and the adjoining ribs, were destroyed by the pressure of a large aneurism of the front of the curvature of the aorta, and the disease presented itself externally somewhat in the form of a boil. (*Epist.* 26, *art.* 9.)

The swelling now pulsates in an alarming way. The blood is only retained by a thin covering of livid skin, which is becoming thinner and thinner. At length, a point of the tumor puts on a more conical, thin, and inflamed appearance than the rest; a slough is formed, and, on this becoming loose, the patient is sometimes instantaneously carried off by a sudden gush of blood.

An extraordinary case of aneurism of the aorta is related by Dr. C. W. Wells. The disease, being unattended with any external swelling, it seems, was not comprehended during the patient's life-time.

The following is an abstract of the case. Mr. A. B. a gentleman, thirty-five years of age, and temperate in his habits, became affected in 1789 with symptoms, which were thought to denote the approach of pulmonary consumption. These, however, after some time, entirely disappeared. In 1798, he was attacked with a slight hemiplegia, from which he also recovered, with the exception of an inconsiderable sense of coldness in the foot, which had been paralytic. In March, 1804, he complained of being frequently troubled with a noise in his ears, flatulence in his bowels, and pains in his hands and feet, sometimes attended with slight swellings in the same parts. From one, or more of these symptoms, he was never afterwards quite free; but, he did not complain of any unusual feelings in his chest. August 11, 1807, he fatigued himself considerably with walking; ate rather a hearty dinner; and, having refreshed himself with some sleep afterwards, he played about with his children. While thus amusing himself, he was suddenly seized, between eight and nine o'clock, with great oppression in his chest. He soon afterwards became sick, and, in the matter thrown up, some streaks of blood were observed. He now went to bed; but, though the weather was warm, and he was covered with bed-clothes, his skin felt cold to the attendants. At midnight, he laboured under a constant cough, and expectorated mucus tinged with blood. His body was moistened with a cold sweat, and his pulse was extremely feeble; sometimes, it was scarcely perceptible. About five in the morning, his pulse was feeble and irregular; his breathing difficult, his skin pale, and cold, and covered with a clammy sweat. He frequently tossed, and writhed his body, as if he was suffering great pain or uneasiness. The mental faculties, however, seemed unimpaired. Shortly afterwards he expired, having complained, just before his death, of much heat in his chest, and thrown off the bed-clothes.

The most remarkable circumstance found on opening the body is thus recorded: "The ascending aorta was distended to about the size of a large orange. The tumor adhered to the pulmonary artery, just before its division into the right and left branches. Within the circumference of this adhesion, there was a narrow hole, by means of which a communication was formed between the two arteries."

Dr. Wells concludes with observing, that, though such a disease might easily have been imagined, he had found no instance of it in books, and that it had not been observed by any of the surgeons or anatomists in London. He supposed, that the communication, between the aorta and pulmonary artery, took place on the evening before the patient's death, when the oppression of the chest was first felt: and that, in consequence of the superior strength of the left side of the heart, a part of the blood, which was thrown into the aorta, must have been forced into the pulmonary artery, from which circumstance, he conjectures most of the symptoms originated. (*Trans. of a Society for the Improvement of Med. and Chir. Knowledge, Vol.* 3, *p.* 85.)

The bursting of an aneurism of the aorta into the pulmonary artery is then another possible mode, in which the disease may prove fatal.

Besides the example of this nature, reported by Dr. Wells, several others are detailed by writers. (See *Bulletin de la Faculté de Médecine, No.* 3, *in which there are two cases; Sue, in Journ. de Méd. continué, T.* 24, *p.* 124; *and in Bulletin de la Faculté, &c. T.* 17, *p.* 16.)

Aneurisms of the arch of the aorta are stated to have adhered to, and burst into the right auricle of the heart, and thus to have produced instant death. (See *Med. Chir. Journ. Vol.* 6, *p.* 617. *Bulletin de la Société de Médicine à Paris*, 1810, *No.* 3, *p.* 38.)

Cases, in which aneurisms of the thoracic aorta burst into the œsophagus, are uncommon. Bonetus and Morgagni record no examples of this event; nor are there any in the comprehensive treatises of Scarpa and Hodgson. Corvisart speaks of an instance, which had been seen by Dupuytren, of which, however, no description is given. Yet, the possibility of the occurrence is not a matter of speculation, or doubt.

A case of this description is noticed by Matani (*De Aneurism. Præcordiorum Morbis*, *p.* 120;) another is alluded to by Ehrhardt, as being related by Copeland, (*Comment De Aneurismate Aortæ*, *p.* 22, *et Cerutti Catal. Prop. Pathol;*) and an instance is described by Bertin. (See *Bulletins de la Faculté de Méd.* 1810, *p.* 14.)

Sauvages is one of the few writers, who have adduced proofs of this mode of rupture: *cadavere aperto, inveni ventriculum septem vel octo libris sanguinis distensum, aortam ad brachii magnitudinem, per spatium septem vel octo pollicum dilatatam, et orificium denarii magnitudine aortæ, et œsophago continuo commune, quod tamen quinque cristæ carneæ, veluti valvulæ ex ambitu orificii oriundæ et circumpositæ potuerunt obturare. Per hoc orificium, sanguis ex aorta fluxerat in œsophagum.* (*Nov. Méthod. T.* 2, *p.* 298.) A similar case has been recently published by Bricheteau. (See *Bulletin de l'Athenée de Méd. de Paris, Dec.* 1816.)

Laennec met with an aneurism of the descending aorta, where the tumor had made such pressure on the thoracic duct, that this tube was partly destroyed, and all the lymphatic vessels were found uncommonly turgid. (*Journ. de Méd. par Corvisart, T.* 2, *p.* 15.) With the exception, perhaps, of one instance given on the authority of Lancisi, (*Lauthii Collect. p.*38,) no other example of this description is upon record.

An instance is reported by Corvisart, in which the pressure of an aneurism of the ascending aorta had nearly obliterated the termination of the lower vena cava, and a fatal attack of apoplexy was the consequence. (*Mal. du Cœur, p.* 342.)

It is well worthy of notice, that aneurisms of the arch of the aorta may occasion a tumor, so much like that of a subclavian aneurism, as to be in danger of being mistaken for the latter disease. An example of this kind is related by Mr. Allen Burn: "a case," says he, "on which several of the most distinguished practitioners of Edinburgh, and almost every surgeon in Glasgow, were consulted. The nature of the disease appeared to be so decided, and its situation in the subclavian artery so clear, that on that subject there was no difference of opinion. Some were, however, of opinion, that an operation might be performed, while others were fully convinced, that the case was hopeless. For myself, I must confess, that I was firmly persuaded, that, in the early stage of the disease, an operation might have been beneficial," &c. (*Surgical Anatomy of the Head and Neck, p.* 30.) After death, the vessel, which was supposed to have been most materially affected, was found perfectly healthy. (*P.* 39.)

After detailing all the particulars of this interesting case, Mr. A. Burns observes, that, "it corroborates Sir Astley Cooper's remark, that aneurism of the aorta may assume the appearance of being seated in one of the arteries of the neck; an inference, drawn from the examination of a case, which came under his own observation, and of which he had the goodness to transmit a short history to me, along with a sketch, illustrative of the position of the tumor. In one case, the aneurism was attached to the right side of the aortic arch, and involved a part of the arteria innominata; in Sir A. Cooper's, the tumor arose from the left side of the arch, from between the roots of the left subclavian, and carotid arteries. It formed a florence-flask-like cyst, the bulbous end of which projected at the root of the neck, from behind the sternum, and so nearly resembled aneurism of the root of the carotid artery, that the practitioner, who consulted Sir A. Cooper, actually mistook the disease for carotid aneurism." (*Allan Burns, Op. cit. p.* 41.)

The preceding statement has received full confirmation from the observation of an intelligent writer. "I have seen (says Mr. Hodgson) several cases of aneurism, arising from the superior part of the arch of the aorta, which protruded above the sternum and clavicles, and, in one instance, the space between the tumor and the sternum was so considerable, that it was proposed to tie the carotid artery for an aneurism, which dissection proved to arise from the origin of the arteria innominata and from the arch of the aorta." (*On the Diseases of Arteries and Veins, p.* 90.)

As we have already noticed, aneurisms of the aoata are most frequent at its curvature; but they are also met with on the other portion of this vessel in the thorax, and likewise on that part of it which is below the diaphragm. In subjects, predisposed to aneurisms, such swellings are frequently seen affecting various parts of the aorta at the same time.

When the disease occurs in the abdominal aorta, a preternatural pulsation generally becomes perceptible at some particular point. The pressure of the tumor interferes with the functions of the viscera; the breathing is rendered difficult by the swelling resisting the descent of the diaphragm; the patient suffers at times excruciating internal pains; sometimes he is affected with costiveness; sometimes with diarrhœa; and not unfrequently with incontinence of the urine and feces. At length, an immense external swelling is formed, which pulsates alarmingly, and, if the patient survives long enough, destroys him by a sudden external, or internal effusion of blood.

Aneurisms, within the thorax and abdomen, being entirely out of the reach of operative surgery, have been too commonly abandoned as unavoidably fatal, and when any thing has been done in such cases, it has generally been only with a view of palliation. Moderating the force of the circulation by bleedings and low diet, avoiding every thing that has the least tendency to heat the body, or quicken the motion of the blood, keeping the bowels well open with laxative medicines, and lessening pain with opiates, have been the means usually employed. Of late years, also, digitalis, which has a peculiar power of diminishing the action of the sanguiferous system and impetus of the blood, has been prescribed with every appearance of benefit.

That the diminution of the force of the circulation will prevent the increase of an aneurism, Mr. Hodgson considers illustrated by the following circumstance: if two sacs exist in the course of the same artery, the obstruction, which is caused by the passage of blood into the upper, removes the force of circulation from the lower, which becomes stationary, or its cavity is obliterated with coagulum. (*On Diseases of Arteries, &c. p.* 149.)

It was the opinion of the celebrated Valsalva, that the utility of a lowering plan of treatment might do more, than merely retard the death of aneurismal patients. It was his belief, that the method might entirely cure such aneurisms as had not already made too much progress; and he put it into practice with such rigour and perseverance, that the treatment became considered as particularly his own. The plan, alluded to, is not described in his writings; but was published in the first volume of the Commentaries of the Academy of Bologna, by Albertini, one of his fellow students; and several persons, who had learnt this method of Valsalva, afterwards imparted it to others. Thus, as Morgagni was passing through Bologna, in 1728, Stancazi, a physician of that place, is said to have informed him of Valsalva's practice. (See on this subject *Kreysig, über die Herzkrankheiten, B.* 2, *p.* 728.)

After taking away a good deal of blood by venesection, Valsalva used next to diminish the quantity of food gradually, till the patient at length was allowed only half a pint of soup in the morning, and a quarter of a pint in the evening, and a very small quantity of water, medicated with mucilage of quinces, or with the lapis osteocolla. When the patient had been so reduced as to be incapable of getting out of his bed, Valsalva used to give him more nourishment till this extreme debility was removed. Valsalva was sure, that some aneurisms, thus treated, had got well, because every symptom disappeared, and his conviction was verified by an opportunity which he had of dissecting the body of a person that had been cured of this disease, and afterwards died of another affection; for, the artery, which had been dilated, was found contracted, and in some degree callous.

Morgagni relates, that this method of treating aneurisms is somewhat like the plan, which Bernard Gengha tried with success, as well as Lancisi, and he refers us to the 24th chapter of the 2nd vol. of the Anatomy of the one, and to lib. 2, cap. 4, of the Treatise on the Heart and Aneurisms, of the other. But, Sabatier tells us, that, in consequence of this instruction, he examined both these works, without finding any thing on the subject. However this may be, we are informed by the latter, that he has seen the good effects of the practice in an officer, who had an alarming aneurism in front of the humeral extremity of the clavicle, in consequence of a sword wound in the axilla. The patient, after having been bled several times, was confined to his bed, and kept to an extremely low diet. He was allowed, as drink, only a very acid kind of lemonade. He took pills containing alum, and the swelling was covered with a bag full of tan mill dust, which was every now and then well wet with port wine. By a perseverance in this treatment, the swelling was reduced to a smallish hard tubercle, having no pulsation, and a perfect cure ensued. (See *Sabatier Médecine Opératoire, Tom.* 3, *p.* 170-172.)

Guerin recommended the application of ice water, or pounded ice, to aneurismal swellings; a plan, which he represents, as being often of itself sufficient to effect a cure. This topical employment of cold applications may be rationally and conveniently adopted in conjunction with Valsalva's practice.

The most interesting and convincing facts, in proof of the efficacy of this mode of treatment, were published a few years ago by Pelletan. Indeed, upon the whole, I have no hesitation in saying, that I never read any modern collection of surgical cases, which have appeared to me more valuable, than those which compose the Clinique Chirurgicale of this experienced writer. The following extract from a well written critique on this work will serve to convey to the reader some idea of the important information contained in the memoir on internal aneurisms. "The intent in the treatment is to reduce the patient gradually to as extreme a degree of weakness as is possible, without immediately endangering life. It is done by absolute rest, a rigorous diet, and bleeding; to these means, M. Pelletan adds the external application of ice, or cold and astringent washes, &c. He has here detailed many cases from his own practice, of partial, or complete success, which cannot be too generally known, as they may be the means of creating in some, and of confirming in others, a good opinion of the only method of treatment, which has been found at all efficacious in a dreadful, and not unfrequent, organic disease.

"Of the cases here recorded, some appear to have been cured; in others, the treatment had marked good effects. In extreme cases, at best, it afforded but partial and temporary relief. We can notice but a few of these cases, which are, in every respect, highly interesting. In one, a robust man, an aneurism at the root of the aorta, with a pulsating tumor of the size of an egg, projecting between the ribs, (the edges of which were already partly absorbed) was reduced, so as to recede within the ribs in the course of eight days. At the end of this time, the patient refused to submit any longer. The tumor did not appear again for nearly a year, although he returned to very drunken and irregular habits. He died in about two years and a half, with the tumor again appearing, and much increased in volume. The aneurismal sac communicated with the aorta, by a smooth and round opening, opposite to one of the sigmoid valves. There can be no doubt of the efficacy of the treatment in this case; and it is highly probable that his health and his life might have been long preserved, but from his own indiscretion. In a case somewhat similar, but not so far advanced, the patient appears to have been cured. There was a swelling on the right side of the breast, about six inches in circumference, with a very strong beating. The pulsation was accompanied with a pain, which stretched towards the scapula and the occiput. It was evident, that the disease was an aneurism of the great arch of the aorta. The patient was a crier, of a strong frame, who was accustomed to drink freely. In the four first days, he was bled eight times, drawing three basins, 'palettes,' in the morning, and two in the evening. On the fifth, the pains and the beating were much lessened, but the pulse was still full. He was again bled once. The pulse was in a favourable state, as to strength, till the seventh day, when it again rose, and the man was twice bled.

"During this time, the man was kept to a most rigorous diet. A cold poultice of linseed and vinegar was placed on the tumor, and renewed when it became warm. At the end of eight days, the good effects of this plan were very evident; the pain and the pulsation were gone. The patient, though weak, was in health and tranquil. He was now allowed more food by degrees. At the end of four weeks from the commencement of the treatment, he left the Hôtel-Dieu well. He afterwards led a sober life, and became fatter, without any vestige of disease, except a slight and deep pulsation at the part, in which the aorta may always be felt beating in its natural state. He died two or three years after, of another complaint. His death was not known, and the body was not examined." (See *London Med. Review, Vol.* 5, *p.* 123.)

Pelletan also cured by similar treatment a large axillary aneurism, which was deemed beyond the reach of operative surgery. On the thirteenth day, the patient was reduced to a degree of weakness, which alarmed many of the observers. From that time, all pulsation in the tumor ceased. The contents were gradually absorbed; and the patient returned to his former laborious life with his arm as strong as ever. The pulse at the wrist was lost in consequence of the obliteration of the axillary artery, and the limb only receiving blood through the branches of the subclavian artery. "*Il y a beaucoup d'exemples, d'aneurismes guéris spontanément et sans le secours de l'art;* (says Pelletan) *mais on ne peut leur comparer le cas que nous venons de décrire; l'état extrême de la maladie, l'energie des moyens employés, et l'effet immédiat et successif qui en est résulté, prouvent assez que le succès a été dû tout entier à l'art.*" (*Clinique Chirurgicale, Tom.* 1, *p.* 80.)

In this work, we find not less than three cases in which aneurism of the aorta is stated to have been effectually cured. One instance was greatly relieved; but, the disease returned, the next year, in consequence of the patient's intemperate mode of life. In another example, an aneurism at the origin of the aorta was cured: but, the disease recurred in another part of that vessel further from the heart. Even such cases, as proved incurable, to the number of fourteen, all received various degrees of palliation from the treatment adopted.

In a modern work of great merit, several other instances are adduced, in which the utility and efficacy of a debilitating plan of treatment are illustrated. (See *Hodgson's Treatise on the Diseases of Arteries, p.* 146, 147, *&c. &c.*) In the same publication, as I have previously explained, there are several interesting facts, which tend to prove, that when the aneurism of the aorta is lessened or cured, this great vessel itself may remain pervious. The progress of the disease is stopped by the blood coagulating in the sac, and closing the communication between the cavity of the aneurism, and that of the artery.

It must be confessed, in regard to Valsalva's mode of treatment, that some experienced men do not place confidence in it. Boyer declares himself against it, as not being really efficacious; and he states, that some time ago, it was tried twice in the Hôtel-Dieu of Paris. The first trial was made on a patient with an axillary aneurism, which could not be operated upon on account of its situation; the second on a woman, who had an aneurism of the abdominal aorta. In both cases, the tumor was large, and its parietes reduced to the cellular coat, and the surrounding cellular substance. In these two aneurisms, the progress of the swelling was much more rapid, and its rupture happened precisely at the moment, when the treatment had been pushed to the utmost, and there ought to have been the greatest hope. (*Traité des Maladies Chir. T.* 2, *p.* 121.)

Roux expresses his entire disbelief in the possibility of an aneurism of the aorta being ever completely cured by Valsalva's mode of treatment, because he imagines, that such change could not happen without the tube of that great vessel becoming impervious, and of the lower parts of the body then perishing from stoppage of the circulation. But, he bears witness to the utility of such treatment, and recites a case which he attended himself, where an aneurism made a considerable projection on the left side of the sternum, where the cartilages of the third and fourth ribs were raised, the throbbings very forcible, and the sense of suffocation such, that the patient was obliged to keep himself constantly quiet; yet, says Roux, though the disease now exists, it forms no prominence on the chest; the pulsations can only be obscurely felt between the ribs; respiration is but slightly oppressed; and the patient is capable of attending to his business. (*Nouveaux Elémens de Médecine Opératoire, T.* 1, *p.* 510, *8vo. Paris,* 1813. *Fr. Torti, De Aortæ Aneurysmate Observationes binæ, cum animadv. Pauli Valcarenghi,* 8*vo. Cremonæ,* 1741. *D. Sommer, Dis. Sistens Aneurysmatis Aortæ Pleuritidem mentientis Casum,* 8*vo. Berol.* 1816.)

ANEURISMAL VARIX, VARICOSE, OR VENOUS ANEURISM.

By these terms, surgeons mean a tumor, arising from a preternatural and direct communication, formed between a large vein and a subjacent artery. Thus, in venesection, performed immediately over the artery at the bend of the elbow, if the lancet be carried too deeply, it may transfix the vein, and wound the artery, in which event, the arterial blood, in consequence of the proximity of the two vessels, instead of being effused into the cellular substance, will pass directly into the cavity of the vein, which will become dilated in the form of a varix by the jet of arterial blood into it.

Although Sennertus probably referred to an instance of this disease, (*Op. T.* 5, *l.* 5, *cap.* 43,) Dr. W. Hunter is undoubtedly the first who gave an accurate description of it. Scarpa is disposed to claim a share of the merit for his countryman Guattani; but, as Mr. Hodgson has remarked, Dr. Hunter's observations on this disease were published in the years 1757, and 1764, whereas, Guattani did not see his first patient until the year 1769, and his book was not published until the year 1772.

"Does it ever happen in surgery," says Dr. Hunter, "that when an artery is opened through a vein, a communication, or anastomosis, is afterwards kept up between these two vessels? It is easy to conceive this case, and it is not long since I was consulted about one, that had all the symptoms that might be expected, supposing such a thing to have actually happened, and such symptoms, as otherwise must be allowed to be very unaccountable. It arose from bleeding; and was of some years standing, when I saw it about two years ago, and I understand very little alteration has happened to it since that time. The veins, at the bending of the arm, and especially the basilic, which was the vein that had been opened, were there prodigiously enlarged, and came gradually to their natural size, at about two inches above, and as much below the elbow. When emptied by pressure, they filled again almost instantaneously, and this happened, even when a ligature was applied tight round the forearm, immediately below the affected part. Both when the ligature was made tight, and when it was removed, they shrunk, and remained of a small size, while the finger was kept tight upon the artery, at the part where the vein had been opened in bleeding. There was a general swelling in the place, and in the direction of the artery, which seemed larger, and beat stronger, than what is natural, and there was a tremulous jarring motion in the vein, which was strongest at the part, which had been punctured, and became insensible at some distance both upwards and downwards." (*Med. Obs. and Inq. V.* 1.)

In the second volume of this work, Dr. Hunter adds some further remarks on the aneurismal varix.

"In the operation of bleeding, the lancet is plunged into the artery through both sides of the vein, and there will be three wounds made in these vessels, viz. two in the vein, and one in the artery, and these will be nearly opposite to one another, and to the wound in the skin. This is what all surgeons know has often happened in bleeding, and the injury done the artery is commonly known by the jerking impetuosity of the stream, whilst it flows from the vein, and by the difficulty of stopping it, when a sufficient quantity is drawn.

"In the next place, we must suppose, that the wound of the skin, and of the adjacent, or upper side of the vein, heal up as usual; but, that the wound of the artery, and of the adjacent, or under side of the vein, remain open, (as the wound of the artery does in the spurious aneurism,) and, by that means, the blood is thrown from the trunk of the artery, directly into the trunk of the vein. Extraordinary as this supposition may appear, in reality it differs from the common spurious aneurism in one circumstance only, viz. the wound remaining open in the side of the vein, as well as in the side of the artery. But this one circumstance will occasion a great deal of difference in the symptoms, in the tendency of the complaint, and in the proper method of treating it: upon which account, the knowledge of such a case will be of importance in surgery.

"It will differ in its symptoms from the common spurious aneurism, principally thus:—

"The vein will be dilated, or become varicose, and it will have a pulsating jarring motion on account of the stream from the artery. It will make a hissing noise, which will be found to correspond with the pulse for the same reason. The blood of the tumor will be altogether, or almost entirely fluid, because kept in constant motion. The artery, I apprehend, will become larger in the arm, and smaller at the wrist, than it was in the natural state; which will be found out by comparing the size, and the pulse, of the artery, in both arms, at these different places. The reason of which I will speak of hereafter; and the effects of ligatures, and of pressure upon the vessels above the elbow and below it, will be what every person may readily conceive, who understands any thing of the nature of arteries and veins in the living body.

"The natural tendency of such a complaint will be very different from that of the spurious aneurism. The one is growing worse every hour, because of the resistance to the arterial blood, and if not remedied by surgery must at last burst. The other, in a short time, comes to a nearly permanent state; and, if not disturbed, produces no mischief, because there is no considerable resistance to the blood, that is forced out of the artery.

"The proper treatment must, therefore, be very different in these two cases, the spurious aneurism requiring chirurgical assistance, as much, perhaps, as any disease whatever; whereas, in the other case, I presume it will be best to do nothing.

"If such cases do happen, they will no doubt be found to differ among themselves, in many little circumstances, and particularly in the shape, &c. of the tumefied parts. Thus the dilatation of the veins may be in one only, or in several, and may extend lower, or higher, in one case than in another, &c. according to the manner of branching, and to the state of the valves in different arms. And the dilatation of the veins may also vary, on account of the size of the artery, that is wounded, and of the size of the orifice in the artery and in the vein.

"Another difference in such cases will arise from the different manner, in which the orifice of the artery may be united or continued with the orifice of the vein. In one case, the trunk of the vein may keep close to the trunk of the artery, and the very thin stratum of cellular membrane between them may, by means of a little inflammation and coagulation of the blood among its filaments, as it were solder the two orifices of these vessels together, so that there shall be nothing like a canal going from one to the other; and then the whole tumefaction will be more regular, and more evidently a dilatation of the veins only. In other instances the blood, that rushes from the wounded artery, meeting with some difficulty of admission and passage through the vein, may dilate the cellular membrane, between the artery and vein, into a bag, as in a common spurious aneurism, and so make a sort of canal between these two vessels. The trunk of the vein will then be removed to some distance from the trunk of the artery, and the bag will be situated chiefly upon the underside of the vein. The bag may take on an irregular form, from the cellular membrane being more loose, and yielding, at one place, than at another, and from being unequally bound down by the fascia of the biceps muscle. And if the bag be very large, especially, if it be of an irregular figure, no doubt, coagulations of blood may be formed, as in the common spurious aneurism."

As Scarpa correctly observes, a concurrence of two circumstances is requisite for the production of an aneurismal varix: 1. the incision in the vein, and that in the artery, must be exactly in the same direction: 2. the solution of continuity in the integuments and upper side of the vein must heal, while the wound in the deeper side of that vessel, and the puncture in the upper surface of the artery, remain open, and communicate so readily, that the arterial blood finds greater facility in entering from the artery into the vein, than in being effused from the artery into the surrounding cellular substance.

If one of these two circumstances be wanting, either because the wounding instrument has entered the artery a little obliquely from the vein, or because the vein has not been sufficiently near to the artery, on account of the cellular substance between them, the arterial blood most frequently does not produce the aneurismal varix; or, if it does, the disease is always complicated with effusion of arterial blood into the cellular substance, or, with an aneurism, and aneurismal varix at the same time. In this case, the small aneurismal sac serves as a short canal of communication between the artery and the vein, (*Med. Facts and Obs. Vol.* 4, *p.* 115,) two distinct diseases in fact being formed from the same cause, and placed one over the other, viz. an aneurism, and an aneurismal varix. (*Scarpa, p.* 421, *Ed.* 2.) The following marks of distinction, between aneurism and aneurismal varix, are pointed out by the same author: the aneurismal varix always forms a circumscribed tumor; aneurism does not always do so. The cellular substance, which constitutes the sac of the aneurism, does not always resist so strongly the impetus of the arterial blood, as the coats of the vein do. Not unfrequently, therefore, aneurism, from being *circumscribed* at first, becomes *diffused;* extends along the course of the wounded artery; compresses strongly the surrounding parts; occasions acute pain and inflammation; and the parts are threatened with gangrene. On the contrary, the aneurismal varix is always *circumscribed*, increases very slowly, does not produce much pain, and, as it augments, it always extends more or less above or below the place, where venesection has been done; and this extension is in proportion to the greater or less force, with which the arterial blood is thrown from the artery into the vein, and the greater or less resistance made by the valves, situated in the vein below the puncture; and according to the greater or less number of veins communicating with the aneurismal varix. The seat of the disease is generally the basilic vein, which appears dilated in an unusual manner, forming an oblong tumor, of the size of a walnut, if the disease is recent. In the centre of the swelling is the cicatrix left by the lancet. The vein is less dilated, the further it is from this scar, and, in general, at the distance of two inches and a half above and below this point, the vessel resumes its natural size. The small tumor, as has been explained, pulsates like an artery, with a tremulous motion and hissing noise, which is sometimes so great, that the patient cannot sleep, if he is lying with his head low, and resting on the injured arm. The trunk of the brachial artery, from the axilla down to the place where it has been wounded with the lancet, vibrates with extraordinary force. There is no change of colour, nor inflammation of the skin; and the pain is inconsiderable. The swelling is compressible and yielding; but, it returns as soon as the pressure is removed from it. When the arm is kept for some time raised up towards the head, the tumor diminishes; and the same thing happens, when pressure is made on the communication between the artery and vein, or when a tight tourniquet is applied near the axilla. If the disease be complicated with aneurism, a second pulsating tumor will be found lying under the aneurismal varix. (*Scarpa, p.* 424, *Ed.* 2.)

After relating two cases, illustrative of the nature of aneurismal varix, Dr. W. Hunter proceeds to inquire; "Why is the pulse at the wrist so much weaker in the diseased arm than in the other? surely, the reason is obvious and clear. If the blood can easily escape from the trunk of the artery directly into the trunk of the vein, it is natural to think, that it will be driven along the extreme branches with less force, and in less quantity.

"Whence is it, that the artery is enlarged all the way down the arm? I am of opinion, that it is the consequence of the blood passing so readily from the artery into the vein, and is such an extension, as happens to all arteries, in growing bodies, and to the arteries of particular parts, when the parts themselves increase in their bulk, and at the same time retain a vascular structure. It is well known that the arteries of the uterus grow much larger in the time of utero-gestation. I once saw a fleshy tumor upon the top of a man's head, as large nearly as his head; and his temporal and occipital arteries, which fed the tumor, were enlarged in proportion. I have observed the same change in the arteries of enlarged spleens, testes, &c. so that I should suppose it will be found to be universally true in fact, and the reason of it in theory seems evident." (See *Med. Obs. and Inq. V.* 2.)

In thin subjects, the median basilic vein is so close to the brachial artery, the track of which it crosses at a very acute angle, that it is almost impossible to open it at this point, without risk of wounding the artery at the same time. The bend of the arm, indeed, is the very situation in which this disease is usually noticed. It is easy to conceive, however, that a venous aneurism may happen wherever an artery of a certain diameter lies immediately under a large vein. Thus, Baron Larrey informs us, that his uncle, surgeon to the hospital at Toulouse, saw a case of aneurismal varix, which had been occasioned by a wound of the popliteal vein, and artery, and that a history of the disease, accompanied with the pathological preparation, was sent to the former royal academy of surgery at Paris. "The varicose swelling, which was as large as two fists, occupied the whole of the ham in a middle-aged man, who some years previously had been wounded with a sword in that part of the limb. At a consultation, amputation was deemed necessary, and was performed with success. At the bottom of the varicose pouch, the communication between the popliteal vein and artery was observed. The sac itself was evidently composed of the vein, the parts of which, adjacent to the varicose swelling, were dilated, especially the lower continuation of the vessel. The popliteal nerve was rendered flat, like a piece of tape, and adherent to the outside of the cyst. (See *Mém. de Chir. Mil. T.* 4, *p.* 340. *Boyer, Traité des Maladies Chirurgicales, &c. T.* 2, *p.* 177.) Two cases are likewise recorded by Mr. Hodgson. In one the disease was caused in the thigh, about four inches below Poupart's ligament, by the point of a heated iron rod, which had passed through the femoral artery and vein. In the other example, the aneurismal varix was situated in the ham, and was the consequence of a wound in that part with a pistol ball. (*Treatise on the Disease of Arteries, p.* 498.) Larrey records one example of aneurismal varix situated under the clavicle.

P. Cadrieux was wounded with a sabre in a duel, on the 20th of November, 1811: part of the attachment of the sterno-mastoid muscle was divided, the anterior scalenus, the subclavian artery and vein at a very deep point, and probably also a portion of the brachial plexus. A most violent hemorrhage took place, followed by syncope. Pressure was applied to the wound, and the patient conveyed to the hospital at Gros-Caillou. The external wound, which was small, did not bleed at all the following morning; but the clavicle was quite concealed by a large tumor, which throbbed with the arteries, particularly at its lower part. A peculiar noise, like that of the passage of a fluid through tortuous metallic tubes, could also be felt more deeply, in the direction of the axillary vein. The arm was quite cold, insensible, motionless, and without any pulse, even in the axillary artery itself. On the 22d, the tumor was not larger, but its throbbings were stronger; the jugular vein on the same side was considerably dilated; and the pulsation of the carotid, and of the arteries of the opposite arm, had augmented. A vein in the right arm was opened, and compresses dipped in camphorated vinegar, muriate of ammonia, and ice, applied to the swelling. It would be superfluous here to detail the diet, bleedings, and other parts of the treatment. On the 8th day, the outer wound was quite healed. On the 10th, the veins of the limb were observed to be swelled, and sensibility and warmth were returning in it; though no pulse could yet be felt. The tumor was much smaller, and restricted to a circumscribed place behind the great pectoral muscle; but, the hissing sound was still plainer. By degrees, the muscles of the arm and fore-arm regained their power of motion. The hand, however, continued useless, and affected with pricking pains. On the 20th day, the tumour was quite gone; but the hissing sound was unaltered, and the throbbings were still evident in the veins of the neck and arm. The arm was not at all emaciated. On the 55th day, a pulse at the wrist could be slightly felt; the hissing sound had become less distinct; the veins were less turgid; and their throbbing diminished.

A second instance of aneurismal varix, or rather perhaps of a varix, of all the veins of the arm, caused by a sword wound of the axilla, is also recorded by Larrey. He mentions however, that a pulsation was observable in the most prominent of the enlarged vessels. (See *Mém. de Chir. Mil. T,* 4, *p.* 341. *&c.*)

Dr. Dorsey, of Philadelphia, published a case of aneurismal varix, which is in several respects interesting. A patient was wounded in the leg with buck-shot; and, after the cure of the injury, an aneurismal varix was noticed just below the knee; and, in a little time, the superficial veins of the limb became dilated, and the hissing noise, characterising this species of aneurism, could be plainly distinguished. The patient was seen by Dr. Dorsey, twelve years after the accident; the veins were then considerably distended from the toes up to the groin, all about which latter part pain was constantly experienced, and some ulcers situated on the foot and ankle could not be healed by any of the remedies which were tried. The patient was under the care of Drs. Physick and Wistar. The enormous distention of the vessels of the leg, and the uncertainty of finding out the communication between the artery and vein, led these gentlemen to tie the first of these vessels in the middle of the thigh. Gangrene soon ensued, and in this state the patient was further weakened by an unexpected hemorrhage from one of the distended veins; and though the vessel was secured with a ligature, the bleeding recurred, the patient became more and more enfeebled, and at length expired. When the limb was examined after death, the whole of the trunk of the femoral artery was found preternaturally dilated; while all the veins of the limb were considerably distended; a bougie could readily be passed from the popliteal into the posterior tibial artery, which participated in the dilatation, and from this last artery, the instrument could be passed into the vein, through a cyst, situated on the inside of the leg below the knee. (See *Dorsey's Elements of Surgery, Vol.* 2, *p.* 210, *Philadelphia*, 1813.)

Professor Scarpa, Dr. Hunter, Mr. B. Bell, Pott, and Garneri, mention cases of the aneurismal varix, which remained stationary for fourteen, twenty, and thirty-five years. Several cases are related by Brambilla, Guattani, and Monteggia, of a cure having been obtained by means of compression. But, as this method of cure, if it does not succeed, exposes the patient to the danger of a complication of the disease with an aneurism, it ought not to be employed, except in recent cases, where the tumor is small, and in slender patients, at an early period of life, and where both of the vessels can be accurately compressed against the bone.

Two cases are recorded, in which it was necessary to operate in consequence of the disease being joined with aneurism of the artery, and even bursting. The sacs were opened, and a ligature applied both above and below the aperture in the artery. (See *Medical Facts and Obs. Vol.* 4, *p.* 111, *and Medical Museum, Vol.* 1, *p.* 65.)

In the winter of 1819, I heard a case read to the Medical and Chirurgical Society of London, from Mr. Atkinson, of York, who had found it necessary to take up the brachial artery, on account of the large and increasing size of an aneurismal varix: mortification of the limb ensued. When the aneurism, joined with an aneurismal varix, is circumscribed, but the circumstances such as to require the brachial artery to be tied, this vessel should be exposed, and tied above the swelling with a single ligature. It is only when the aneurism is diffused, that opening the swelling, and applying a ligature both above and below the aperture in the artery, are thought necessary. (See *Scarpa on Aneurism*, *p.* 433, *Ed.* 2.)

ANEURISM FROM ANASTOMOSIS.

This is the term which the late Mr. John Bell, of Edinburgh, applied to a species of aneurism, which resembles such bloody tumors, (*nævi materni*) as appear in new-born children, grow to a large size, and ultimately bursting, emit a considerable quantity of blood.

Clear descriptions of this disease may be traced in writers, though before the publication of Mr. John Bell's Principles of Surgery, it was not classed with aneurisms. Thus, Desault has recorded a case of this affection, for the express purpose of proving, that pulsation is an uncertain sign of the existence of an aneurism. (See *Parisian Chirurgical Journal, Vol.* 2, *p.* 73.)

The aneurism from anastomosis often affects adults, increasing from an appearance like that of a mere speck, or pimple, to a formidable disease, and being composed of a mutual enlargement of the smaller arteries and veins. The disease originates from some accidental cause; is marked by a perpetual throbbing; grows slowly, but uncontrollably; and is rather irritated, than checked, by compression. The throbbing is at first indistinct, but when the tumor is perfectly formed, the pulsation is very manifest. Every exertion makes the throbbing more evident. The occasional turgid states of the tumor produce sacs of blood in the cellular substance, or dilated veins, and these sacs form little tender, livid, very thin, points, which burst, from time to time, and then like other aneurisms, this one bleeds so profusely, as to induce extreme weakness.

The tumor is a congeries of active vessels, and the cellular substance, through which these vessels are expanded, resembles, as Mr. John Bell describes, the gills of a turkey-cock, or the substance of the placenta, spleen, or womb. The irritated and incessant action of the arteries fills the cells with blood, and from these cells it is reabsorbed by the veins. The size of the swelling is increased by exercise, drinking, emotions of the mind, and by all causes which accelerate the circulation.

In this peculiar disease, Dupuytren regards the arteries as being in an aneurismal state; but, besides this circumstance, he says, their extreme ramifications intermix in a thousand different ways, intercepting spaces, and representing cavities, like those which are found in the corpora cavernosa; and he imputes the disease to increased activity of the capillary circulation. (*Fr. Transl. of Mr. Hodgson's Work, T.* 2, *p.* 300.)

In the female subject, the hemorrhage from the aneurism by anastomosis is sometimes a substitute for menstruation, as the following example illustrates: Ann Vachot, of St. Maury, in Bresse, was born with a tumor on her chin, of the size and shape of a small strawberry, without pain, heat, or discoloration of the skin. As it produced no uneasiness, nor inconvenience whatever, it excited little attention, particularly as it did not seem to increase with the growth of the child. For the first fifteen years, there was but little alteration; but about the menstrual period, it increased suddenly to double the size, and became more elongated in its form. A quantity of red blood was observed to ooze from its extremity. This flux became, in some measure, periodical, and sometimes was sufficiently abundant to produce an alarming degree of weakness. Each period of its return was preceded by a violent pain in the head, and numbness.

Before and after the appearance of these symptoms, there was no alteration in the size of the tumor; the only difference was a small enlargement of the cutaneous veins, with an increase of heat in the part, occasioning some degree of tenderness.

The menses at length took place, but, in small quantity, and, at irregular periods, without influencing the blood discharged from the tumor, or the frequency of the evacuation.

The breasts were not enlarged till a late period, nor did the approach of puberty seem to have its accustomed influence on those glands, &c. (See *Parisian Chirurgical Journal, Vol.* 2, *p.* 73, 74.)

As far as my observations extend, the true aneurism by anastomosis is a disease with which a surgeon should never tamper; and, if it be decided to try any treatment at all, the only prudent plan is either a complete removal of the disease with a knife, or tying the chief arteries, which supply the swelling with blood. The first is the surest mode of relief, and should be preferred, when not forbidden by the magnitude, or situation of the tumor.

In performing such an operation, as Mr. Wardrop remarks, the surgeon should avoid cutting into the substance of the tumor; for if this be done, the hemorrhage is violent; whereas, by making the incisions beyond the diseased structure, the flow of blood is much more moderate. (*Med. Chir. Trans. Vol.* 9, *p.* 212.) In a few nævi pressure may be safely tried; but, all attempts to get rid of a true aneurism from anastomosis by caustic, I should think by no means advisable.

"This aneurism," as Mr. John Bell observes, "is a mere congeries of active vessels, which will not be cured by opening it; all attempts to obliterate the disease with caustics, after a simple incision, have proved unsuccessful, nor does the interception of particular vessels, which lead to it, affect the tumor; the whole group of vessels must be extirpated. In varicose veins, or in aneurisms of individual arteries, or in extravasations of blood, such as that produced under the scalp from blows upon the temporal artery, or in those aneurisms produced in school-boys by pulling the hair, and, also in those bloody effusions from blows on the head, which have a distinct pulsation, the process of cutting up the varix, aneurism, or extravasation, enables you to obliterate the vessel and perform an easy cure. But, in this enlargement of innumerable small vessels, in this aneurism by anastomosis, the rule is, 'not to cut into, but to cut it out.' These purple and ill-looking tumors, because they are large, beating, painful, covered with scabs, and bleeding, like a cancer in the last stage of ulceration, have been but too often pronounced cancers! incurable bleeding cancers! and the remarks which I have made, while they tend, in some measure, to explain the nature and consequences of the disease, will remind you of various unhappy cases, where either partial incisions only had been practised, or the patient left entirely to his fate." (*Principles of Surgery, Vol.* 1.)

The following case, recorded by Mr. Wardrop, affords a valuable illustration of the nature and structure of one form of this disease. A child was born with a very large subcutaneous nævus on the back part of the neck. It was of the form and size of half an ordinary orange. The tumor had been daily increasing, and when Mr. Wardrop saw it, ten days after birth, the skin had given way, and a profuse hemorrhage had taken place. The swelling was very soft and compressible: squeezed in the hand, it yielded like a sponge, and was reducible to one third of its original size. On removing the pressure, however, the tumor rapidly filled again, and the skin resumed its purple colour. "Conceiving the immediate extirpation of the tumor the only chance of saving the infant, (says Mr. Wardrop,) I removed it as expeditiously as possible, and made the incision of the integuments beyond the boundary of the tumor; aware of the danger of hemorrhage, where such tumors are cut into. So profuse, however, was the bleeding, that, though the whole mass was easily removed by a few incisions, the child expired.

"The tumor having been injected, by throwing coloured size into a few of the larger vessels, its intimate structure could be accurately examined. Several of the vessels, which, from the thinness of their coats, appeared to be veins, were of a large size, and there was one sufficiently big to admit a full sized bougie." This vessel was fully as large as the carotid artery of an infant. The boundaries of the tumor appeared distinct, some healthy cellular membrane surrounding it, which was traversed by the blood vessels. On tracing these vessels to the diseased mass, they penetrated into a spongy structure, composed of numerous cells and canals, of a variety of forms and sizes, all of which were filled with the injection, and communicated directly with the ramifications of the vessels. These cells and canals had a smooth and polished surface, and, in some parts, resembled very much the cavities of the heart, fibres crossing them in various directions, like the columnæ tendineæ. The opening in the skin, through which the blood had escaped during life, communicated directly with one of the large cells, into which the largest vessel also passed. (*Wardrop in Med. Chir. Trans. Vol.* 9. *p.* 203.)

In the Section on Carotid Aneurisms, I have mentioned the cases, in which Mr. Travers and Mr. Dalrymple cured aneurisms by anastomosis in the orbit, by tying the common carotid artery. Professor Patterson also cured an immense anastomosing aneurism of the cheek and side of the face by taking up the carotid artery. (See *Med. and Phys. Journ. Vol.* 48, *July* 1822.) These facts prove, that aneurism by anastomosis, like many other diseases, sometimes admits of being cured, on the principle of cutting off, or lessening, the supply of blood to the part affected.

However, surgeons must not be too confident of being always able to cure the disease, by tying the main artery, from which the swelling receives its supply of blood; and the great cause of failure is the impossibility of preventing in some situations the transmission of a considerable quantity of blood into the tumor, through the anastomosing vessels. A case is recorded by Maunoir, in which he applied a ligature for three days to the carotid artery and obliterated it; yet, the benefit effected seemed to be only temporary, as in a short time, the tumor was as large as before. (See *Med. and Phys. Journ. Vol.* 48.) In fact, every vessel, artery, and vein, around the disease, seems to be enlarged and turgid; and the inosculations are so infinite, that no point of the circumference of the swelling can be imagined, which is free from them. Etienne Dumand was born with two small red marks on the antihelix of the right ear. Until the age of twelve years, the chief inconveniencies were a sensation of itching about the part, occasional bleeding from it, and the greater size of this, than of the other ear. The disease now extended itself over the whole antihelix, and to the helix and concha; and the upper part of the ear became twice as large as natural. Slight alternate dilatations and contractions began to be perceptible in the tumor, which was of a violet colour, and covered by a very thin skin. Soon afterwards, any accidental motion of the patient's hat was sufficient to excite copious hemorrhages, which were difficult to suppress, and, at the same time that they produced great weakness, caused a temporary diminution of the tumor and its pulsations. At length, the disease began to raise up the scalp for the distance of an inch around the meatus auditorius, and the hemorrhages to be more frequent and alarming. Pressure was next applied to the temporal, auricular, and occipital arteries; but, as the patient could not endure it, the first two of these vessels were tied, the only benefit from which was a slight diminution in the pulsation and bulk of the swelling. This treatment did not prevent the return of hemorrhage, and, therefore, forty-three days after the first operation, a ligature was applied to the occipital artery, which proceeding was equally ineffectual. As the disease continued to make progress, the patient entered the Hotel-Dieu, where, on the 8th of April, 1818, Dupuytren tried what effect tying the trunk of the carotid artery would produce on the swelling. As soon as the ligature was applied, the throbbings ceased, and the tumor underwent a quick and considerable diminution. On the 17th day, slight expansions and contractions of the diseased part of the ear were again perceptible, though the swelling had diminished one third. An attempt was now made to compress the tumor by covering it with plaster of Paris; a plan which was somewhat painful, though it lessened the size of the disease. After being sixty-three days in the hospital, the patient was discharged, at which period the tumor was diminished one third; the throbbings had returned, but no unpleasant noises continued to affect the ear. (See *Breschet's Tr. of Mr. Hodgson's Work, T. 2, p.* 296.)

An infant, six weeks old, was brought to Mr. Wardrop, on account of an aneurism by anastomosis, (a subcutaneous nævus) of a very unusual size, situated on the left cheek. The base of the tumor extended from the temple to beyond the angle of the jaw, completely enveloping the cartilage of the ear. At its upper part, there was an ulcer, about three inches in diameter, presenting a sloughing appearance. The tumor was soft and doughy; its size could be much diminished by pressure; there was a throbbing in it; and a strong pulsation in the adjacent vessels. The disease was daily increasing, and several profuse hemorrhages had taken place from the ulcerated part. Mr. Wardrop knowing, from the case to which I have already adverted, the danger of attempting to extirpate so large a tumor of this nature, was led to try what benefit might be obtained by tying the carotid artery. A few hours after this operation, the tumor became soft and pliable, its purple colour disappeared, and the tortuous veins collapsed. On the second day, the skin had resumed its natural pale colour, and the ulceration continued to extend. On the third, the tumor still diminished. On the fourth, the swelling had considerably increased again; the integuments covering it had become livid; and the veins turgid. The inosculating branches of the temporal and occipital arteries had become greatly enlarged. A small quantity of blood had oozed from the ulcer. After remaining without much alteration, the tumor on the seventh day had again evidently diminished. On the ninth the ulceration was extending itself slowly, and the tumor was lessened fully one half. On the twelfth the child's health was materially improving. The auricular portion of the swelling had now so much diminished, that the cartilage of the ear had fallen into its natural situation. After a poultice had been applied for two days, the central portion of the swelling, which appeared like a mass of hardened blood, was softened, and Mr. Wardrop removed considerable portions of it. On the thirteenth, the child became very ill, and died the following day, exhausted by the irritation of an ulcer, which had involved the whole surface of an enormous tumor. Mr. Wardrop thinks the advantages likely to occur from the plan of tying the main arteries supplying tumors of this nature with blood are, the diminution of the size of the disease; the lessening of the danger of hemorrhage, if the ulcerative process has commenced; and the rendering it practicable to remove the swelling with the knife, though the operation may previously have been dangerous, or impracticable. (See *Med. Chir. Trans. Vol.* 9, *p.* 206–214, *&c.*) Instead of endeavouring to promote ulceration in any of these cases, my own sentiments would incline me to leave the business of removing the diseased mass quietly to the absorbents, or, at most, I would only assist them with pressure, or by covering the tumor with plaster of Paris.

The next case of aneurism by anastomosis, which I shall briefly notice, was one which was under the care of my friend Mr. Lawrence, and situated on the right finger of the right hand, in a young woman about twenty years of age. The disease was attended with painful sensations extending to various parts of the limb and the breast, and the arm was disqualified for any kind of exertion. In January 1815, Mr. Hodgson had taken up the radial and ulnar arteries, and the consequences of the operation were an entire cessation of beating, collapse of the swelling, and relief from pain; but, these symptoms all recurred in a few days. Finding compression unavailing, and the sufferings of the patient increasing, Mr. Lawrence proposed amputation of the finger at the metacarpal joint; but, as this suggestion was not approved of, he recommended the patient to try the effects of a division of all the soft parts, by a circular incision close to the palm, so as to cut off the supply of blood. This operation Mr. Lawrence performed in the presence of Mr. George Young and myself, in as complete a manner as can possibly be conceived. All the soft parts, excepting the flexor tendons, with their theca and the extensor-tendon, were divided. The digital artery, which had pulsated so evidently in the palm of the hand, was fully equal in size to the radial, or ulnar of an adult, and was the principal nutrient vessel of the disease. After tying this and the opposite one, we were surprised at finding so strong a jet of arterial blood from the other orifices of these two vessels, as to render ligatures necessary. I can here only add, that the whole finger beyond the cut swelled very considerably; the incision healed slowly; the swelling subsided, but did not entirely disappear; the integuments recovered their natural colour; the pulsation and pain were removed; and the patient so far recovered the use of her arm, that she could work at her needle for an hour together, and use the arm for most purposes. (See *Wardrop's Obs. on one Species of Nævus in Med. Chir. Trans. Vol.* 9, *p.* 216.)

For information on aneurism, consult *G. Arnaud on Aneurisms,* 8vo. *S. C. Lucae, De Ossescentia Arteriarum Senili,* 4to. *Marburgi,* 1817. *A. F. Walther, Programma de Aneurysmate, Argent.* 1738. (*Haller, Disp. Chir.* 5, 189.) *A. de Haller, De Aortæ Venæque Cavæ gravioribus quibusdam Morbis Observationes,* 4to. *Gott.* 1749. *F. Thierry, Quæstio, &c. An tutior faciliorque vulgari detur Aneurysmatis Chirurgica curatio?* (*Haller, Disp. Chir.* 5, 211.) *H. Petiat de Aneurysmate, Monsp.* 1749. *Lauth Scriptorum Latinorum de Aneurysmatibus Collectio,* 4to. *Argent.* 1785, *which work contains Asman's Diss. de Aneurismate,* 1773; *Guáttani, de Externis Aneurismatibus,* 4to. *Romæ,* 1772; *Lancisi de Aneurysmatibus, Argent.* 1785; *Matani de Aneurysmaticis Præcordiorum Morbis Animadversiones,* 1785; *Verbrugge, Dissertatio Anatomico-Chirurgica de Aneurysmate,* 1773; *Weltinus de Aneurysmate Vero Pectoris Externo Hemiplegiæ Sobole, Basil,* 1750; *Murray, Observations in Aneurysmata Femoris,* 1781; *Trew, Aneurysmatis Spurii post Venæ Basilicæ Sectionem Orti, Historia et Curatio. See also*

an account of Mr. Hunter's Method of performing the Operation for the Cure of the Popliteal Aneurism, by Sir E. Home, in Trans. of a Society for the Improvement of Med. and Chir. Knowledge, V. 1, *p.* 138, *and V.* 2, *p.* 235. *Sabatier's Médecine Opératoire, T.* 3, *V.* 2. *The several volumes of the Medico-Chirurgical Transactions. Cases in Surgery by J. Warner, p.* 141, *&c. Edit.* 4. *J. B. Heraud, De Aneurysmatibus Externis, Monsp.* 1775. *J. F. L. Deschamps, Obs. et Reflexions sur la Ligature des principales Artères blessés, et particulièrement sur l'Aneurisme de l'Artère poplitée,* 8*vo. Paris,* 1797. *Richerand's Nosographie Chirurgicale, T.* 4, *Ed.* 4. *Pelletan's Clinique Chirurgicale, T.* 1, *et* 2. *A. Burns's Surgical Anatomy of the Head and Neck,* 8*vo. Edinb.* 1811, *and Observations on Diseases of the Heart, &c.* 8*vo. Edinb.* 1809. *Ramsden's Practical Observations on the Sclerocele, with four cases of operations for aneurism,* 8*vo. Lond.* 1811. *Œuvres Chirurgicales de Desault, par Bichat, T.* 2, *p.* 553. *S. C. Lucæ quædam Observationes Anatomicæ circa Nervos Arterias adeuntes et comitantes,* 4*to. Francof.* 1810. *Wells in Transactions of a Society for the Improvement of Med. and Chir. Knowledge, V.* 3, *p.* 81—85, *&c. G. P. Scheid, Obs. Med. Chir. de Aneurysmate,* 8*vo. Hardevici,* 1792. *Corvisart, Essai sur les Maladies et les Lesions Organiques du Cœur et des Gros Vaisseaux. Edit.* 2. *or Transl. by C. H. Hebb,* 8*vo. Lond.* 1813. *C. Bell's Operative Surgery, V.* 1, *Ed.* 2. *John Bell's Principles of Surgery, V.* 1. *Richter's Anfangsgr. der Wundarzneykunst, B.* 1. *Abernethy's Surgical Works, V.* 1. *Monro's Observ. in the Edinb. Med. Essays. Various productions in the Med. Observ. and Inquiries. The article Aneurism in Rees's Cyclopædia. J. P. Maunoir, Mémoires Physiologiques et Pratiques sur l'Aneurisme et la ligature,* 8*vo. Geneve,* 1802. *Freer's Observations on Aneurism,* 4*to. Lond.* 1807; *and a Treatise on the Anatomy, Pathology, and Surgical Treatment of Aneurism by A. Scarpa, translated by J. Wishart,* 1808. *The original Italian was published* 1802. *Ant. Scarpa, Memoria sulla Legatura delle Principali Arterie delle Arti, con una Appendice all' Opera sull' Aneurisma, fol. Pavia,* 1817. *This tract, and a great deal of valuable additional matter, are contained in the* 2*d Edition of Scarpa's Work on Aneurism by Mr. Wishart,* 8*vo. Edinb.* 1819. *Callisen's Systema Chirurgiæ Hodiernæ, Part* 2, *p.* 545, *&c. Edit.* 1791. *Boyer, Traité des Maladies Chir. T.* 2, *p.* 84, *&c. A. C. Hutchison, Letter on Popliteal Aneurism,* 8*vo. Lond.* 1811. *J. Hodgson on the Diseases of Arteries and Veins, Lond.* 1815, *a work of the greatest accuracy and merit. Transl. into German by Dr. Koberwein, with additions by this gentleman, and Dr. Kreysig,* 8*vo. Hanov.* 1817; *and also into French, with valuable annotations by Breschet,* 2 *T.* 8*vo. Paris,* 1819. *Roux, Nouveaux Elemens de Médecine Opératoire, T.* 1. *Also, Roux, Voyage fait à Londres en* 1814, *ou Parallèle de la Chirurgie Anglaise avec la Chirurgie Françoise, p.* 248, *&c.* 1815. *D. Fried. Lud. Kreysig, Die Krankheiten des Herzens,* 4 *Bände,* 8*vo. Berlin,* 1814—17. *C. D. Kühln, De Aneurysmate Externo,* 4*to. Jenæ,* 1816. *A. J. Ristelhueber, Mem. sur la Ligature et l'Applatissement de l'Artère, dans l'Operation de l'Aneurisme Poplité,* 8*vo. A. V. Berlinghieri Memoria sopra l'Allacciatura dell' Arterie,* 8*vo. Pisa* 1819. *Lassus Pathologie Chir. T.* 1, *p.* 347, *&c. Léveillé Nouvelle Doctrine Chirurgicale, T.* 4, *p.* 213, *&c. T. F. Baltz, De Ophthalmia Catarrhali Bellica, &c.; Præmittitur F. C. Nægele Epistola, quâ Historia et Descriptio Aneurysmatis, quod in Aorta abdominali observavit,* 4*to. Heidelberg,* 1816. *J. Cole, Exposé du Traitément d'un Aneurisme Inguinale par la Ligature de l'Artère Iliaque Externe,* 8*vo. Cambrai,* 1817; *and London Medical Repository for May,* 1820. *Hennen's Military Surgery, p.* 183—185, 393, *&c. Ed.* 2, *Edinb.* 1820. *J. Kirby, Cases, &c.* 8*vo. Lond.* 1819. *C. Fred. Hübner de Aneurysmatibus; Gott.* 1807. *Manuale di Chirurgia del Cav. Assalini; Milano,* 1812. *The author's main object is to recommend his compressor. Todd's Cases in Dublin Hospital Reports. C. F. Gräfe, Angiektasie, ein Beytrag zur rationellen Cur und Erkentniss der Gefäss-ausdehnungen. Valentine Mott, in New York Medical and Surgical Register, Vol.* 1, 1818: *the first example of the arteria innominata being tied. C. F. Gräfe in Journ. der Chirurgie, B.* 3, 1822, *and B.* 4, 1823: *the second instance of the arteria innominata having a ligature applied to it.*

ANTHRAX, (ανθραξ, a burning coal.) See *Carbuncle.*

ANTIMONIAL POWDER; PULVIS ANTIMONIALIS. (Oxidum Antimonii cum Phosphate Calcis.) In all cases where it is desirable to promote the secretions in general, and those of the kidneys, skin, and alimentary canal, in particular, it is proper to have recourse to antimonial medicines. In inflammation of the brain, and its membranes, and in that of the greater number of organs of high importance in the system, antimony should be exhibited. For an adult, from two to five grains of pulv. Antim. may be ordered, and the dose, if requisite, may be repeated three or four times a day. In order to increase its action on the bowels, it is frequently conjoined with calomel, in the form of pills.

Of late, doubts have arisen concerning the efficacy of antimonial powder, Dr. Elliotson having prescribed it even in the dose of 100 gr. apparently without any effect. Mr. R. Phillips has attempted to explain the circumstance by the preparation of antimony being the peroxide, which is known to be inert. (See *Annals of Philosophy for Octob.* 1822. *Pharmacologia by Dr. Paris, p.* 357, *vol.* 2, *Ed.* 5, 1822.)

ANTIMONIUM MURIATUM. (*Butter of antimony.*) Employed in surgery as a caustic.

ANTIMONII SULPHURETUM PRÆCIPITATUM. An ingredient in the compound calomel pill, and seldom prescribed in any other form.

ANTIMONIUM TARTARIZATUM, (*Emetic Tartar.*) Of this useful medicine, the best preparation is the Vinum Antim. Tart. every half ounce of which contains one grain of antim. tart. Tartarized antimony, in the dose of gr. $\frac{1}{4}$ will, if the skin be kept warm, promote a diaphoresis; gr. $\frac{1}{2}$ will procure some stools first, and sweating afterwards; and gr. j. will generally excite vomiting, then purging, and lastly perspiration. In very minute doses, as gr. $\frac{1}{10}$, or $\frac{1}{12}$, combined with squill and ammoniacum, it acts as an expectorant. As Dr. Paris justly remarks, it is decidedly the most manageable, and the least uncertain of all the antimonial preparations, and the practitioner would probably have but little to regret, were all the other combinations of antimony discarded from our pharmacopœias. (See *Pharmacologia by Dr. Paris, Vol* 2, *p.* 67. *Ed.* 5.)

The following is the mode of preparing the vinum antimon. tart. as ordered in the new edition of the Pharmacopœia of the London College.

R. Antimonii tart. scrupulum, Aquæ distillatæ, ferventis fluiduncias octo, Spiritus rectificati fluiduncias duas.

Dissolve the antimony in the hot distilled water, and then add the spirit to the strained liquor.

This direction is considered better than that formerly given, because, instead of good sherry wine, inferior wines were often used, which did not properly hold the tartar emetic in solution.

Tartarized antimony is sometimes blended with, lard, or spermaceti ointment, and used for producing a redness and irritation of the integuments, where such practice is indicated. (See *Unguentum.*)

ANTRUM, *Diseases of.* This cavity is liable to a variety of diseases. Sometimes its membranous lining inflames, and secretes an extraordinary quantity of mucus, or pus; at other times, in consequence of inflammation, or other causes, it is the seat of various excrescences, polypi, and fungi. Even the bony parietes of the antrum are occasionally affected with exostosis, or caries. Sometimes it contains extraneous bodies; and, it is even asserted, that insects may be generated there, and cause, for many years, very afflicting pains.

COLLECTIONS OF MUCUS AND PUS.

Inflammation of the membranous lining of the antrum sometimes produces an extraordinary secretion of mucus within that cavity, and the collected fluid being confined, the bony parietes of the cavity become expanded in a surprising degree. This disease, says Boyer, is sometimes ascribed to a blow on the cheek, to caries of the teeth, or the projection of one of their fangs into the antrum. But, in general, the case takes place unpreceded by any of these causes, and without there being the least ground for suspecting what has given rise to the disorder. It is remarked, however, that collections of mucus within the antrum are most frequent in young subjects: of three patients, seen by Boyer, the eldest was not more than twenty. (*Traité des Mal. Chir. T.* 6, *p.* 139.) As Mr. Hunter has noticed, whether the obliteration of the duct, leading to the nose, be a cause or only an effect of the disease, is not easily determined; but, from some of the symptoms, there is great reason to suppose it an attendant. "If it be a cause, we may suppose, that the natural mucus of these cavities, accumulating, irritates, and produces inflammation for its own exit; in the same manner, as an obstruction to the passage of the tears through the ductus ad nasum produces an abscess of the lachrymal sac." (See *Hunter's Natural Hist. of the Teeth, p.* 174, *Ed.* 3.) The most interesting example of the effects of the lodgment of mucus in the antrum is that recorded by Dubois: a boy, between seven and eight years of age, was observed to have at the base of the ascending process of the upper jaw bone, on the left side, a small, very hard tumor, of the size of a nut. As it gave no pain, and did not appear to increase, his parents did not give themselves any concern about it. When he was about sixteen, however, the swelling began to increase, and to be somewhat painful. Before he was eighteen, its augmentation was so considerable, that the floor of the orbit was raised up by it: the eye thrust upwards: the palpebræ very much closed; the arch of the palate pushed down in the form of a tumor: and the nostril almost effaced. Below the orbit, the cheek made a considerable prominence; while the nose was thrown towards the opposite side of the face, and the skin at the upper part of the tumor, below the lower eyelid, was of a purple red colour, and threatening to burst. The upper lip was drawn upwards, and behind it, all the gums on the left side were observed to project much further, than those on the opposite side of the face, and at this point alone the thinness of the bony parietes of the antrum was perceptible. The patient spoke, and breathed with great difficulty; he slept uneasily, and his mastication was painful. The case was at first supposed by Dubois, Sabatier, Pelletan, and Boyer, to be a fungus of the antrum, and an operation was considered advisable. In proceeding to this measure, the first thing which attracted the notice of Dubois was, a sort of fluctuation in the situation of the gum, behind the upper lip; a circumstance which led him to give up the idea of the case being a fungus, though he expected that, on making an opening, merely a small quantity of ichorous matter would escape, affording no kind of information. In this place, however, he determined to make an incision, along the alveolary process, whereby a large quantity of a glutinous substance, like lymph, or what is found in cases of ranula, was discharged. A probe was now introduced, with which Dubois could feel a cavity equal in extent to the forepart of the tumor, and in moving the instrument about, with the view of learning whether any fungus was present, it struck against a hard substance, which felt like one of the incisor teeth, near the opening that had been made. Five days after this first operation, Dubois extracted two incisors and one grinder, and then removed the corresponding part of the alveolary process. As the hemorrhage was profuse, the wound was now filled with dressings, which in two days came away, and enabled Dubois to see with facility all the interior of the cavity. At its upper part, he perceived a white speck, which he supposed was pus, but on touching it with a probe, it turned out to be a tooth, which was then extracted, in doing which some force was requisite. The rest of the treatment merely consisted in injecting lotions into the cavity, and applying common dressings. In about six weeks, all the hollow disappeared; but the swelling of the cheek, and palate, and the displacement of the nose, still continued. In the course of another year and a half, however, every vestige of deformity was entirely removed. (*Dubois, Bulletin de la Faculté de Méd. an* 13, *No.* 8.)

With respect to the treatment of collections of mucus in the antrum, by means of injections, thrown into that cavity through the natural opening in it, while the head is inclined to the opposite side, for the purpose of facilitating the escape of the collected fluid, as proposed by Jourdain in 1765, (*Mém. de l'Acad. de Chir. T.* 4, *p.* 357,) Deschamps and Boyer are of opinion, that the method is objectionable; not only because it is difficult to find the aperture, which, ere the disease forms an outward swelling, is probably obliterated, but also because the thickness of the mucus collected would make it impossible for the surgeon to wash it out with injections. Hence, Boyer approves of the practice of opening the tumor in an eligible place, and to an extent sufficient for the discharge of the mucus. (*Deschamps, Traité des Maladies des Fosses Nazales, et de leur Sinus, p.* 231, *8vo. Par.* 1804; *Boyer Traité des Mal. Chir. T.* 6, *p.* 145, *8vo. Paris,* 1818.) Indeed, that Jourdain's proposal was attended with too much difficulty for common practice, was the sentence long ago pronounced upon it by a committee of the Royal Academy of Surgeons in France, nominated for the express purpose of inquiring into the merits of the suggestion. The method of making an opening into the antrum, will be considered in the sequel of this article. As a general rule, I may here remark, that except when a tumor or fungus requires to be extirpated, or a foreign body to be extracted from the antrum, it is quite unnecessary to remove any part of the alveolary process, or cut away any of the bony parietes of the antrum: the drawing of one of the teeth situated below this cavity, and making a perforation in this situation, being the only kind of opening required. This aperture may be preserved, as long as necessary, by the introduction of a piece of elastic gum catheter, which is to be fastened to the adjacent teeth, and through which the secretion in the antrum may escape, or lotions be injected. (See *Deschamps, Traité des Mal. des Fosses Nazales, &c. p.* 234.) However, as Hunter remarks, if the forepart of the bone has been destroyed, even though the case be merely a collection of mucus, or pus, an opening may be made on the inside of the lip; but, on account of the difficulty of maintaining such an aperture, he still inclines to the practice of drawing one of the teeth. (*Natural Hist. of the Teeth, p.* 176, *ed.* 3.)

Of all the above cases, abscesses are by far the most common. Violent blows on the cheek, inflammatory affections of the adjacent parts, and especially, of the pituitary membrane lining the nostrils, exposure to cold and damp, and, above all things, bad teeth, may bring on inflammation and suppuration within the hollow of the upper jaw bone. The first symptom is a sensation of pain, at first imagined to be a tooth-ach, particularly if there should be a carious tooth at this part of the jaw. Such pain, however, extends more into the nose, than that usually does which arises from a decayed tooth: it also affects, more or less, the eye, the orbit, and the situation of the frontal sinuses. (See *Hunter on the Teeth, p.* 175, *ed.* 3.) But, even these symptoms are insufficient to characterize the disease, the nature of which is not unequivocally evinced, till a much later period. The complaint is, in general, of much longer duration, than one entirely dependent on a caries of a tooth, and its violence increases more and more, until, at last, a hard tumor is perceptible below the cheek bone. By degrees the swelling extends over the whole cheek: but it afterwards rises to a point, and forms a very circumscribed hardness, which may be felt above the back grinders. This symptom is accompanied with redness, and sometimes with inflammation and suppuration of the external parts. It is not uncommon, also, for the outward abscess to communicate with that within the antrum.

The circumscribed elevation of the tumor, however, does not occur in all cases. There are instances, in which the matter makes its way towards the palate, causing the bones of this part to swell, and, at length, rendering them carious, unless timely assistance be given. There are other cases, in which the matter escapes between the fangs and sockets of the teeth. Lastly, there are certain examples, in which the matter formed in the antrum, makes its exit at the nostril of the same side, when the patient is lying with his head on the opposite one, in a low position. If this mode of evacuation should be frequently repeated, it prevents the tumor, both from pointing externally, and bursting, as it would do if the purulent matter could find no other vent. But this evacuation of pus from the nostril is not very common: for, according to Mr. Hunter, the opening between the antrum and cavity of the nose, is generally stopped up. He even seems inclined to think, as I have already observed, that the disease may sometimes be occasioned by the impervious state of this opening, in consequence of which the natural mucus of the antrum collects in such quantity, as to irritate and inflame the membrane with which it is in contact, just as an obstruction in the ductus nasalis hinders the passage of the tears into the nose, and causes an abscess in the lachyrmal sac. This is a point, however, on which even Mr. Hunter would not venture to speak with certainty; for, it is by no means impossible, that the impervious state of the opening is rather an effect, than the cause, of the disease, since inflammation in the antrum is often manifestly produced by causes of a different kind, and since the opening in question is not invariably closed.

Abscesses in the antrum require a free exit for their contents, and, if the surgeon neglects to procure such opening, the bones become more and more distended and pushed out, and, finally, carious. When this happens, the pus makes its appearance, either towards the orbit, the alveoli, the palate, or, as is mostly the case, towards the cheek. The matter having thus made a way for its escape, the disease now becomes fistulous.

In all cases, whether the pus be simply confined in the antrum, or whether the case be conjoined with a carious affection of the bones, the principal indication is to discharge the matter.

The ancients seem to have known very little about the treatment of diseases of the antrum. Drake, an English anatomist, is reputed to be the first proposer of a plan for curing abscesses of this cavity. (*Anthropologia Nova. Londini,* 1727.) However, Meibomius was much earlier in proposing, with the same intention, the extraction of one or more of the teeth, in order that the matter might have an opening for its escape, through the sockets. This plan may be employed with success. The pus frequently has a tendency to make its way outward towards the teeth; it often affects their fangs; and, after their extraction, the whole of the abscess is seen to escape through the sockets. But this very simple plan will not suffice for all cases, as there are numerous instances in which there is no communication between the alveoli and the antrum.

Drake, and, perhaps, before him, Cowper, took notice of the insufficiency of Meibomius's method, and, hence, they proposed making a perforation through the socket into the antrum with an awl, for the purpose of letting out the matter, and injecting into the cavity such fluids as were judged proper.

M. Jourdain recommended to the French Academy of Surgery, the injection of detergent lotions into the natural opening of the antrum, by means of a curved pipe, introduced into the nostril; but, without dwelling upon the difficulty of putting this method in practice, especially where the opening is closed, many assert, on the authority of the French surgeons themselves, that the mere employment of injections is not in these cases an effectual mode of treatment. (See *Dict. des Sciences Med. T.* 51, *p.* 383.)

In the treatment of abscesses of the antrum, the extraction of one or more teeth, and the perforation of the alveoli, being generally essential steps, we must consider what tooth ought to be taken out, in preference to others.

A caries, or even a mere continual aching, of any particular tooth, in general ought to decide the choice. But, if all the teeth should be sound, which is not often the case, writers direct us to tap each of them gently, and to extract that which gives most pain on this being done. When no information can be thus obtained, other circumstances ought to guide us.

All the grinding teeth, except the first, correspond with the antrum. They even sometimes extend into this cavity, and the fangs are only covered by the pituitary membrane. The bony lamella, which separates the antrum from the alveoli, is very thin, towards the back part of the upper jaw. Hence, when the choice is in our power, it is best to extract the third or fourth grinder, as, in this situation, the alveoli can be more easily perforated. Though, in general, the first grinder and canine tooth do not communicate with the antrum, their fangs approach the side of it, and from their socket an opening may readily be extended into that cavity.

When one or more teeth are carious, they should be removed, because they are both useless and hurtful. The matter frequently makes its escape, as soon as a tooth is extracted, in consequence of the fang having extended into the antrum, or rather in consequence of its bringing away with it a piece of the thin partition between it and the sinus. Perhaps a discharge may follow from the partition itself being carious. If the opening, thus produced, be sufficiently large to allow the matter to escape, the operation is already completed. But, as it can easily be enlarged, it ought always to be so when there is the least suspicion of its being too small. However, when no pus makes its appearance after a tooth is extracted, the antrum must be opened by introducing a pointed instrument in the direction of the alveoli. Some use a small trocar, or awl; others a gimblet for this purpose.

The patient should sit on the ground, in a strong light, resting his head on the surgeon's knee, who is to sit behind him. Immediately the instrument has reached the cavity, it is to be withdrawn. Its entrance into the antrum is easily known by the cessation of resistance. After the matter is discharged, surgeons advise the opening to be closed with a wooden stopper, in order to prevent the entrance of extraneous substances.

The stopper is to be taken out, several times a day, to allow the pus to escape. This plan soon disposes the parts affected to discontinue the suppuration, and resume their natural state. Sometimes, however, the pus continues to be discharged, for a long time after the operation, without any change occurring, in regard to its quality or quantity. In such instances, the cure may often be accelerated by employing injections of brandy and water, lime-water, or a solution of the sulphate of zinc.

Some surgeons prefer a silver cannula, or a piece of elastic gum catheter, instead of the stopper, as it can always be left pervious except at meals. The examples on record, where the extraction of a tooth, and the perforation of the bottom of the antrum, were the means of curing abscesses of that cavity, are very numerous. (See *Farmer's Select Cases, No,* 9; *Gooch's Cases, p.* 63, *new edition; Palfyn, Anatomie, &c.*)

If no opening were made in the antrum, the matter would make its way, sometimes towards the front of this cavity, which is very thin; sometimes, towards the mouth; and fistulous openings, and caries would inevitably follow.

When the bones are diseased, the above plan will not accomplish a cure, until the affected pieces of bone exfoliate. A probe will generally enable us to detect caries in the antrum. The fetid smell, and ichorous appearance of the discharge, also leave little doubt, that the bones are diseased; and, in proportion as the bones free themselves of any dead portions, the discharge has less smell, and its consistence becomes thicker.

When there are loose pieces of dead bone, or other foreign bodies, to be extracted, it is requisite to make a larger opening in the antrum than can be obtained at its lower part. Instances also occur, where patients have lost all the grinding teeth, and the sockets are quite obliterated, so that a perforation from below cannot be effected. Some practitioners object to sacrificing a sound tooth. In these circumstances, it has been advised to make a perforation in the antrum, above the alveolary processes: a method first suggested by Lamorier. It consists in making a transverse incision, below the malar process, and above the root of the third grinder. Thus the gum and periosteum are divided, and the bone exposed. A perforating instrument is to be conveyed into the middle of this incision, and the opening in the antrum made as large as requisite. (See *Mém. de l'Acad. de Chir. T.* 4, *p.* 351; *Gooch's Obs. append. p.* 138.) There are some extensive exfoliations of the antrum, where it is absolutely necessary to expose a great part of the surface of the bone, and to cut away the dead pieces which are wedged, as it were, in the living ones. A small trephine may sometimes be advantageously applied to the malar process of the superior maxillary bone.

Surgeons formerly treated carious affections of the antrum in the most absurd and unscientific way, introducing setons through its cavity, and even having recourse to the actual cautery. The moderns, however, are not much inclined to adopt this sort of practice. It is now known, that the detachment of a dead portion of bone, in other terms the process of exfoliation, is nearly, if not entirely the work of nature, in which the surgeon can act a very inferior part. Indeed, he should limit his interference to preventing the lodgment of matter, maintaining strict cleanliness, and removing the dead pieces of bone, as soon as they become loose. But, it is be understood, that examples occasionally present themselves, in which the dead portions of bone are so tedious of separation, and so wedged in the substance of the surrounding living bone, that an attempt may properly be made to cut them away.

TUMORS OF THE ANTRUM.

Ruysch, Bordenave, Desault, Abernethy, Weinhold, and others, have recorded cases of polypous, fungous, and cancerous diseases of the antrum, and examples of this cavity being affected with exostosis.

The indolence of any ordinary fleshy tumor in the antrum, while in an incipient state, certainly tends to conceal its existence; but such a disease rarely occurs without being accompanied with some affection of the neighbouring parts; and hence, its presence may generally be ascertained before it has attained such a size as to have altered in a serious degree the natural shape of the antrum. This information may be acquired, by examining whether any of the teeth have become loose, or have spontaneously fallen out; whether the alveolary processes are sound, and whether there are any fungous excrescences making their appearance at the sockets; whether there is any habitual bleeding from one side of the nose; any sarcomatous tumor at the side of the nostril, or towards the great angle of the eye. When the swelling, however, has attained a certain size, the bony parietes of the antrum always protrude, unless the body of the tumor should be situated in the nostril, and only its root in the antrum. This case, however, is very uncommon.

As soon as a tumor is certainly known to exist in the antrum, the front part of this cavity should be opened, without waiting till the disease makes further progress. In a few instances, indeed, we may avail ourselves of the opening which is sometimes found in the alveolary process, and enlarge it sufficiently to allow the tumor to be extirpated. If the front of the antrum were freely opened, it would in general be better to cut away the disease in its interior.

A swelling of the parietes of the antrum, in consequence of an abscess, or a sarcomatous tumor in its cavity, may lead us to suppose the case an enlargement of the bones, or an exostosis. The symptoms of the two first affections have been already detailed. One sign of an exostosis, besides the absence of the symptoms characterizing an abscess or a sarcoma, is the thickened parietes of the antrum forming a solid resistance; whereas, in cases of mere expansion, the dimensions of the surface of the bone being increased, while its substance is rendered proportionally thinner, the resistance is not so considerable.

When such an exostosis depends upon a particular constitutional cause, and especially upon one of a venereal nature, it must be attacked by remedies suited to this affection. But when the disease resists internal remedies, and its magnitude is likely to produce an aggravation of the case, a portion of the bone may be removed with a trephine, or a cutting instrument. Such operations, however, require a great deal of delicacy and prudence.

Mr. B. Bell, vol. 4, describes a kind of exostosis of the upper jaw, very different from what I have mentioned, since instead of its being distinguishable from other diseases of the antrum by the greater firmness of the tumor, the substance of the bone gradually acquires such suppleness and elasticity, that it yields to the pressure of the fingers, and immediately resumes its former plumpness when the pressure is discontinued. If the bone be cut, it is found to be as soft as cartilage, and, in an advanced stage of the disease, its consistence is almost gelatinous. The swelling increases gradually, and extends equally over the whole cheek, without becoming prominent at any particular point, or only so in the latter periods of the malady, when the soft parts inflame, and become affected. The complaint is described as totally incurable. Cutting and trephining the tumor, as recommended in other cases of exostosis, only aggravate the patient's unhappy condition.

Mr. Abernethy published an account of a very singular disease of the antrum. The patient, who was thirty-four years of age when the account was written, perceived, when about ten years old, a small tumor on his left cheek, which gradually attained the size of a walnut, and then remained for some time stationary. About a year afterwards, the tumor having again enlarged, a caustic was applied to the integuments, so as to expose the bone. The actual cautery was next applied, and an opening thus made into the antrum. After the exfoliation, the antrum became filled with a fungus, which rose out upon the cheek, and could not be restrained by any applications. Part of the fungus also made its way into the mouth, through the socket of the second tricuspid tooth, the other teeth remaining natural. The disease continued in this state nine years, occasionally bleeding in an alarming way. When the patient was in his twentieth year, the whole fungus sloughed away during a fever, and never returned. After this, the sides of the aperture in the bone began to grow outwards, forming an exostosis, which rapidly attained a great magnitude. A small exostosis took place in the mouth, but became no larger than a horsebean. The exostosis of the maxillary bone was of an irregular figure, and projected from the whole circumference of the aperture a great way directly forward. Mr. Abernethy compared its appearance, when he was writing, with that of a large tea-cup fastened upon the face, the bottom of which may be supposed to communicate with the antrum. The diameter of the cup, formed by the circular edge of the bone, was three inches and a half; the depth two inches and seven-eighths. The general height of the sides of the exostosis, from the basis of the face, was two inches; its walls were not thick, and terminated in a thin circular edge. The integuments, as they approached this edge, became thinner, and they extended over it into the cavity. The exostosis now reached to the nose in front, and to the masseter muscle behind; above, it included the very ridge of the orbit, and below, it grew from the edge of the alveolary process. A line, that would have separated the diseased from the sound bone, would have included the orbit and nose, and indeed one half of the face. Mr. Abernethy saw no means of affording the man relief. (*Trans. of a Society for the Improvement of Med. and Chirurgical Knowledge*, *vol.* 2.) See also a case related by Harrison. (*New Lond. Med. Journ. vol.* 1, *p.* 1.)

In a case of fungus, which had distended the antrum, hindered the tears from passing down into the nose, raised the lower part of the orbit, caused a protrusion of the eye, made two of the grinding teeth fall out, and occasioned a carious opening in the front of the antrum, through which opening a piece of the fungus projected, Desault operated as follows: the cheek was first detached from the os maxillare, by dividing the internal membrane of the mouth, at the place where it is reflected over this bone. Thus the outer surface of the bone was denuded of all the soft parts. A sharp perforating instrument was applied to the middle of this surface, and an opening made more forward than the one already existing. The plate of bone situated between the two apertures, was removed with a little falciform knife, which, being directed from behind forward, made the division without difficulty. The opening thus obtained being insufficient, Desault endeavoured to enlarge it below, by sacrificing the alveolary process. This he endeavoured to accomplish with the same instrument, but finding the resistance too great, he had recourse to a gouge and mallet. A considerable piece of the alveolary arch was thus detached, without any previous extraction of the corresponding teeth, three of which were removed by the same stroke. In this manner an opening was procured in the external and inferior part of the antrum, large enough to admit a walnut. Through this aperture a considerable part of the tumor was cut away with a knife, curved sideways, and fixed in its handle. A most profuse hemorrhage took place; but Desault, unalarmed, held a compress in the antrum for a short time; this being removed, the actual cautery was applied repeatedly to the rest of the fungus. The cavity was dressed with lint, dipped in powdered colophony.

On the eighteenth day, the swelling was evidently diminished, the eye less prominent, and the epiphora less visible. But, at this period, a portion of fungus made its appearance again. This was almost entirely destroyed by applying the actual cautery twice. It appeared again, however, on the twenty-fifth day, and required a third and last recourse to the cautery. From this time, the progress of the cure went on rapidly. Instead of fungous excrescences, healthy granulations were now formed in the bottom of the sinus. The parietes of the antrum gradually approaching each other, the large opening, made in the operation, was reduced to a small aperture, hardly capable of admitting a probe. Even this little opening closed in the fourth month, at which time, no vestiges of the disease remained, except the loss of teeth, and a very obvious depression just where they were situated.

In all fungous diseases of the antrum, making a free exposure of them is an essential part of the treatment: if you neglect this method, how can you inform yourself of the size, form, and extent of the tumor? How could you remove the whole of the fungus, through a small opening, which would only allow you to see a very little portion of the excrescence? How could you be certain that the disease were extirpated, to its very root? Even when the antrum is freely opened, this circumstance can only be learnt with difficulty; and how could it be ascertained, when only a point of the cavity is opened? A portion, left behind, very soon gives origin to a fresh fungus, the progress of which is more rapid, and the character more fatal, in consequence of being irritated by the surgical measures adopted. (*Œuvres Chirurgicales de Desault, par Bichat, t.* 2.) See also other cases, recorded by Canolles, (*Récueil Périodique de la Soc. de Méd. t.* 2, *No.* 9.) Eichorn, (*Diss. de Polypis in Antro Highmori, Goett.* 1814.) Sandifort, (*Museum Anat. vol.* 2. *tab.* 30.) Leveillé, (*Récueil de la Soc. &c. t.* 1, *p.* 24.) Weinhold, (*Von den Krankheiten der Gesichtsknochen, p.* 27, 4*to. Halle*, 1818.)

I imagine, that English surgeons, unaccustomed to use the actual cautery, will peruse with a degree of aversion this means, so commonly employed in France by Desault, and other celebrated surgeons. Nor can I expect, that they will altogether approve the use of the mallet and gouge for making a free opening into the antrum. Perhaps, it might be better to trephine this cavity with a small instrument for the purpose, and then cut the fungus away. After removing as much of it as possible in this manner, some instrument of suitable shape might be used to scrape the part, where the tumor has its root. However, if there be any case in which potent and violent measures, like those of Desault, are allowable, it is the one of which we have just been treating. Inveterate diseases demand powerful means, and tampering with them is generally more hurtful than useful.

There is an interesting case of a fungus in the maxillary sinus, related in the first volume of the Parisian Chirurgical Journal. It was at last cured by opening the antrum, applying the cautery, and tying the portion of the tumor which had made its way into the nose. In the second volume of the same work, is an excellent case, exhibiting the dreadful ravages which the disease may produce when left to itself.

INSECTS IN THE ANTRUM.

It is said, that insects in this cavity may sometimes make an opening into it necessary. This case, however, must be exceedingly rare; and even what we find in authors, (*Pallas, de Insectis Viventibus intra viventia*), appears so little authentic, that I should hardly have mentioned the circumstance, if there were not, in a modern work, (*Med. Comm. vol.* 1), a fact which appears entitled to attention. Mr. Heysham, a medical practitioner at Carlisle, relates, that a strong woman, aged sixty, in the habit of taking a great deal of snuff, was subject, for several years, to acute pains in the antrum, extending over one side of the head. These pains never entirely ceased, but were more severe in winter than summer, and were always subject to frequent periodical exacerbations. The patient had taken several anodyne medicines, and others, without benefit, and had twice undergone a course of mercury, by which her complaints had been increased. All her teeth on the affected side had been drawn. At length, it was determined to open the antrum with a large trocar, though there were no symptoms of an abscess, nor of any other disease in this cavity. For four days, no benefit resulted from the operation. Bark injections, and the elixir of aloes, were introduced into the sinus. On the fifth day, a dead insect was extracted, by means of a pair of forceps, from the mouth of the cavity. It was more than an inch long, and thicker than a common quill. The patient now experienced relief for several hours: but, the pains afterwards recurred with their former severity; oil was next injected into the antrum, and two other insects, similar to the former, were extracted. No others appeared, and the wound closed. The pains were not completely removed, but considerably diminished for several months, at the end of which time they became worse than ever, particularly affecting the situation of the frontal sinus.

Bordenave has published, in the twelfth and thirteenth volumes of the Mem. de l'Acad. de Chir. edit. 12mo. two excellent papers on diseases of the antrum. In the thirteenth volume, he relates the history of a case, in which several small whitish worms, together with a piece of fetid fungus, were discharged from the antrum, after an opening had been made on account of an abscess of this cavity, attended with caries. (*P.* 381.) But, in this instance, the worms had probably been generated after the opening had been made in the cavity; for when they made their appearance, the opening had existed nine months. Deschamps refers to another case, in which M. Fortassin, his colleague at La Charité, found in the antrum of a soldier, whom he was dissecting, a worm of the ascaris lumbricus kind, four inches in length. (*Traité des Mal. des Fosses Nazales, &c. p.* 107.) Such an example is also recorded in one of the volumes of the Journ. de Méd. Were a case of this description to present itself in a living subject, it would be advisable to inject oil into the cavity of the antrum, and then endeavour to wash out the extraneous substances by throwing into the sinus warm water, by means of a syringe. See *Précis d'Observations sur les Maladies du Sinus Maxillaire, par M. Bordenave, in Mem. de l'Acad. Royale de Chirurgie, t.* 12. *edit. in* 12*mo. Also Suite d'Observations on the same Subject, by M. Bordenave, t.* 13, *of the said Work, L. H. Runge, De Morbis Præcipuis Sinuum Ossis Frontis et Maxillæ Superioris, &c. Rintelii,* 1750. *Haller, Disp. Chir.* 1. 205. *L'Encyclopédie Méthodique, Partie Chirurgicale, art. Antre Maxillaire. Jourdain, in Mém. de l'Acad. de Chir. t.* 4. *p.* 357; *also his Traité des Depóts dans le Sinus Maxillaire, &c.* 12*mo. Paris,* 1760; *his Traité des Mal. de la Bouche, t.* 2; *and Journ. de Méd. t.* 21, *p.* 57, *et t.* 27, *p.* 52—157. *This author, who, in* 1765, *suggested to the Royal Academy of Surgery the method of injecting fluid into the antrum, through the natural opening, is said to have been anticipated in the practice by Allouel, who first conceived the plan in* 1737, *and tried it with success in* 1739; *See Boyer, Traité des Mal. Chir. t.* 6. *p.* 149. *Rémarques et Observations sur les Maladies du Sinus Maxillaire, in Œuvres Chirurgicales de Desault par Bichat, t.* 2. *p.* 156. *Desault's Parisian Chirurgical Journal, vols.* 1 *and* 2. *Medical Communications, vol.* 1. *Trans. of a Society for the Improvement of Med. and Chir. Knowledge, vol.* 2. *Natural History of the Human Teeth, by John Hunter, p.* 174, 175. *edit.* 3. *Gooch's Chirurgical Works, vol.* 2. *p.* 61, *and vol.* 3. *p.* 161, *edit.* 1792. *Callisen's Systema Chirurgiæ Hodiernæ, t.* 1. *p.* 346, *&c. Dubois, in Bulletin de la Faculté de Médecine, N.* 8. *J. L. Deschamps Traité des Maladies des Fosses Nazales, et de leur Sinus,* 8*vo. Paris,* 1804. *P. V. Leinicker, De Sinu Maxillari, ejusdem Morbis, &c. Wurceb.* 1809. *C. A. Weinhold, Ideen über die abnormen Metamorphosen der Highmorshöle, Leipz.* 1810. *C. A. Weinhold, Von den Krankheiten der Gesichtsknochen und ihrer Schleimhaüte, der Asrottung eines grossen Polypen in der linken Oberkieferhohle, dem Verhuten der Einsinkens der Gichtischen und Venerischen Nase, und der Einsetzung Künstlicher Choanen,* 4*to. Halle,* 1818.

ANUS. The lower termination of the great intestine, named the rectum, is so called, and its office is to form an outlet for the feces.

The anus is furnished with muscles, which are peculiar to it, viz. the sphincter, which keeps it habitually closed, and the *levatores ani*, which serve to draw it up into its natural situation, after the expulsion of the feces. It is also surrounded, as well as the whole of the neighbouring intestine, with muscular fibres, and a very loose sort of cellular substance. It is subject to various diseases, in which the aid of surgery is requisite: of these we shall next treat.

IMPERFORATE ANUS.

As it is of the utmost consequence that this and other malformations should not remain long unknown, one of the earliest duties of an accoucheur, after delivery, should be an examination of all the natural outlets of new-born infants.

The place, in which the extremity of the rectum, or the anus, ought to be, may be entirely, or partly, shut up by a membrane, or fleshy adhesion. In other instances, no vestige of the intestine can be found, as the skin retains its natural colour over the whole space between the parts of generation and the os coccygis, without being more elevated in one place than another. In these cases, the intestine sometimes terminates in one or two culs-de-sac, about an inch upward from the ordinary situation of the anus. (See *Baillie's Series of Engravings, Fasc.* 4. *Tab.* 5.) Sometimes, it does not descend lower, than the upper part of the sacrum; sometimes, it opens into the bladder, or vagina. Dr. Palmer dissected a case, where the colon, after reaching the vicinity of the left kidney, began, as it descended to form a sigmoid flexure; but, previously to its arrival at the concavity of the left ilium, made a sudden turn to the right; and crossing the psoas muscle, reached the projection of the sacrum, where it terminated, *without at all entering the pelvis.* With this malformation was combined an imperforate meatus urinarius, and other considerable deviations of the genital organs from their natural structure. (See *Medico-Chir. Journ. vol.* 1. *p.* 8*vo. Lond.* 1816.)

Sometimes the colon terminates in a sac, and the rectum is entirely deficient. (See *Beauregard, in Journ. de Méd.* 1. 66.) Instances are also upon record, where the rectum opened into the urethra. (*Bresl. Samml.* 1718, *p.* 702; *Hist. de l'Acad. Royale des Sciences*, 1752; *p.* 113; *Hochstetter, in Med. Wochenblatt*, 1780, *No.* 18 —1783, *No.* 19; *Kretschmar, in Horn's Archiv.* 1 *B. p.* 350.)

When a surgeon is consulted, he must not lose much time in deliberation; for, if a speedy opening be not made for the feces, the infant will certainly very soon perish, with symptoms similar to those of a strangulated hernia. After ascertaining the complaint, which is an easy matter, he should endeavour to learn, whether the anus is merely shut by a membrane, or fleshy adhesion, or whether the anus is altogether wanting, in consequence of the lower portion of the cavity of the gut being obliterated, or the rectum not extending sufficiently far down.

When a membrane, or production of the skin closes the opening of the rectum, the part producing the obstruction is somewhat different in colour from the neighbouring integuments. It is usually of a purple or livid hue, in consequence of the accumulation of the meconium on its inner surface. The meconium, propelled downward by the viscera above, forms a small roundish prominence, which yields like dough to the pressure of the fingers; but immediately projects again when the pressure is removed. When a fleshy adhesion closes the intestine, the circumstance is obvious to the eye, if the part protrude, as is generally the case. The finger feels greater hardness and resistance, than when there is a mere membrane, and the livid colour of the meconium cannot be seen through the obstructing substance.

These last signs alone are enough to convince the surgeon of the necessity of the operation; but, they do not clearly show, whether the intestine descends as far as it ought, in order to form a proper kind of anus. Complete information on this point, can only be acquired after the membrane or adhesion has been divided; or else after the child's death, when the operation has proved ineffectual. Though there be no mark to denote where the anus ought to be situated, and no degree of prominence, yielding, like soft dough, to the pressure of the fingers, and rising again when such pressure is removed; yet, it may happen, especially on our being consulted immediately after the child is born, that, notwithstanding the absence of such symptoms, denoting the presence of the meconium, and the natural extent of the intestine, as far as where the anus ought to be, the gut may exist, and have a cavity, as far as the membrane, or adhesion, closing it.

When the anus is simply covered with skin, and its place indicated by a prominence, arising from the contents of the rectum, we have only to make an opening with a knife, sufficient to let out the meconium. Levret recommends a circular incision in the membrane; but a transverse one is sufficient. A small tent of lint is afterwards to be introduced, in order to keep the opening from closing. If the anus be only partly closed by a membrane, the opening may be dilated with tents or bougies; but, if the aperture be very small, it is preferable to use the bistoury for its enlargement.

When no external appearance denotes where the situation of the anus ought to be, the case is much more serious and embarrassing; and this, whether the intestine be stopped up by a fleshy adhesion, or the coalescence of its sides, or whether a part of the gut be wanting.

However, it is the surgeon's duty to do every thing in his power to afford relief. For this purpose an incision, an inch long, or rather more, is to be made in the situation where the anus ought to be, and the wound is to be carried more and more deeply in the natural direction of the rectum. The cuts are not to be made directly upwards, nor in the axis of the pelvis, for the vagina, or bladder, might thus be wounded. On the contrary, the operator should cut backward, along the concavity of the os coccygis, where there is no danger of wounding any part of importance. In all cases of this kind, the surgeon's finger is the best director. The operator, guided by the index finger of his left hand, introduced within the os coccygis, is to dissect in the direction above recommended, until he reaches the feces, or has cut as far as he can reach with his finger. If he should fail in finding the meconium, as death must unavoidably follow, one more attempt ought to be made, by introducing, upon the finger, a middle-sized trocar, in the direction best calculated to reach the rectum, without danger to other parts, viz. upwards and backwards. The cannula of the trocar may be left in the puncture, and secured there with tapes, so as to afford an outlet for the feces. In some observations on this subject, addressed to the Medical and Chirurgical Society by Mr. Copland Hutchison, he recommends an elastic gum catheter to be substituted for the cannula, after a week, and, when the tube can be dispensed with, a sponge tent, or piece of bougie to be worn 12 out of the 24 hours.

In a very interesting case, recorded in Langenbeck's new Surgical Bibliotheca, the imperforate state of the anus was not discovered till the evening of the 12th day from the child's birth, when hiccough and convulsions had come on. M. Wolff found the abdomen protuberant, hard, and painful when handled, and nausea, vomiting, and great depression of strength prevailed. Next day, he introduced a large lancet a few lines in front of the os coccygis, to the depth of an inch, without finding the rectum. The puncture was then carried to the depth of two inches, but without effect. With a pharyngotomus, however, he now succeeded in piercing the rectum; and a glyster was administered, which brought away some meconium. Under the use of glysters and tents, the child soon recovered.

By such proceedings, many infants have been preserved, which would otherwise have been devoted to certain death. Hildanus, La Motte, Roonhuysen, Mr. Copland Hutchison, and others, have successfully adopted the practice. Mr. B. Bell met with two cases, in which the intestine was very distant from the integuments, and he was so successful, as to form an anus, which fulfilled its office tolerably well for several years; but he found it exceedingly difficult to keep the passage sufficiently pervious. As soon as he removed the dossils of lint, and other kinds of tents, used for maintaining the necessary dilatation, such a degree of contraction speedily followed, that the evacuation of the intestinal matter became very difficult, for a long while afterwards. He employed, at different times, tents made of sponge, gentian root, and other substances, which swell on being moistened. But they always produced so much pain and irritation, that it was impossible to persevere in their use.

Tents of very soft lint, dipped in oil, or rolls of bougie plaster, cause less irritation, than those composed of any other materials.

Though keeping the opening dilated may seem simple and easy, to such men as have had no opportunities of seeing cases of this description, it is far otherwise in practice. Mr. B. Bell assures us, that he never met with any disease, that gave him so much trouble and embarrassment, as he experienced in the two cases of this sort, which occurred in his practice. Although in both instances, he made the openings at first sufficiently large, it was only by very assiduous attention, for eight or ten months, that the necessity for another operation, and even repeated operations, was prevented. When only the skin has been divided, the rest of the treatment is doubtless more simple; for, then, nothing more is requisite, than keeping a piece of lint, for a few days, in the opening made with the knife. But, when the extremity of the rectum is at a certain distance, though we may generally hope to effect a cure, after having succeeded in giving vent to the intestinal matter; yet the treatment, after the operation, will always demand for a long while a great deal of attention and care on the part of the surgeon. The difficulty of success may be considered as, in some measure, proportioned to the depth of the necessary incision. In a case, like that recorded by Dr. Palmer, to which I have above adverted, the inutility of any attempt to discharge the feces by an operation, in the usual site of the anus, must be sufficiently obvious. (*Medico-Chir. Journ. Vol. I. p.* 181.)

Sometimes, while the anus appears pervious and well-formed, infants suffer the same symptoms, as if there were no anus at all. The reason of this depends upon the intestine being occasionally closed by a membranous partition, situated more or less upward, above the aperture of the anus, (*Courtial, Nouvelles Obs. sur les Os, p.* 147. *John Wayte, in Edinb. Med. and Surg. Journ. April* 1821,) and, sometimes the symptoms are owing to the termination of the gut in a cul-de-sac. This erroneous formation may always be suspected, when an infant, whose anus is externally open, does not void any excrement, for two or three days after its birth, and, especially, when urgent symptoms arise, such as swelling of the belly, vomiting, &c. We are now to endeavour to ascertain, whether the rectum is impervious above the anus, by attempting to inject glysters, or to introduce a probe. If the gut be shut up, there is nothing to be done, but having recourse to the method described above, and forming a communication by means of a bistoury guided on the finger, or else with a pharyngotomus. If the obstacle should only consist of a transverse membrane, the operation will be easy, and its success highly probable. But, if there should be a strangulation, or obstruction of the intestine, the case is infinitely more serious.

In the case, recorded by Mr. Wayte, the membranous septum was felt by the finger, about an inch from the verge of the anus. It was pierced with a pointed probe, which was followed by a hydrocele trocar, and afterwards by a bougie of larger dimensions. On withdrawing the latter, much meconium, mixed with feces, escaped, and continued to be frequently discharged. In a week, however, the opening closed, and a fresh puncture was made, which was maintained by the frequent introduction of bougies. The child proceeded tolerably well until the end of another week, when the passage was again much contracted, and the abdomen proportionably distended. On the 20th day from birth, a full sized trocar was used for restoring the opening, which, however, again had a tendency to close, but was afterwards dilated by introducing twice a day bougies, which were increased in size, until a rectum bougie of middle size could be passed. The boy now rapidly improved, and every hope of a perfect recovery was entertained, but disease of the os coccygis ensued, and at the end of six months, the little patient died hectic. (See *Edinb. Med. and Surg. Journ. Vol.* 17.)

When the anus is imperforate, the intestine sometimes opens into the vagina, or bladder. (*Dumas in Récueil Periodique de la Soc. de Méd. T.* 3, *N.* 13. *L'Eveillé Rapport des Travaux de la Soc. Philom. Vol.* 1, *p.* 145. *Murray Diss. Atresis Ani vesicalis, Ups.* 1794. *Act. Nat. Cur. Vol.* 8, *Obs.* 24, *Vol.* 9, *Obs.* 11, *Roestel in Mursinna's Journ. für die Chir.* 1 *B. p.* 547. *Obs. Med. Decad.* 2, *No.* 2.) The first case is the least dangerous of such malformations. The intestine may also terminate at two places, at the same time, viz. at the usual place, so as to form a proper anus, more or less perfect; and also in the vagina.

If these two openings should be ample enough, for the easy evacuation of the excrement, nothing can be done at so tender an age; for, though voiding the feces through the vagina is a most unpleasant inconvenience, yet, there is no effectual means of closing the opening of the intestine in this situation, nor could one be devised, which would not seriously incommode the infant.

But, when the two openings are exceedingly small, and the alvine evacuations cannot readily pass out, even with the aid of glysters, the opening of the anus ought to be dilated by cannulæ of different sizes. If this method should not avail, the knife must be employed, and the wound dressed, as already explained.

For the most part, the intestine has only one opening in the vagina. In this circumstance, as in the instance in which the feces have no vent at all, we must make an incision in that place which the anus ought to occupy. The natural course of the feces being opened by this operation, which in such a case is not at all perilous, much less excrement will pass out of the vagina and, of course, the infirmity will be diminished. By the introduction of a tube into the new anus, the communication between the rectum an vagina, might possibly be obliterated, and perfect cure accomplished. The opening between the intestine and vagina, may, also, be too small for the easy evacuation of the feces, and even expose the infant to the same sort of dangerous symptoms, as would occur, if the rectum had no opening at all.

In male infants, the rectum sometimes opens into the bladder, and, in this circumstance, there is generally no anus. The case is easily known by the meconium being blended with the urine, which acquires a thick greenish appearance, and is voided almost continually, though in small quantities. Only the most fluid part of the meconium is thus discharged. The thicker part, not getting from the rectum into the bladder, nor from the bladder into the urethra, greatly distends the intestines and bladder, and produces the same symptoms, as take place, in cases of total imperforation. Hence, without the speedy interference of art to form an anus, capable of giving vent to the feces, with which the urinary organs cannot remain obstructed, the infant will inevitably die. This case must, therefore, be treated like the foregoing examples. Though we can hardly hope to prevent altogether the inconveniences, resulting from the rectum opening into the bladder, since even a new passage will not completely hinder the feces from following the other course; yet we shall thus afford the child a very good chance of preservation, and the only one which its situation will allow.

In cases, in which an outlet for the feces cannot be procured by any of the methods pointed out above, it has been proposed by Littre, to make an opening above one of the groins, find out a portion of intestine, open it, fix it in this situation with a few stitches, and thus form an artificial anus. Sabatier was only acquainted with one case, in which this proceeding had been actually done, viz. the example, where Duret, a French naval surgeon, operated. This gentleman cut into the abdomen at the lower part of the left iliac region, and, having opened the sigmoid flexure of the colon, he fixed it near the wound. The child was saved by the formation of an artificial anus; but at the age of twenty-five months, it continued to be troubled with a sort of prolapsus of the lining of the bowel. (See *Recueil Periodique de la Soc. de Med. T.* 4, *No.* 19, *& Sabatier*, *Méd. Opèratoire*, *T.* 3, *p.* 336, *Edit.* 2.)

An instance has been published by Mr. Pring, in which he made an opening in the colon, near its sigmoid flexure, in a lady, who, in consequence of a scirrhous disease of the rectum, was afflicted with an obstinate and perilous obstruction of the intestinal canal. The patient survived the operation nearly sixteen months, at the end of which time she fell a victim to the disease of the rectum. (See *London Medical and Physical Journal*, *Vols.* 45 *&* 47.) I should be reluctant to offer any remarks encouraging the repetition of this practice, against which various considerations present themselves, particularly in cases, where, besides a mere difficulty of emptying the bowels, another disease exists, which is itself likely to destroy the patient, and is of a nature not capable of receiving any effectual benefit from the bold operation practised in the example related by Mr. Pring.

Callisen conceives, that the descending colon may be most conveniently got at by making an incision in the left lumbar region, along the edge of the quadratus lumborum muscle; and he prefers this mode of operating, to that of making the incision above the groin. (*Syst. Chir. Hodiernæ, T.* 2, *p.* 688, 689. *ed.* 1800.) Its advantages, however, are not obvious. (See *Médecine Opèratoire par Sabatier*, *T.* 3, *p.* 330. *Also Remarques sur Différens Vices de Conformation que les Enfans apportent en naissant, par M. Petit, in Mem. de l'Acad. Royale de Chirurgie*, *T.* 2, *p.* 236, *Edit. in* 12*mo. H. A. Wrisberg*, *de præternaturali et raro Intestini Recti cum vesica urinaria coalitu, et independente Ani defectu*, 4to. *Gött.* 1779. *Ford, in Med. Facts & Obs. Vol.* 1, *No.* 10. *Chamberlaine in Memoirs of the Med. Soc. of Lond. Vol.* 5, *No.* 23. *Richerand*, *Nosographie Chir. t.* 3. *p.* 437, *&c. Edit.* 4. *G. Wayte in Edinb. Med. Journ. Vol.* 17. *Lancet, vol.* 1. *p.* 434.

ABSCESSES OF THE ANUS.—FISTULA IN ANO.

The custom of giving the appellation of *fistula* to every collection of matter formed near the anus, has, by conveying a false notion of them, been productive of such methods of treating them, as are diametrically opposite to those which ought to be pursued.

A small orifice or outlet from a large or deep cavity, discharging a thin gleet, or sanies, made a considerable part of the idea which our ancestors had of a fistulous sore, wherever seated. With the term fistulous, they always connected a notion of callosity: and, therefore, whenever they found such a kind of opening yielding such sort of discharge, and attended with any degree of induration, they called the complaint a *fistula.* Imagining this callosity to be a diseased alteration made in the very structure of the parts, they had no conception that it could be cured by any means but by removal with a cutting instrument, or by destruction with escharotics: and, therefore, they immediately attacked it with knife or caustic, in order to accomplish one of these ends; and very terrible work they often made.

That abscesses, formed near the fundament, do sometimes, from bad habits, from extreme neglect, or from gross mistreatment, become fistulous, is certain; but the majority of them have not, at first, any one character or mark of a true fistula; nor can, without the most supine neglect on the side of the patient, or the most ignorant management on the part of the surgeon, degenerate, or be converted into one.

Collections of matter from inflammation (wherever formed) if they be not opened in time, and in a proper manner, do often burst. The hole, through which the matter finds vent, is generally small, and not often situated in the most convenient, or most dependent part of the tumor: it therefore is unfit for the discharge of all the contents of the abscess; and, instead of closing, contracts itself to a smaller size, and becoming hard at its edges, continues to drain off what is furnished by the undigested sides of the cavity.

When an abscess near the anus bursts, the smallness of the accidental orifice; the hardness of its edges; its being found to be the outlet from a deep cavity; the daily discharge of a thin, gleety, discoloured kind of matter; and the induration of the parts round about, have all contributed to raise and confirm the idea of a true fistula.

Abscesses about the anus present themselves in different forms.

Sometimes the attack is made with symptoms of high inflammation; with pain, fever, rigor, &c. and the fever ends as soon as the abscess is formed.

In this case, a part of the buttock, near the anus, is considerably swollen, and has a large circumscribed hardness. In a short time, the middle of this hardness becomes red, and inflamed; and in the centre of it matter is formed.

This (in the language of our ancestors) is called in general a *phlegmon;* but when it appears in this particular part, a *phyma.*

The pain is sometimes great, the fever high, the tumor large, and exquisitely tender; but however disagreeable the appearances may have been, or however high the symptoms may have risen, before suppuration, yet, when that end is fairly and fully accomplished, the patient generally becomes easy and cool; and the matter formed under such circumstances, though it may be plentiful, is good.

On the other hand, the external parts, after much pain, attended with fever, sickness, &c. are sometimes attacked with considerable inflammation, but without any of that circumscribed hardness, which characterised the preceding tumor; instead of which the inflammation is extended largely, and the skin wears an erysipelatous kind of appearance. In this, the disease is more superficial; the quantity of matter small, and the cellular membrane sloughy to a considerable extent.

Sometimes, instead of either of the preceding appearances, there is formed in this part, what the French call *une suppuration gangreneuse;* in which the cellular and adipose membrane is affected in the same manner, as it is in a carbuncle.

In this case, the skin is of a dusky red or purple kind of colour; and although harder than when in a natural state, yet it has, by no means, that degree of tension or resistance, which it has either in phlegmon, or in erysipelas.

The patient has generally, at first, a hard, full, jarring pulse, with great thirst, and very fatiguing restlessness. If the progress of the disease be not stopped, or the patient relieved by medicine, the pulse soon changes into an unequal, low, faltering one; and the strength and the spirits sink in such manner, as to imply great and immediately impending mischief. The matter formed under the skin, so altered, is small in quantity, and bad in quality; and the adipose membrane is gangrenous and sloughy throughout the extent of the discoloration. This generally happens to persons, whose habit is either naturally bad, or has been rendered so by intemperance.

Sometimes the disease makes its first appearance in an induration of the skin, near to the verge of the anus, but without pain or alteration of colour; which hardness gradually softens and suppurates. The matter, when let out, in this case, is small in quantity, good in quality; and the sore is superficial, clean, and well-conditioned. On the contrary, it now and then happens, that although the pain is but little, and the inflammation apparently slight, yet the matter is large in quantity, bad in quality, extremely offensive, and proceeds from a deep crude hollow.

The place also where the abscess points, and where the matter, if let alone, would burst its way out, is various and uncertain. Sometimes, it is in the buttock, at a distance from the anus; at other times, near its verge, or in the perineum, and this discharge is made sometimes from one orifice only, sometimes from several. In some cases, there is not only an opening through the skin, externally, but another through the intestine into its cavity: in others, there is only one orifice, and that either external, or internal.

Sometimes the matter is formed at a considerable distance from the rectum, which is not even laid bare by it; at others, it is laid bare also, and not perforated: it is also sometimes not only denuded, but pierced; and that in more places than one.

All consideration of preventing suppuration, is generally out of the question: and ourbusiness, if called at the beginning, must be to moderate the symptoms; to forward the suppuration; when the matter is formed, to let it out; and to treat the sore in such manner, as shall be most likely to produce a speedy and lasting cure.

When there are no symptoms which require particular attention, and all that we have to do is to assist the maturation of the tumor, a soft poultice is the best application. When the disease is fairly of the phlegmonoid kind, the thinner the skin is suffered to become, before the abscess is opened, the better: as the induration of the parts about will thereby be the more dissolved, and, consequently, there will be the less to do after such opening has been made. This kind of tumor is generally found in people of full, sanguine habits; and who, therefore, if the pain be great, and the fever high, will bear evacuation, both by phlebotomy, and gentle cathartics: which is not often the case of those, who are said to be of bilious constitutions; in whom the inflammation is of a larger extent, and in whom the skin wears the yellowish tint of the erysipelas; persons of this kind of habit, and in such circumstances, being in general seldom capable of bearing large evacuation.

When the inflammation is erysipelatous, the quantity of matter formed is small, compared with the size and extent of the tumor; the disease is rather a sloughy, putrid state of the cellular membrane, than an imposthumation; and therefore, the sooner it is opened, the better: if we wait for the matter to make a point, we shall wait for what will not happen; at least not till after a considerable length of time: during which, the disease in the membrane will extend itself, and consequently, the cavity of the sinus, or abscess, be thereby greatly increased.

When, instead of either of the preceding appearances, the skin wears a dusky, purplish-red colour; has a doughy, unresisting kind of feel, and very little sensibility: when these circumstances are joined with an unequal, faltering kind of pulse, irregular shiverings, a great failure of strength and spirits, and inclination to doze, the case is formidable, and the event generally fatal.

The habit, in these circumstances, is always bad: sometimes from nature, but much more frequently from gluttony and intemperance. What assistance art can lend, must be administered speedily; every minute is of consequence; and if the disease be not stopped, the patient will sink. Here (says Pott) is no need for evacuation of any kind: recourse must be immediately had to medical assistance; the part affected should be frequently fomented with hot spirituous fomentations; a large and deep incision should be made into the diseased parts, and the application made to it should be of the warmest, most antiseptic kind.

This also is a general kind of observation, and equally applicable to the same sort of disease in any part of the body. Our ancestors have thought fit to call it in some a carbuncle, and in others by other names: but it is, (wherever seated,) really and truly a gangrene of the cellular and adipose membrane: it always implies great degeneracy of habit, and, most commonly, ends ill.

Strangury, dysury, and even total retention of urine, are no very uncommon attendants upon abscesses forming in the neighbourhood of the rectum and bladder: more especially if the seat of them be near the neck of the latter.

They sometimes continue from the first attack of the inflammation, until the matter is formed, and has made its way outward: and sometimes last a few hours only.

The two former most commonly are easily relieved by the loss of blood, and the use of gum arabic, with nitre, &c. But in the last (the total retention), they who have not often seen this case, generally have immediate recourse to the catheter: but the practice is essentially wrong.

The neck of the bladder does certainly participate, in some degree, in the said inflammation. But, the principal part of the complaint arises from irritation, and the disease is, strictly speaking, spasmodic. The manner, in which an attack of this kind is generally made; the very little distention which the bladder often suffers; the small quantity of urine sometimes contained in it, even when the symptoms are most pressing; and the most certain, as well as safe, method of relieving it; all tend to strengthen such opinion.

But, whether we attribute the evil to inflammation, or to spasmodic irritation, whatever can, in in any degree, contribute to the exasperation of either, must be manifestly wrong. The violent passage of the catheter through the neck of the bladder (for violent in such circumstances it must be) can never be right.

If the instrument be successfully introduced, it must either be withdrawn as soon as the bladder is emptied, or it must be left in it: if the former be done, the same cause of retention remaining, the same effect returns; the same pain and violence must again be submitted to, under (most likely) increased difficulties. On the other hand, if the catheter be left in the bladder, it will often, while its neck is in this state, occasion such disturbance, that the remedy (as it is called) will prove an exasperation of the disease, and add to the evil it is designed to alleviate. Nor is this all; for the resistance which the parts, while in this state make, is sometimes so great, that if any violence be used, the instrument will make for itself a new route in the neighbouring parts, and lay the foundation of such mischief as frequently baffles all our art.

The true, safe, and rational method of relieving this complaint (says Pott) is by evacuation and anodyne relaxation: this not only procures immediate ease, but does, at the same time, serve another very material purpose; which is that of maturating the abscess. Loss of blood is necessary; the quantity to be determined by the strength and state of the patient: the intestines should also be emptied, if there be time for so doing, by a gentle cathartic; but, the most effectual relief will be from the warm bath, or semicupium, the application of bladders with hot water to the pubes and perineum, and, above all other remedies, the injection of glysters, consisting of warm water, oil, and opium. There may have been cases which have resisted and baffled this method of treatment; but Pott never met with them.

A painful tenesmus is no uncommon attendant upon an inflammation of the parts about the rectum.

If a dose of rhubarb, joined with the confect. opii, does not remove it, the injection of thin starch and opium, or tinct. thebaic. is almost infallible.

The bearing down, in females, as it proceeds in this case, from the same kind of cause (viz. irritation,) admits of relief from the same means as the tenesmus.

In some habits, an obstinate costiveness attends this kind of inflammation, accompanied, not unfrequently, with a painful distention and enlargement of the hæmorrhoidal vessels, both internally and externally. While a large quantity of hard feces is detained within the large intestines, the whole habit must be disordered; and the symptomatic fever, which necessarily accompanies the formation of matter, must be considerably heightened. And while the vessels surrounding the rectum (which are large and numerous) are distended, all the ills proceeding from pressure, inflammation, and irritation, must be increased. Phlebotomy, laxative glysters, and a low, cool regimen, must be the remedies: while a soft cataplasm applied externally serves to relax and mollify the swollen, indurated piles, at the same time that it hastens the suppuration.

When the abscesses have formed, and are fit to be opened, or when they have already burst, they may be reduced to two general heads, viz.

1. Those, in which the intestine is not at all interested; and,

2. Those, in which it is either laid bare, or perforated.

In making the opening, the knife or lancet should be passed in deep enough to reach the fluid; and, when it is in, the incision should be continued upward and downward, in such manner as to divide all the skin covering the matter. By these means, the contents of the abscess will be discharged at once; future lodgment of matter will be prevented; convenient room will be made for the application of proper dressings; and there will be no necessity for making the incision in different directions, or for removing any part of the skin composing the verge of the anus.

Notwithstanding all these collections of matter are generally called *fistulæ*, and are all supposed to affect the rectum, the abscess is sometimes really at such a distance from the gut, that it is not at all interested by it; and none of these cases either are or can be originally *fistulæ*.

In this state of the disease we have no more necessarily to do with the intestine, than if it was not there; the case is to be considered merely as an abscess in the cellular membrane.

A short time ago, some interesting remarks on fistula in ano were published in France by Dr. Ribes, whose opinions, however, like those of many other valuable writers, are not invariably free from error; and I have no hesitation in extending this observation to one of his statements, though what he has said is alleged to be deduced from the dissection of not less than 75 persons, who had died with fistulæ. No man, who has seen much of this part of surgery, can doubt that the most frequent form of the disease is that in which the abscess has only an external opening, and does not perforate the rectum at all, from which, indeed, the matter is sometimes more or less distant. Nor can any experienced surgeon question the truth of Mr. Pott's account, respecting the diversity of the nature of the cases of fistulæ, some being phlegmonous, some erysipelatous, and others more like the carbuncle in their origin, progress, and consequences. But, besides these circumstances, another one worthy of notice is, that the presence of fistula in ano by no means implies the previous or present existence of piles. However, notwithstanding these considerations, the doctrine started by Dr. Ribes is, that a fistula is formed by the bursting of an internal pile into the rectum, and the consequent passage of a portion of the contents of the bowel into the orifice. He further asserts, that such orifice is *always* within five or six lines above the junction of the internal membrane of the bowel with the external skin, and that it may usually be seen, if the patient forces the gut gently down, as in going to stool. The only correct part of these statements is, I believe, the account of the common situation of the internal opening, when the abscess communicates with the bowel, which is not always the case. (See *Recherches sur la Situation de l'Orifice interné de la Fistule dé l'Anus, &c. Quarterly Journ. of Foreign Med. No.* 8, *Oct.* 1820.)

Suppose a large and convenient opening to have been made by a simple incision; the contents of the abscess to have been thereby discharged; and a sore or cavity produced, which is to be filled up

The term *filling up*, and the former opinion, that the induration of the parts about is a diseased callosity, have been the two principal sources of misconduct in these cases.

The old opinion, with regard to hollow and hardness, was that the former is caused entirely by loss of substance: and the latter, by diseased alteration in the structure of the parts.

The consequence of which opinion was, that as soon as the matter was discharged, the cavity was filled and distended, in order to procure a gradual regeneration of flesh, and the dressings, with which it was so filled, were most commonly of the escharotic kind, intended for the dissolution of hardness.

On the other hand, the surgeon who regards the cavity of the abscess as being principally the effect of the gradual separation of its sides, with very little loss of substance, compared with the size of the said cavity; and who looks upon the induration round about, as nothing more than a circumstance which necessarily accompanies every inflammation, will upon the smallest reflection, perceive, that the dressings applied to such cavity ought to be so small in quantity, as to permit nature to bring the sides of the cavity toward each other, and that such small quantity of dressings ought not by their quality either to irritate or destroy.

If the hollow, immediately it is opened, be filled with dressings (of any kind), the sides of it will be kept from approaching each other, or may even be farther separated. But if this cavity be not filled, or have little or no dressings of any kind introduced into it, the sides immediately collapse; and, coming nearer and nearer, do, in a very short space of time, convert a large hollow into a small sinus. And this is also constantly the case, when the matter, instead of being let out by an artificial opening, escapes through one made by the bursting of the containing parts.

True, this sinus will not always become perfectly closed; but the aim of nature is not therefore the less evident; nor the hint, which art ought to borrow from her, the less palpable.

In this, as in most other cases, where there are large sores, or considerable cavities, a great deal will depend on the patient's habit, and the care that is taken of it; if that be good, or if it be properly corrected, the surgeon will have very little trouble in his choice of dressings; only to take care that they do not offend either in quantity, or quality: but if the habit be bad, or injudiciously treated, he may use the whole farrago of externals, and only waste his own and his patient's time.

By light, easy treatment, large abscesses formed in the neighbourhood of the rectum will sometimes be cured, without any necessity occurring of meddling with the said gut. But it much more frequently happens, that the intestine, although it may not have been pierced or eroded by the matter, has yet been so stripped or denuded, that no consolidation of the sinus can be obtained, but by a division; that is, by laying the two cavities, viz. that of the abscess, and that of the intestine, into one.

When the intestine is found to be separated from the surrounding parts by the matter, the operation of dividing it had better (on many accounts) be performed at the time the abscess is first opened, than be deferred to a future one. For, if it be done properly, it will add so little to the pain, which the patient must feel by opening the abscess, that he will seldom be able to distinguish the one from the other, either with regard to time or sensation; whereas, if it be deferred, he must either be in continual expectation of a second cutting, or feel one at a time when he does not expect it.

The intention in this operation is to divide the intestine rectum from the verge of the anus up as high as the top of the hollow in which the matter was formed; thereby to lay the two cavities of the gut and abscess into one; and by means of an open, instead of a hollow or sinuous sore, to obtain a firm and lasting cure.

For this purpose, the curved, probe-pointed knife, with a narrow blade, is the most useful and handy instrument of any. This, introduced into the sinus, while the surgeon's fore-finger is in the intestine, will enable him to divide all that can ever require division; and that with less pain to the patient, with more facility to the operator, as well as with more certainty and expedition, than any other instrument whatever. If there be no opening in the intestine, the smallest degree of force will thrust the point of the knife through, and thereby make one: if there be one already, the same point will find and pass through it. In either case, it will be received by the finger in ano; will thereby be prevented from deviating, and being brought out by the same finger, must necessarily divide all that is between the edge of the knife, and the verge of the anus: that is, must by one simple incision (which is made in the smallest space of time imaginable) lay the two cavities of the sinus and of the intestine into one.

Authors make a very formal distinction between those cases in which the intestine is pierced by the matter, and those in which it is not; but although this distinction may be useful when the different states of the disease are to be described, yet in practice, when the operation of dividing the gut becomes necessary, such distinction is of no consequence at all: it makes no alteration in the degree, kind, or quantity of pain which the patient is to feel; the force required to push the knife through the tender gut is next to none, and when its point is in the cavity, the cases are exactly similar. In this statement every man of experience and discernment must agree, notwithstanding the prohibition to the operation, delivered by Dr. Ribes, in every case, in which the internal opening cannot be found: a piece of advice (as it seems to me) fully admitting the occurrence of cases which could not be formed in the manner in which he conceives all fistulæ in ano to be produced, viz. by the bursting of a pile, and the entrance of feces into the orifice.

Immediately after the operation, a soft dossil of fine lint should be introduced (from the rectum) between the divided lips of the incision; as well to repress any slight hæmorrhage, as to prevent the immediate reunion of the said lips; and the rest of the sore should be lightly dressed with the same. This first dressing should be permitted to continue, until a beginning suppuration renders it loose enough to come away easily; and all the future ones should be as light, soft, and easy as possible; consisting only of such materials as are likely to promote kindly and gradual suppuration. The sides of the abscess are large; the incision must necessarily, for a few days, be inflamed; and the discharge will, for some time, be discoloured and gleety: this induration, and this sort of discharge, are often mistaken for signs of diseased callosity, and undiscovered sinuses; upon which presumptions, escharotics are freely applied, and diligent search is made for new hollows; the former of these most commonly increase both the hardness and the gleet; and by the latter new sinuses are sometimes really produced. These occasion a repetition of escharotics, and, perhaps, of incisions; by which means, cases which at first, and in their own nature were simple and easy of cure, are rendered complex and tedious.

To quit reasoning, and speak to fact only: In the great number of these cases, which must have been in St. Bartholomew's Hospital, within these ten or twelve years, *I do aver*, (says Pott) *that I have not met with one, in the circumstances before described, that has not been cured by mere simple division, together with light, easy dressings: and that I have not, in all that time, used for this purpose, a single grain of precipitate, or of any other escharotic.*

Let us now suppose the case in which the matter is fairly formed; has made its point, as it is called; and is fit to be let out.

Where such point is, that is, where the skin is most thin, and the fluctuation most palpable, the opening most certainly ought to be made, and always with a cutting instrument, not caustic, as was formerly done.

We have supposed the matter of the abscess to have been formed, and collected; but still to have been contained within the cavity, until let out by an incision.

We are now to consider it, as having made its own way out, without the help of art.

This state of the disease is also subject to some variety of appearance; and these different appearances have produced, not only a multiplicity of appellations, but a groundless supposition also, of a variety of essentially different circumstances.

When a discharge of the matter by incision is too long delayed or neglected, it makes its own way out, by bursting the external parts somewhere near to the fundament, or by eroding and making a hole through the intestine into its cavity; or sometimes by both. In either case, the discharge is made sometimes by one orifice only, and sometimes by more. Those, in which the matter has made its escape by one or more openings, through the skin only, are called *blind external fistulæ*; those, in which the discharge has been made into the cavity of the intestine, without any orifice in the skin, are named *blind internal*; and those, which have an opening both through the skin, and into the gut, are called *complete fistulæ*.

Thus, all these cases are deemed fistulous, when hardly any of them ever are so: and none of them necessarily. They are still mere abscesses, which are burst without the help of art; and, if taken proper and timely care of, will require no such treatment as a true fistula may possibly stand in need of.

The most frequent of all are what are called the *blind external;* and the *complete.* The method whereby each of these states may be known is, by introducing a probe into the sinus by the orifice in the skin, while the fore finger is within the rectum: this will give the examiner an opportunity of knowing exactly the true state of the case, with all its circumstances.

Whether the case be, what is called a complete fistula, or not; that is, whether there be an opening in the skin only, or one there, and another in the intestine, the appearance to the eye is much the same. Upon discharge of the matter, the external swelling subsides, and the inflamed colour of the skin disappears: the orifice, which at first was sloughy and foul, after a day or two are past, becomes clean and contracts in size; but the discharge, by fretting the parts about, renders the patient still uneasy.

As this kind of opening seldom proves sufficient for a cure, (though it sometimes does) the induration, in some degree, remains; and if the orifice happens not to be a depending one, some part of the matter lodges, and is discharged by intervals, or may be pressed out by the fingers of an examiner. The disease, in this state, is not very painful; but it is troublesome, nasty, and offensive: the continual discharge of a thin kind of fluid from it, creates heat, and causes excoriation in the parts above; it daubs the linen of the patient; and is, at times, very fetid; the orifice also sometimes contracts so, as not to be sufficient for the discharge; and the lodgment of the matter then occasions fresh disturbance.

The means of cure proposed and practised by our ancestors, were three, viz. caustic, ligature, and incision.

The intention in each of these is the same, viz. to form one cavity of the sinus and intestines by laying the former into the latter. The two first are now completely, and most properly, exploded.

Hitherto we have considered the disease either as an abscess, from which the matter has been let out by an incision, made by a surgeon; or from which the contents have been discharged by one single orifice, formed by the bursting of the skin somewhere about the fundament. Let us now take notice of it, when instead of one such opening, there are several.

This state of the case generally happens when the quantity of matter collected has been large, the inflammation of considerable extent, the adipose membrane very sloughy, and the skin worn very thin before it burst.—It is, indeed, a circumstance of no real consequence at all; but from being misunderstood, or not properly attended to, is made one of additional terror to the patient, and additional alarm to the inexperienced practitioner: for it is taught, and frequently believed, that each of these orifices is an outlet from, or leads to a distinct sinus, or hollow: whereas in truth, the case is most commonly quite otherwise; all these openings are only so many distinct burstings of the skin covering the matter; and do all, be they few or many, lead and open immediately into the one single cavity of the abscess: they neither indicate, nor lead to, nor are caused by distinct sinuses; nor would the appearance of twenty of them (if possible) necessarily imply more than one general hollow.

If this account be a true one, it will follow, that the treatment of this kind of case ought to be very little, if at all different from that of the preceding; and that all that can be necessary to be done, must be to divide each of these orifices in such manner as to make one cavity of the whole. This the probe-knife will easily and expeditiously do; and when that is done, if the sore, or more properly its edges, should make a very ragged, uneven appearance, the removal of a small portion of such irregular angular parts will answer all the purposes of making room for the application of dressings, and for producing a smooth, even cicatrix after the sore shall be healed.

When a considerable quantity of matter has been recently let out, and the internal parts are not only in a crude, undigested state, but have not yet had time to collapse, and approach each other, the inside of such cavity will appear large; and if a probe be pushed with any degree of force, it will pass in more than one direction into the cellular membrane by the side of the rectum. But let not the unexperienced practitioner be alarmed at this, and immediately fancy, that there are so many distinct sinuses; neither let him, if he be of a more hardy disposition, go to work immediately with his director, knife, or scissars: let him enlarge the external wound by making his incision freely; let him lay all the separate orifices open into that cavity; let him divide the intestine lengthwise by means of his finger in ano; let him dress lightly and easily; let him pay proper attention to the habit of the patient; and wait, and see what a few days, under such conduct, will produce. By this he will frequently find, that the large cavity of the abscess will become small and clean; that the induration round about will gradually lessen; that the probe will not pass in that manner into the cellular membrane; and consequently, that his fears of a multiplicity of sinuses were groundless. On the contrary, if the sore be crammed or dressed with irritating, or escharotic medicines, all the appearances will be different: the hardness will increase, the lips of the wound will be inverted, the cavity of the sore will remain large, crude, and foul; the discharge will be thin, gleety, and discoloured; the patient will be uneasy and feverish: and, if no new cavities are formed by the irritation of parts, and confinement of matter, yet the original one will have no opportunity of contracting itself; and may very possibly become truly fistulous.

Sometimes the matter of an abscess, formed juxta anum, instead of making its way out through the skin, externally near the verge of the anus, or in the buttock, pierces through the intestine only. This is what is called a *blind internal fistula.*

In this case, after the discharge has been made, the greater part of the tumefaction subsides, and the patient becomes easier. If this does not produce a cure, which sometimes, though very seldom happens, some small degree of induration generally remains in the place where the original tumor was; upon pressure on this hardness, a small discharge of matter is frequently made per anum; and sometimes the expulsion of air from the cavity of the abscess into that of the intestine may very palpably be felt, and clearly heard; the stools, particularly, if hard, and requiring force to be expelled, are sometimes smeared with matter; and although the patient, by the bursting of the abscess, is relieved from the acute pain which the collection occasioned, yet he is seldom perfectly free from a dull kind of uneasiness, especially if he sits for any considerable length of time in one posture. The real difference between this kind of case, and that in which there is an external opening (with regard to method of cure) is very immaterial; for an external opening must be made, and then all difference ceases. In this, as in the former, no cure can reasonably be expected, until the cavity of the abscess, and that of the rectum, are made one; and the only difference is, that in the one case we have an orifice at, or near the verge of the anus, by which we are immediately enabled to perform that necessary operation; in the other, we must make one.

We come now to that state of the disease, which may truly and properly be called *fistulous.* This is generally defined, *sinus angustus*, *callosus*, *profundus: acri sanie diffluens:* or, as Dionis translates it, " *Un ulcère profond*, *& caverneux*, *dont l'entrée est etroite*, *& le fond plus large*; *avec issue d'un pus acre & virulent*; *et accompagné de callosités.*"

Various causes may produce or concur in producing such a state of the parts concerned as will constitute a fistula, in the proper sense of the word; that is, a deep, hollow sore, or sinus, all parts of which are so hardened, or so diseased, as to be absolutely incapable of being healed, while in that state; and from which a frequent or daily discharge is made, of thin, discoloured sanies, or fluid.

These are divided into two classes, viz. those which are the effect of neglect, distempered habit, or bad management, and which may be called, without any great impropriety, local diseases; and those which are the consequence of disorders, whose origin and seat are not in the immediate sinus or fistula, but in parts more or less distant, and, which, therefore, are not local complaints.

The natures and characters of these are obviously different by description; but they are still more so in their most frequent event, the former being generally curable by proper treatment; the latter frequently not so by any means whatever.

Under the former are reckoned all such cases as were originally mere collections of matter within the coats of the intestine rectum, or in the cellular membrane surrounding the said gut; but which, by being long neglected, grossly managed, or by happening in habits which were disordered, and for which disorders no proper remedies were administered, suffer such alteration, and get into such state, as to deserve the appellation of *fistulæ.*

Under the latter, are comprised all those cases, in which the disease has its origin and first state in the higher and more distant parts of the pelvis, about the os sacrum, lower vertebræ of the loins, and parts adjacent thereto; and are either strumous, or the consequence of long and much distempered habits; or the effect of, or combined with, other distempers, local or general; such as a diseased neck of the bladder, or prostate gland, or urethra, &c. &c. &c.

Among the very low people, who are brought into hospitals, we frequently meet with cases of the former kind: cases, which, at first, were mere simple abscesses; but which from uncleanliness, from intemperance, negligence, and distempered constitutions, become such kind of sores, as may be called *fistulous.*

In these the art of surgery is undoubtedly, in some measure, and at some time, necessary; but it very seldom is the first or principal fountain from whence relief is to be sought: the general effects of intemperance, debauchery, and diseases of the habit are first to be corrected and removed, before surgery can with propriety, or with reasonable prospect of advantage, be made use of.

The surgery required in these cases, consists in laying open and dividing the sinus, or sinuses, in such manner that there may be no possible lodgment for matter, and that such cavities may be fairly opened lengthwise into that of the intestine rectum: if the internal parts of these hollows are hard, and do not yield good matter, which is sometimes the case, more especially where attempts have been made to cure by injecting astringent liquors, such parts should be lightly scratched or scarified with the point of a knife or lancet, but not dressed with escharotics; and if, either from the multiplicity of external orifices, or from the loose, flabby, hardened, or inverted state of the lips and edges of the wound near to the fundament, it seems very improbable that they can be got into such a state as to heal smoothly and evenly, such portion of them should be cut off as may just serve that purpose. The dressings should be soft, easy, and light; and the whole intent of them to produce such suppuration as may soften the parts, and bring them into a state fit for healing.

If a loose, fungous kind of flesh has taken possession of the inside of the sinus, (a thing much talked of, and very seldom met with,) a slight touch of the lunar caustic will reduce it sooner, and with better effect on the sore, than any other escharotic whatever.

Modern writers also speak of a smooth adventitious membrane, which is found to line old fistulæ, and frequently to hinder the success of the operation; (*See Quarterly Journ. of Foreign Medicine, &c. N.* 8.) a complication, which would undoubtedly justify the recourse to measures for the extirpation of such membrane. But, I ought to mention my own belief, that a case hindered from getting well by this cause is very rare in comparison with others, in which the cure is prevented by the matter being still more or less confined, and not having as free an outlet as circumstances demand.

The method and medicines, by which the habit of the patient was corrected, must be continued (at least in some degree) through the whole cure; and all the excesses and irregularities, which may have contributed to injure it, must be avoided.

By these means, cases which at first have a most disagreeable and formidable aspect, are frequently brought into such state as to give very little trouble in the healing.

If the bad state of the sore arises merely from its having been crammed, irritated, and eroded; the method of obtaining relief is so obvious, as hardly to need recital.

A patient who has been so treated, has generally some degree of fever; has a pulse which is too hard, and too quick; is thirsty, and does not get his due quantity of natural rest. A sore which has been so dressed, has generally a considerable degree of inflammatory hardness round about; the lips and edges of it are found full, inflamed, and sometimes inverted; the whole verge of the anus is swollen; the hemorrhoidal vessels are loaded; the discharge from the sore is large, thin, and discoloured; and all the lower part of the rectum participates in the inflammatory irritation, producing pain, bearing-down, tenesmus, &c. *Contraria contrariis* is never more true than in this instance: the painful, uneasy state of the sore, and of the rectum, is the great cause of all the mischief, both general and particular; and the first intention must be to alter that state. All escharotics must be thrown out and disused; and in lieu of them, a soft digestive should be substituted, in such manner as not to cause any distention, or to give any uneasiness from quantity: over which a poultice should be applied: these dressings should be renewed twice a day; and the patient should be enjoined absolute rest. At the same time, attention should be paid to the general disturbance, which the former treatment may have created. Blood should be drawn off from the sanguine; the feverish heat should be calmed by proper medicines; the languid and low should be assisted with the bark and cordials; and ease in the part must, at all events, be obtained by the injection of anodyne clysters of starch and opium.

If the sinus has not yet been laid open, and the bad state of parts is occasioned by the introduction of tents imbued with escharotics, or by the injection of astringent liquors, (the one for the destruction of callosity, the other for the drying up gleet and humidity,) no operation of any kind should be attempted until both the patient and the parts are easy, cool, and quiet: cataplasms, clysters, rest, and proper medicines must procure this: and when that is accomplished, the operation of dividing the sinus, and (if necessary) of removing a small portion of the ragged edges, may be executed, and will, in all probability, be attended with success. On the contrary, if such operation be performed while the parts are in a state of inflammation, the pain will be great, the sore for several days very troublesome, and the cure prolonged or retarded, instead of being expedited.

Abscesses, and collections of diseased fluids, are frequently formed about the lumbar vertebræ, under the psoas muscle, and near to the os sacrum; in which cases, the said bones are sometimes carious, or otherwise diseased. These sometimes form sinuses, which run down by the side of the rectum, and burst near to the fundament.

The treatment of such sores and sinuses can have little influence on the remote situation, where the collection of matter is originally formed. (See *Lumbar Abscess.*)

Fistulous sores, sinuses, and indurations about the anus, which are consequences of diseases of the neck of the bladder, and urethra, called fistulæ in perinæo, require separate and particular consideration. (See *Fistula in Perinæo.*)

A few years ago, M. Roux published a critique on the preference, which English surgeons invariably give to Pott's method of operating for the fistula in ano. The chief peculiarity in the French plan, on which he bestows unqualified praise, consists in the use of a kind of director, called a gorget, which is usually made of ebony wood, and intended to be introduced within the rectum, with its concavity turned towards the fistula. A steel inflexible director, slightly pointed and without a cul-de-sac, is then passed through the fistula till the point comes into contact with the wooden gorget. A long, narrow, sharp-pointed, straight bistoury is now introduced along the groove of the steel director, till its point meets the groove of the ebony gorget, by cutting upon which all the parts are divided, which lie between the internal opening of the fistula and the anus. It may be objected to this method, that it is not always easy to make a director pass at once through the fistula into the rectum. This is acknowledged by Richerand, who adds, that, in this circumstance, the point of the director may be forced into the rectum, without lessening the chance of the success of the operation. (*Nosogr. Chirurg. T.* 3, *p.* 463, 464. *Edit.* 4.) Why then does it matter so much, that the surgeon sometimes pierces the rectum with the point of his curved bistoury? Surely, this is as good an instrument for making the puncture as the pointed director. Besides, it appears to me, that a flexible silver director is more likely to follow the track of the fistula into the rectum, than an unbending iron instrument. I shall say nothing of the awkwardness of using the other wooden director: the finger of the surgeon can always do the office of all such contrivances, with greater safety and convenience. M. Roux also censures us for not *cramming* the wound with charpie; for he is not content with merely introducing into it a dossil of lint. (See *Parallèle de la Chir. Angloise, &c. p.* 296, *&c.*) His countryman Pouteau, however, knew better long ago: for, he has expressed his decided conviction of the inutility of cramming the wound with dressings to its very bottom after the third day, when superficial dressings, and the renewal of them as often as cleanliness requires, will be fully sufficient.

For information, relative to former opinions concerning *fistula in ano*, refer to *Celsus; Heister's Surgery; Le Dran's Operations; Sharp's Operations; La Faye's Notes on Dionis. H. Bass. De Fistula Ani feliciter curanda, in Halleri Disp. Chir.* 4, 463. *J. L. Petit, Traité des Mal. Chir. T.* 1 *and* 2, *p.* 113. *Petit is an advocate for making an early opening, like Pott, and all the best writers on this disease. In Kirkland's Medical Surgery, Vol.* 2, *may be found an account of the opinions and practice of many former celebrated practitioners. The best modern practical remarks are contained in Pott's Treatise on the Fistula in Ano, in which he has offered also an excellent critique on some opinions of Le Dran, De la Faye, and Cheselden. The reader may also consult with advantage Sabatier's Médecine Opératoire, T.* 2; *J. Howship, Practical Obs. on the Diseases of the Lower Intestines, &c. Chap.* 6. *Ed.* 3. *Lond.* 1824. *T. Whately, Cases of Polypi, &c. with an appendix, describing an improved instrument for the fistula in ano,* 8*vo. Lond.* 1805. *J. T. Oetzmann, De Fistula Ani,* 4*to. Jenæ,* 1812. *Richerand, Nosographie Chir. T.* 3, *p.* 446, *&c. Edit.* 4. *Roux, Voyage fait à Londres en* 1814, *ou Parallèle de la Chirurgie Angloise avec la Chirurgie Françoise, p.* 296, *&c. Paris,* 1815. *Callisen's Syst. Chirurgiæ Hodiern. T.* 1, *p.* 470. *Schreger, Chirurgische Versuche, B.* 2, *über die Unterbindung der Mastdarmfisteln, p.* 1. 131, 8*vo. Nürnberg,* 1818. *T. Ribes, Re-*

cherches sur la Situation de l'Orifice interne de la Fistule de l'Anus, et sur les parties dans l'épaisseur desquelles ces ulcères ont leur siège: See Quarterly Journ. of Foreign Medicine, No. 8. Fr. Reisinger, Darstellung eines neun Verfahrens die Mastdarmfistel zu unterbinden, &c. 8vo. Augsb. 1816. *Into the consideration of these plans of curing fistulæ by the introduction of a ligature through them, and tying them, I have not judged it advisable to enter, because every method of this kind is most justly banished from the practice of surgery in this country.*

ANUS, PROLAPSUS OF.

Prolapsus ani, technically called also *exania,* or *archoptosis.* In this case, the rectum protrudes in a greater or less degree at the anus, either from mere relaxation of the internal membrane of the bowel, or from a real displacement and inversion of its upper portion, which presents itself as an external tumor. The first form of the disease is that which is most common. The inner coat of the rectum, being connected to the muscular by a very loose elastic cellular substance, naturally forms several folds, the use of which is to let this bowel dilate sufficiently for the retention of the excrement. The swelling, occasioned by the protrusion of the inner coat of the rectum, or by the actual displacement of a greater part of this bowel, is subject to considerable variety in respect to length and thickness; when small, resembling a mere ring; when large and reaching far downwards, having an oblong globular form. The tumor, sometimes, admits of reduction with ease; sometimes it cannot be returned without difficulty. The disease occurs in persons of all ages; but, it is most common in infants and elderly subjects. Such examples as are combined with thickening and relaxation of the inner coat of the rectum, internal hemorrhoids, or other tumors, are sometimes attended with a copious discharge from the anus, and from the prolapsed bowel, of a serous and mucous fluid, mixed with blood. The disease may originate from various causes:

1. From circumstances, which tend to relax and weaken the parts, which retain the rectum, or its inner membrane, in its situation.

2. From various kinds of irritation and pressure on the bowel itself, having the effect of increasing the powers, by which it is liable to be forced outward.

3. From any disease, or irritation in the adjacent parts, and affecting the rectum sympathetically.

Hence, a prolapsus ani may be caused by long habitual crying, and great exertions of the voice; violent coughing; sitting long at stool; hard dry feces, and much straining to void them; obstinate diarrhœa in infants, kept up by dentition; dysentery; chronic tenesmus; various diseases of the rectum itself; the abuse of aloetic medicines and emollient clysters; hemorrhoids; excrescences and thickenings of the inner membrane of the rectum; difficulty of making water; the efforts of parturition; the stone in the bladder; paralysis of the sphincter and levatores ani; and prolapsus vaginæ.

Considering the degree of the disease, and the occasional closeness of the stricture, the symptoms are sometimes mild, the rectum generally bearing pressure, exposure to the air, and other kinds of irritation, better than any other bowel. But, the urgency and danger of a prolapsus ani are greater, when the swelling is large, recent, and conjoined with violent pain, inflammation, and febrile symptoms. When complicated with strangulation, the consequences may be a stoppage of the feces, severe pain, swelling, inflammation, and even gangrene, within the cavity of the abdomen. In short, all the evils may arise, which attend strangulated hernia. The prognosis, therefore, varies according to the different degree, species, cause, and complication of the disease. The recent, small, moveable prolapsus ani, the cause of which admits of being at once removed, may be effectually and radically cured. It should always be recollected, however, that when once the rectum has been affected with prolapsus, a tendency to protrusion from any slight occasional cause generally remains. The habitual prolapsus, which has existed for years, and comes on whenever the patient goes to stool, is the case which is most difficult of relief.

The treatment of prolapsus ani embraces three principal indications.

1. The speedy reduction of the prolapsed part.
2. The retention of the reduced bowel.
3. The removal and avoidance of the causes by which the disease is induced.

In general, when the case is recent, and the tumor not of immoderate size, the reduction may be accomplished with tolerable ease, by putting the patient in a suitable posture, with the buttocks raised, and the thorax depressed, and by making gentle and skilful pressure, either with the palm of the hand, or fingers. When difficulty is experienced, the patient if young or robust may be bled; and the part be fomented. The large intestines may also be emptied by means of a mild unirritating clyster, and half an ounce of the oleum ricini should be exhibited. In the habitual prolapsus ani, the patient himself is generally accustomed to reduce the part, or it goes up of itself when he lies down. When, however, the inflammation and swelling are urgent, the part ought on no account to be irritated by repeated attempts at reduction. The practitioner should rather have recourse to the antiphlogistic plan, especially leeches, fomentations, or cold washes, and the exhibition of the oleum ricini, and when the swelling has been lessened, the reduction may be again attempted. When the reduction is prevented by a spasmodic resistance, the use of an anodyne poultice, or fomentations, a clyster of the same quality, the warm bath, and the internal use of opium, are the best means. Should the complaint not give way to the preceding remedies, and the symptoms become more and more pressing, the particular situation of the stricture should be examined with a probe, and divided either with a knife and director, or with a concealed bistoury. Some writers speak of the employment of a speculum ani; but on account of the globular form of the disease, it must be difficult of application. Cases are recorded, in which the protruded part, either in the state of gangrene or of chronic hardness, thickening, and elongation, has been removed with a knife, or ligature. (See *Cheselden's Anatomy, &c.* 1741: *Kerstens, Historia Sedis procidua, resectione feliciter sanatæ, Kilon.* 1779;

Whately, in Med. Tracts and Observ. Vol. 8, *No.* 16.)

However, I should apprehend, that, in the circumstance of gangrene, the measures, best calculated for stopping its course, detaching the sloughs, and keeping up the patient's strength, must always be more prudent, than such an operation.

The reduction having been effected, it is proper to introduce the forefinger up the rectum, in order to ascertain, that no intussusception exists above the anus within the sphincter. The bowel is then to be kept in its place by quietude and the recumbent posture, and, if there be a great tendency to relapse, it will be proper to apply to the fundament a piece of sponge, or compresses, supported with the T bandage. But, if such means should not answer, and an habitual prolapsus ani should recur again and again, which is not unfrequent when the disease has been neglected, or its causes have long remained unremoved, the apparatus described by Mr. Gooch may be tried with more hope of success. (*Chirurgical Works, Vol.* 2, *p.* 150, *Edit.* 1792.) Others have used perforated balls of ivory. Callisen found the introduction of a piece of sponge, within the rectum, fastened to a silver probe, give effectual support. In France, instruments, made of elastic gum, have been employed with advantage for supporting the rectum. (*Richerand Nosgr. Chir. T.* 3, *p.* 444, *Ed.* 4.)

On account of the elasticity, and unirritating quality of this substance, I conceive, it is better calculated than any other material for the construction of such instruments. It cannot be denied, however, that all foreign bodies in the rectum create serious annoyance. In the female sex, a vaginal pessary, rather prominent behind, usually hinders the recurrence of a prolapsus ani.

The late Mr. Hey published some highly interesting remarks on the cure of the procidentia ani in adults. In one gentleman, the disease took place whenever he had a stool, and continued for some hours, the gut gradually retiring, and at last disappearing, until he had occasion to go to the privy again. After each stool, he used to place himself in a chair, and obtain a little relief by making pressure on the prolapsed part; and he then was in the habit of going to bed, where the intestine by degrees regained its natural situation. While the bowel was down, there was a copious discharge from it of a thin mucous fluid, blended with blood. When the part was up, the anus was constantly surrounded by a thin, pendulous flap of integuments, generally hanging down to the extent of three fourths of an inch. Around the anus, there were also several soft tubercles of a bluish colour, situated at the basis, and at the inner part, of the pendulous flap. These were evidently formed by the extremity of the rectum. The patient, previously to the establishment of these habitual attacks of prolapsus ani, had been afflicted for several years with pain after each stool, protuberances at the extremity of the rectum, and discharge of blood and mucus. For these complaints, he applied to Mr. Sharp, who gave him an ointment to be applied after each stool, some soapy pills to be taken, and recommended the use of a clyster a little before the time of going to stool. The latter remedy, however, could not be adopted, and no material benefit was derived from the others. Some years afterwards, when Mr. Hey was consulted, the foregoing symptoms continued; in addition to which there was the grievance of the prolapsus, which came on at every time of going to stool, and lasted for several hours. This judicious surgeon, at first, advised the patient to wash the prolapsed part with a lotion composed of an infusion of oak bark, lime-water, and spirit of wine, and keeping on the tumor compresses, wet with this fluid, and supported by the T bandage. The disease, however, was too obstinate to be cured by this treatment. Nor could Mr. Hey succeed in reducing the bowel, when it came down. "Although (says he) the prolapsed part of the intestine consisted of the whole inferior extremity of the rectum, and was of considerable bulk, yet, the impediment to reduction did not arise from the stricture of the sphincter ani; for, I could introduce my finger with ease during the procidentia; but, it seemed to arise from the relaxed state of the lowest part of the intestine, and of the cellular membrane, which connects it with the surrounding parts. My attempt proved vain, as to its immediate object, yet it suggested an idea, which led to a perfect cure of this obstinate disorder. The relaxed state of the part, which came down at every evacuation, and the want of sufficient stricture in the sphincter ani, satisfied me, that it was impossible to afford any effectual relief to my patient, unless I could bring about a more firm adhesion to the surrounding cellular membrane, and increase the proper action of the sphincter. Nothing seemed so likely to effect these purposes, as the removal of the pendulous flap, and the other protuberances, which surrounded the anus." This operation was performed on the 13th of November. On the 15th the gut protruded, and did not gradually retire, as it used to do. Mr. Hey attempted to procure ease by means of opiates and fomentations, and avoided immediately trying to reduce the prolapsed part. However, the prolapsus continued so long, that the appearance of the part began to alter, and, therefore, on the 16th he made an attempt at reduction, and succeeded with great ease. However, as a good deal of pain in the hypogastrium was still complained of, the patient was bled in the evening, and gently purged with the oleum ricini. These means gave relief; but, as some pain in the belly yet continued, an opiate was given. A low diet, linseed tea, lac amygdalæ, &c. were ordered, and a little of the oleum ricini every morning, or every other morning, with an opiate after a stool had been procured. "By proceeding in this manner for some days, regular stools were procured, without any permanent inconvenience. My patient recovered very well, and was freed from this distressing complaint, which had afflicted him so many years." (See *Hey's Pract. Obs. p.* 438, *&c. Ed.* 2.)

This, and some other cases, which this gentleman has related, convincingly exemplify the necessity of paying attention to the removal of excrescences, hemorrhoids, and other tumors, situated about the lower part of the rectum, in cases of prolapsus ani; for, unless this object be accomplished, the disease may resist every other treatment. Mr. Howship prefers the ligature for the extirpation of the protuberances; but heartily commends the principle of the treatment proposed by Mr. Hey. (*Pract. Obs. on Diseases of the Lower Intestines, p.* 163, *Ed.* 3.) An elderly gentleman, whom I know, was troubled for many years with a prolapsus ani, which used to come on several times a week, sometimes at the privy, and sometimes on other occasions. Several of the first surgeons were consulted, who failed in affording permanent benefit, because they omitted to extirpate some hemorrhoidal excrescences, situated at the lower part of the rectum; for, when these were afterwards removed, the prolapsus ani entirely disappeared,

Dupuytren, finding that the excision of piles, which so often accompany prolapsus ani, commonly prevented the return of the latter complaint, was led to cut off more or less considerable portions of the internal membrane of the rectum. However, as in one case a profuse hemorrhage took place, and, in another, a tedious suppuration, he has subsequently adopted the plan of removing a certain number of the projecting folds, which may be seen converging from the circumference to the margin of the anus. He takes hold of them with ligature-forceps, a little flattened at one end, and cuts them off with scissars curved on their flat side. This practice is similar to that employed by the late Mr. Hey. Dupuytren in his first method, used to cut away the mucous membrane itself; in the last, only the folds of skin at the margin of the anus are removed. A woman had had a constant prolapsis ani for ten years: when she was in the upright posture, the swelling was ten inches in one diameter, and seven in the other; it hindered her from walking, and continually discharged a mixture of blood and mucus. Dupuytren removed five or six of the projecting folds from without inwards. The patient, who used to have more than 20 stools a day now went six days without one; on the seventh, however, an abundant evacuation took place, and the prolapsus never returned. Merely simple dressings are needed. (See *Journ. Universel des Sciences Med. N.* 81. *Sept.* 1822.)

The last indication in the treatment is the removal, and avoidance, of all such causes as are known to have a tendency to bring on the complaint. In infants, a fresh protrusion of the rectum may sometimes be prevented by making them sit on a high close-stool, with their feet hanging freely down. Every thing, tending to cause either diarrhœa, or costiveness, should be avoided. In the generality of cases, however, there is an inclination to costiveness, which must be obviated by the mildest means. For this purpose, Mr. Hey used to prescribe half an ounce of the oleum ricini, which is to be taken every morning, or every other morning, as circumstances may require. The same practitioner sometimes also employed, in addition to this medicine, a clyster composed of a pint of water gruel, and a large spoonful of treacle. The tone of the relaxed intestine is to be restored by the continued use of cold clysters, made with the decoction of oak bark, alum, and vinegar. In one obstinate case, under the care of Mr. Hey, he recommended the following lotion for washing the part during the state of prolapsus, and he also advised its application to the anus in the intervals, by means of a thick compress, supported by the T bandage. ℞. Aquæ calcis simplicis lbij. Cort. Quercûs contus. ℥iv. f. infusum per hebdomadam, et colaturæ adde Sp. Vini rect. ℥iv. ft. lotio. (See *Hey's Pract. Obs. p.* 442, *Ed.* 2.)

Irritability of the rectum may be lessened with opium.

The intussusception of the higher part of the bowel, especially of the colon, or cœcum, causing a protrusion at the anus, is always incurable, as it is not in the power of art to rectify the displacement. Some extraordinary cases prove, however, that large portions of the intestinal canal thus inverted, may be separated and voided, and the patients recover. (See *Intussusception.*)

According to Mr. Travers, when an artificial anus is complicated with prolapsus, the case very rarely admits of cure. (See *Inquiry into the process of Nature in repairing Injuries of the Intestines, p.* 374.)

Surgical writers have been too much in the habit of confounding together prolapsis ani and intussusception. In the latter disease, they have even fallen into the error of supposing, that the whole of the rectum becomes everted, in consequence of the relaxation of the sphincter and levatores ani, and that it then draws after it other portions of the intestinal canal. But, they ought to have been undeceived by the strangulation, which sometimes occurs under such circumstances, and which not only throws a great obstacle in the way of the reduction of the displaced part, but even sometimes brings on mortification. Besides, the connexions of the rectum with the neighbouring parts, by means of the cellular substance, which surrounds it, and the attachment of this intestine to the posterior surface of the urinary bladder, render the above origin of the complaint impossible. Such an explanation could only be admitted with regard to those protrusions of the rectum, which come on in a very slow manner. It could not apply to certain cases, in which the everted intestine presents itself in the form of an enormous tumour. Fabricius ab Aquapendente met with cases of prolapsus of the rectum, where the tumour was as long as the forearm, and as large as the fist. In the *Mélanges des Curieux de la Nature*, is the description of a tumor of this sort, which was two feet long, and occurred in a woman from parturition. Nor is a more satisfactory reason assigned for these cases, by supposing, that they originate from a relaxation of the villous coat of the rectum, and its separation from the muscular one. We are not authorized to imagine, that such a separation can take place to a considerable extent, nor so suddenly, as to give rise to the phenomena, sometimes remarked in this disease.

Accurate observations long ago removed all doubt upon this subject. In the *Mémoires de l'Académie de Chirurgie, T.* 11, *edit. in* 12*mo.* is an account of a pretended prolapsus of the rectum, which, after death, was discovered to be an eversion of the cœcum, the greater part of the colon being found at the lower end of this intestine, and most of the rectum at its upper part. This eversion began at the distance of more than eleven inches from the anus, and terminated about five or six from this opening, the tumour, formed by the disease, having been reduced some time before the child's death. It was impossible to draw back the everted part, in consequence of the adhesions, which it had contracted. Another dissection evinced the same fact. A child, having suffered very acute pain in the abdomen, after receiving a blow, had a prolapsus of intestine through the anus, about six or seven inches long. This was taken for a prolapsus of the rectum. After death, the termination of the protruded bowel was found to be the cœcum, which had passed through the colon, and rectum. (See *Intussusception.*)

The reader may consult with advantage: *l'Encyclopédie Méthodique, Partie Chir. De la Chûte du Fondement, T.* 1. *p.* 150. *Gooch's Chirurgical Works, Vol.* 2, *p.* 150. 1792. *Récherches Historiques, sur la Gastrotomie, ou l'Ouverture du bas Ventre, dans le cas du Volvulus, &c. par M. Hevin, in Mém. de l'Acad. Royale de Chir. T.* 11, *p.* 315. *Edit. in* 12*mo. J. Howship, Obs. on the Diseases of the Lower Intestines, &c. Ed.* 3. *Lond.* 1824. *Chap.* 4. *Richter's Anfangsg. der Wundarzn. B.* 6, *p.* 403. *Edit.* 1802. *Callisen's Syst. Chirurgiæ Hodiernæ, T.* 2, *p.* 521, *Edit.* 1800. *Hey's Practical Obs. in Surgery, p.* 438, *&c.* 8*vo. Edit.* 2. 1810. *Journ. Univ. des Sciences Méd. N.* 18, *Sept.* 1822.

ANUS, ARTIFICIAL.

This signifies an accidental opening in the parietes of the abdomen, to which opening some part of the intestinal canal tends, and through which the feces are, either wholly, or in part, discharged.

An artificial anus is always preceded by an injury of the intestinal canal, either a penetrating wound of the abdomen, ulceration of the bowel, and the bursting of an abscess externally; an operation, in which the preternatural opening is purposely made, with the view of saving life in particular cases of imperforate anus; an accidental wound of the gut in the operation for hernia; or, lastly, and, most commonly, mortification of the bowel, the effect of the violence and long continuance of the strangulation of the part. All these cases are further divisible into such, as are attended with a destruction of a portion of the intestinal tube; and into those, which are not accompanied with any such loss of substance.

Whatever may be the kind of injury, which the bowel has sustained, one thing here invariably happens, viz. the adhesion of the two divided portions of the intestine to the edge of the opening in the parietes of the abdomen. This occurrence, which has the most salutary effect in preventing extravasation of the contents of the bowel in the cavity of the abdomen, is produced by inflammation, which precedes gangrene, and follows wounds. (See *Œuvres Chir. de Desault, T.* 2. 352—354.)

When, in strangulated hernia, the case is not relieved by the usual means; or when the necessary operation has not been practised in time, the protruded bowel sloughs; the adjoining part of it adheres to the neck of the hernial sac, and the gangrenous mischief spreads from within outwards. If the patient live long enough, and an incision in the tumor be not now practised, one or more, openings soon form in the integuments, and, through these apertures, the feces are discharged until the separation of the sloughs gives a freer vent to the excrement. But when an incision is made, the feces are more readily discharged, and, as Mr. Travers has related, this is sometimes the best mode of relief.

"In the ordinary situation of hernia, (as this gentleman has correctly explained), the portions of intestine, embraced by the stricture, occupy a position nearly parallel. Their contiguous sides mutually adhere; in the remainder of their circumference, they adhere to the peritoneum, lining, or forming the stricture. The existing adhesion of the contiguous sides, strengthened by the adhesion of the parts in contact, insures a partial continuity upon the separation of the sphacelated part. The line of separation is the line of stricture. It commences on that side of the gut which is in direct contact with the stricture. As the separation advances, the opposite adhering sides may perhaps recede somewhat, and a little enlarge the angle of union. But, it is ever afterwards an angle; and, where the peritoneum is deficient, the canal is simply covered in by granulations from the cellular membrane of the parietes, coalescing with those of the external, or cellular surface of the peritoneum." (*On the Process of Nature in repairing Injuries of the Intestines, p.* 360.) It must be confessed, that few surgeons have entertained sufficiently accurate ideas of the changes, which happen around the wounded, or mortified portion of intestine, when an artificial anus is produced; and, though Desault's account was excellent, as far as it went, it was not until the year 1809, when Scarpa published his valuable work on Hernia, that the whole process of nature on such occasions was completely elucidated. The hernial sac, (says he) does not always partake of gangrene with the viscera contained in a hernia, and even when it does slough, since the separation of the dead parts happens on the outside of the abdominal ring, there almost always remains in this situation a portion of the neck of the hernial sac perfectly sound. It may be said therefore, that, in all cases, immediately after the detachment of the mortified intestine, whether it happen within, or on the outside of the ring, the two orifices of the gut are enveloped in the neck of the hernial sac, which, soon becoming adherent to them by the effect of inflammation, serves for a certain time to direct the feces towards the external wound, and to prevent their effusion in the abdomen. In proportion as the outer wound diminishes, the external portion of the neck of the hernial sac also contracts; but, *that part, which embraces the orifices of the intestine, gradually becomes larger, and at length forms a kind of membranous funnel-shaped, intermediate cavity, which makes the communication between the two parts of the bowel.* However, according to Scarpa's investigation, this adhesion of the neck of the hernial sac, round the two orifices of the gut, does not hinder the latter from gradually quitting the ring, and becoming more and more deeply placed in the cavity of the abdomen. The base of the above described funnel-shaped membranous cavity corresponds to the bowel, and its apex tends towards the wound, or fistula.

But, in relation to this part of the subject, there are some other circumstances, which every surgeon should well understand, and his ignorance of them would not be excusable, on the ground of their not having been, like the funnel-shaped membranous cavity, forming the communication between the two orifices of the bowel, only a discovery of recent date; for, they were fully explained many years ago. I here allude to the exact position of the two portions of the bowel, with respect to each other, the direction of their orifices, the angle, or ridge between them, and the difference in their diameters. The first of these circumstances, viz. the position of the two parts of the bowel, was correctly described by Morand, and as we have seen, is pointed out by Mr. Travers, who represents them as occupying a position nearly parallel, and cites an interesting observation recorded by Pipelet. The patient was a woman, 56 years old; the loop of spoiled gut was from five to six inches long; the contents of the bowel were discharged through the wound for a considerable time, and an artificial anus was established. Some accidental obstruction occurred; a purgative was given, which operated in the natural way, and, in fifteen days, the wound was healed. She lived in perfect health, to the age of 82, when she died of a disease, not connected with this malady. Pipelet examined the body, and has given a figure representing the union. The line of the intestine formed an acute angle, where it adhered to the peritoneum, opposite to the crural arch. The cylinder is evidently much contracted. Pipelet particularly dwells upon the angular position, and constriction of the tube at the point of union. The lower continuation of the intestinal tube was also remarked to be more contracted, than the upper portion; a circumstance correctly referred, by Mr. Travers, to the undilated state of the bowels, situated between the artificial and the natural anus. (See *Mém. de l'Acad. de Chir. T.* 4, *p.* 164, *and Travers on Injuries of the Intestines, p.* 364.) The two ends of the bowel, as Scarpa has observed, are always found lying in a more or less parallel manner by the side of each other; the upper, with its orifice open, and directed towards the external wound by the feces, which issue from it, while the lower, which gives passage to nothing, becomes less capacious, and is retracted further into the abdomen. Hence, the breach in the intestinal canal is never repaired by the orifices of the upper and lower portions of the bowels reuniting, coalescing, and running, as it were, into each other. Indeed, they meet at a very acute angle; the axis of one does not correspond to that of the other; and their orifices never lie exactly opposite each other. It is in short by means of the funnel-shaped cavity, formed by the remains of the hernial sac, that the two parts of the bowel communicate, and the feces, in order to get from the upper into the lower continuation of the intestine, must first pass in a semicircular track through that funnel-shaped cavity, there being between the orifices of the bowel, directly opposite to the communication between the cavity of the intestine and that of the funnel-shaped membrane, *a considerable projection, or jutting angle, forming a material additional obstacle to the direct passage of the feces from the upper into the lower portion of the intestinal tube.* (*Scarpa sull' Ernie Memorie, nat. Chirurgiche, Milano*, 1809.)

Desault, after noticing the efficiency of the adhesions, between the injured part of the bowel and the edge of the opening in the parietes of the abdomen, in preventing extravasation, remarks, that, if such adhesions were entire, the abdominal parietes would form a substitute for the portion of the canal, which has been destroyed, and the contents of the bowel would continue to pass, as usual, towards the anus, if the portions of the intestine, separated and adherent to the neighbouring parts, did not form such an acute angle as obstructs the passage of the intestinal matter. The more acute this angle is, the greater is the obstruction; when the two parts of the bo wel lie nearly parallel, the entrance into the lower portion of the canal is completely prevented; but, if they meet at a right angle, then more or less of the contents of the upper portion may be transmitted into the lower. The first disposition chiefly happens, when a considerable part of the intestinal canal has been destroyed, or when the tube has been completely divided; while the second posture is principally remarked in all cases, where the injury has been less extensive. And, it is plain, that the possibility of a cure depends materially on the kind of angle, at which the two portions of bowel meet, and that the projection of the internal frænum, or jutting membranous ridge between the two orifices, is always a greater or lesser obstacle to the cure.

With respect to the diminution, which occurs in the diameter of the part of the intestinal canal, between the artificial opening and the natural anus, Desault admits the correctness of the observation, but entirely dissents from such authors as have spoken of the change, as sometimes proceeding so far, that an obliteration of that portion of the intestinal tube is the consequence. The mucus secreted within it suffices for preventing this obliteration; a secretion which, in these cases, is copious, and is partly voided from the rectum, in the form of white flakes. And, if any further proof were needed, that the bowels between the artificial and natural anus remain pervious, it is furnished by the fact, that, in cases of artificial anus, the lower continuation of the tube frequently becomes inverted, and protrudes. On the other hand, the kind of obliteration, above spoken of, has never been demonstrated by dissection: it was not observed by Lecat, in the examination of the body of a person, who died twelve years after the entire cessation of the passage of feces *per anum;* nor was it found to exist by Desault, when he opened a patient, who died of marasmus in the Hotel-Dieu, in consequence of an artificial anus, which communicated with the ileum, and had lasted two years. (*Œuvr. de Desault, T.* 2, *p.* 354-6.)

However proper the formation of an artificial anus may be, in many cases, in which the patient's life depends upon the event, it must be confessed, that the consequence is a most afflicting and disgusting infirmity. This truth cannot be denied, though the feces, which are discharged, from not having been so long retained in the bowels, may not be so fetid as those which are evacuated in the ordinary way. As the opening, which gives vent to the excrement, is not endued with the same organization as the lower end of the rectum, and, as in particular, it is not furnished with any sphincter capable of contracting and relaxing itself, as occasion requires, the feces are continually escaping without any knowledge of the circumstance on the part of the patient. Hence, the uncleanly state of the parts around the external opening; and their frequently excoriated fungous state. Some persons in this state, among the number of those whose histories are on record, made use of a metal box, in which their excrement was received. Schenckius relates the case of an officer, who was wounded in the belly, and who allowed his feces to escape into a vessel made for the purpose. Dionis mentions a similar case.

Moscati also communicated to the Academy of Surgery, the history of a wounded man, in whom an artificial anus took place, in consequence of a wound in the abdomen below the right hypochondrium. His excrement used to be received in a tin-box, fastened to him with a belt. The wound received a leaden canula, to which the tin-box was accommodated.

Uncleanliness is not the only inconvenience of an artificial anus. Persons have been known to be quite debilitated by the affliction, and even ultimately to die in consequence of it. This is liable to happen, whenever the intestinal canal is opened very high up, so that the aliment escapes before chylification is completed, and the nutritious part of the food has been taken up by the lacteals. In this circumstance, the patient becomes emaciated, and sometimes perishes, as Desault had an opportunity of observing; and examples of which are also recorded by Hoin and Le Blanc. In cases of this description, the matter voided has little fetor, and is frequently sourish. In all instances, the matter is evacuated involuntarily, because there is nothing like a sphincter. But, when the opening only interests the lower convolutions of the ileum, or, what is more frequent, when it has occurred in the large intestines, the danger is less serious, and patients, in this state, are often noticed performing all their functions very well; and, with the exception of colic, to which they are subject, enjoying as good health as they did previously to their having the present disease. In such examples, the matter voided is more fetid, its discharge does not follow so quickly its introduction into the stomach, and it is retained for a longer time.

Many patients, afflicted with an artificial anus, void no feces at all from the rectum; but, occasionally, a thick whitish substance, which is the mucous secretion of the portion of the large intestines nearest to the anus. Under certain circumstances, the quantity of this mucus discharged is more copious. (*Desault, Vol. cit. p.* 359.)

The most grievous occurrence, to which persons with an artificial anus are exposed, is a prolapsus of the bowel, similar to what sometimes happens through the anus, with respect to the rectum. The descent of the bowel is sometimes simple, only affecting a portion of the intestinal canal just above, or below, the opening. On other occasions, the complaint is double, the bowel both above and below the opening being prolapsed. This descent of the intestine forms a tumor, the dimensions of which vary considerably in different subjects. When the protrusion is caused by the upper part of the intestinal canal, the feces are voided at the extremity of the tumor, and, when the swelling consists of the lower portion of the bowel, the excrement is evacuated at the base of the prolapsed part. By observing this evacuation, when the tumor is double, it is easy to know to which end of the intestinal canal each protruded portion belongs. This consequence of an artificial anus is very serious, because it greatly increases the inconvenience, which the patient suffers. Sometimes, the tumor is exquisitely sensible; and, occasionally, when the eversion of the intestine is considerable, a strangulation is produced, which puts the patient's life in danger.

I apprehend no well informed surgeon of the present day can doubt, that formerly the frequency of artificial ani after hernia was seriously increased by the absurd measures, sometimes adopted for the express purpose of preventing them; and, as Mr. Travers has rightly observed, the cases, reported by the old surgeons, if they prove any thing, prove this: "that the canal has been very generally restored, when the artificial anus was reckoned upon as inevitable, and that where an officious solicitude had been at work to prevent it, showing itself in an active interference with the arrangements of nature, the case has terminated in artificial anus; so that the event, either way, has been a matter of surprise to the surgeon. The fear of doing too little, or too much, applies only to the pernicious customs of dilating the stricture, displacing, amputating, and sewing the intestine; the general adoption of which practice fully accounts to my mind for the number of artificial ani, which are the sequelæ of hernia." (*Op. cit. p.* 367.)

The treatment of an artificial anus, is either palliative, or radical. The first consists in obviating the habitual uncleanliness, produced by the involuntary discharge of the intestinal matter, and in relieving such bad symptoms, as may arise from the disorder.

The first indication is fulfilled by the employment of silver, or tin machines, which are either kept applied to the external opening by means of a spring, or form receptacles placed more or less off the artificial anus, from which the intestinal matter is transmitted through a tube, kept constantly in the opening. In general, says Desault, as elastic gum is supple, light, and capable of taking any shape, it is the best material for the construction of such instruments, which however, rarely answer their purpose completely, and always give the patient a great deal of trouble.

As for the second indication, Richter, with the view of hindering the too quick escape of the intestinal matter, and the death of the patient from this cause, proposed covering the opening for a certain time with a piece of sponge, supported by an elastic bandage, or truss. But Loeffler found this method objectionable, as it was apt to bring on colic, constipation, and an inflamed excoriated state of the skin.

When the outer opening is disposed to contract too much, and inconveniences arise from this change, Sabatier is an advocate for preventing such closure by means of a tent, or skein of silk, introduced into the aperture, and changed very often for the sake of cleanliness; while others prefer a ring of ivory for the purpose. But the irritation produced by the matter imbibed by this sort of tent, and in particular the liability of the bowel to protrude, and be strangulated in the opening of the ivory ring, are found strong objections to these practices; and, according to Desault, the sponge, employed by Richter, also occasions a great deal of excoriation by the irritation of the fluid which is lodged in it.

For the purposes of hindering a protrusion of the gut, of keeping the opening sufficiently pervious, of relieving any uneasiness and tenesmus, of hindering the intestinal matter from escaping in the intervals of dressing, and confining it long enough for the adequate nourishment of the patient, Desault preferred a linen tent, or stopper, covered by a pad of charpie, compresses, and a tight bandage. At first, says he. the patient feels some uneasiness from this plan, and slight colics may be the consequence of it; but, by degrees, the parts become habituated to their new state, and every thimg goes on well. With respect to the employment of tents and plugs, with the views above indicated, I am disposed to think the practice can rarely be advisable; and that any necessity for it may be obviated by attention to diet, and the occasional exhibition of laxative medicines and clysters, as will be hereafter noticed. When the gut protrudes, its reduction is to be effected in the same way, as a common prolapsus ani; but serious difficulty will occur when the protruded part is inflamed, thickened, and of considerable size. Indeed, surgeons have usually regarded the reduction as impracticable in these circumstances; but, according to Desault, this is not the case, as compression with a bandage, kept up for some days, will succeed. Care must be taken, however, to leave a sufficient opening for the passage of the feces. Whatever may be the size of the protrusion, Desault argues, that it should be the invariable rule of the surgeon to endeavour to return the part by the means here suggested. (See *Œuvres Chir. de Desault*, *T.* 2, *p.* 361, *&c.*)

The radical cure is what is next to be considered. The business of the surgeon is to prevent, if possible, the formation of an artificial anus; but, when the event has occurred, and, particularly, when the whole, or the greater part, of the stools is discharged in this way, no attempt must be made to stop up the opening, without a great deal of consideration; for, any effort of this kind, made under circumstances which do not justify it, may be the means of exposing the patient's life to the most alarming danger. Sometimes, indeed, without any interference of the surgeon, the outward opening contracts, and, the issue of the intestinal matter being obstructed, pain and tenesmus are excited; and the same consequences may be produced by any swelling and enlargement of the projecting ridge, situated between the two portions of the bowel. In two cases, Puy found this swelling take place in such a degree, that the patients fell victims to the complete stoppage of the intestinal contents. The symptoms, which arise, are then similar to those which happen in strangulated hernia. Hoin, Le Blanc, and Sabatier, also cite instances, in which the patients lost their lives by gangrene, brought on by this species of strangulation. (*Desault*, *Vol. cit. p.* 360.)

There is a period (says Mr. Travers), at which the function of the lower portion of the canal, with a little assistance, may be restored. The natural order of events, connected with this recovery, has been mistaken and inverted. Practitioners have closed the wound, instead of conducting the matter by purgatives and clysters into the large intestines. Now, the wound will never fail to heal, when the matter recovers its accustomed route; but, this condition cannot be reversed. The restoration is safest, when most gradual; when there is evidence of an existing sympathy between the repair of structure, and the return of function. According to the same gentleman, there is reason to believe, that the well-timed exhibition of a single purgative might often prove effectual. "If the food is rapid, and little changed, in its passage, it should be pultaceous and nutritive, and given in moderate quantity at short intervals; while injections of the same kind should be administered at least twice in twenty-four hours, and retained as long as possible." He states, that by such means, patients may be nourished for many weeks. If the discharge is sparing, and does not readily escape, he recommends an occasional purgative in less than ordinary quantity. He disapproves of other medicines, especially stimulants, and all such food as is difficult of digestion, giving a general preference to animal food in a gelatinous form. He bestows just praise on strict attention to cleanliness, and, in opposition to Desault and Sabatier, condemns the employment of tents and sponges. (*Op. cit. p.* 371, 373.)

Numerous cases on record furnish abundance of proof, that the feces, after being voided for several months from the wound, produced by the operation for hernia, frequently resume their natural course. Facts of this kind, which, in general, may be said to be common where the intestine is without loss of substance, are not very rare even where more or less of the bowel has been destroyed by gangrene; and many illustrations of this remark may be found in the writings of De la Peyronie, Louis, Petit, Pott, Le Dran, &c. The greater number of these instances of success, as already stated, were the result of the most simple, unofficious treatment, or rather of the undisturbed, and very little assisted, efforts of nature.

In the radical cure of an artificial anus, the following are the general indications laid down by Desault: 1. To reduce the gut when it protrudes, and is everted. 2. To prevent the issue of the feces from the wound, so that they may be obliged to pass on towards the rectum, at the same time that the healing of the external opening is to be promoted. 3. To obviate any internal impediments to the passage of the matter into the lower part of the intestinal canal.

How the first of these objects is to be accomplished in the case of greatest difficulty, that is, when the parietes of the bowel are thickened, has been already explained. Experience proves, says Desault, that the second indication cannot be fulfilled by means of sutures. The best thing for this purpose he represents to be the linen stopper, above spoken of as a means for preventing the protrusion of the bowel. Here it answers the double object of hindering such a protrusion, and filling up the fistulous opening, so as to make the contents of the bowel tend towards the anus. Desault argues, that the surgeon need not be apprehensive of the tent doing harm by keeping the wound from healing. The first aim, he says, should be to determine the feces to take their natural route; and when this has been done by closing the external opening, the tent may be removed, and this opening will spontaneously close.

However, when the internal impediment is too great, it must be overcome, ere such treatment can be successful. According to Desault, the most frequent impediment, here alluded to, is the angle formed by the two portions of the intestine, and it must be enlarged, and rendered less acute, in order that the feces may continue their route. This desirable change he recommends to be effected by introducing long dossils of charpie into the two ends of the bowel, and gradually altering their direction so as to bring it into one same straight line. When the dilatation is sufficient, and the inner angle, or ridge, is effaced, the long dossils need not be continued. The linen tent, with the precaution of not introducing it too deeply, lest it obstruct the course of the feces itself, will then suffice. When this plan is skilfully managed, Desault says, there will be a great chance of its succeeding, and its beneficial effect will be denoted by a rumbling in the bowels, and frequently by slight colics. At first, wind is discharged from the rectum, and, soon afterwards, the feces begin to come away. On the contrary, if they should not pass with facility, the colic be violent, and an accumulation happen in the upper portion of the intestinal canal, the tent must be withdrawn, and the other cause of obstruction be considered, and, if possible, removed. (*Vol. cit. p.* 365, *&c.*)

In the preceding columns, I have given a full explanation of the impediment made to the passage of the feces into the lower orifice of the intestinal canal, by the projecting septum, or ridge between the two parts of the bowel, and the matter having to traverse the funnel-shaped membranous cavity in quite a semicircular track. A representation of this septum may be seen in Scarpa's work, Tab. 9, Fig. 1, and also in the sixth plate of Mr. Travers's Inquiry. In one example in which this septum was plainly visible in the wound, Dupuytren introduced into the orifice of the upper part of the bowel a curved needle, and, passing it through the projecting septum, brought it out again through the orifice of the lower portion of the gut. Thus, he included a considerable part of the septum in a ligature, which was daily made thicker, with a view of first exciting inflammation in the two layers of this septum, and thus insuring their adhesion together, and his next plan consisted in making a division through the part embraced by the ligature, whereby the passage for the feces into the lower portion of the bowel was made quite free. But, as the section, made by the ligature, was too superficial, Dupuytren completed the division of the septum with a knife; but peritonitis and the death of the patient ensued. According to Dr. Breschet, the ligature also proved ineffectual, because its operation was so slow, that adhesions and cicatrization took place behind it as fast as it made its way through the rest of the septum. Hence, the expectation that the feces would sufficiently pass through the aperture made by the ligature was not realized; and, in one case quoted by Breschet, though some amendment followed the operation, still the cure was far from being accomplished, as only some of the feces passed out of the natural anus, while the remaining and greater part of them still came through the fistula. (See *Graefe's Journ. B.* 2, *p* 300.) In another case, Dupuytren tried to render the layers of the septum adherent by compressing them between the blades of a pair of forceps of particular construction, and afterwards he effected the division of the part by augmenting the compression, by means of a screw, traversing the handles of the instrument. In a case which followed the operation for bubonocele, attended with mortification of the bowel, Dupuytren began with dilating the outer opening with a bistoury, and after ascertaining the position of the septum, between the two orifices of the bowel, he introduced one of the blades of the forceps into each portion of the gut, and closed the instrument with the screw. The part of the instrument, situated externally to the ridge, or septum, he covered with charpie and a compress. The constriction was soon followed by colic pains, and tendency to vomit, complaints which were quickly removed by fomenting the belly. They recurred, however, the instrument became loose, and some discharge ensued. On examination, the septum was found to be partially divided. After the breadth of the instrument had been lessened, it was applied again; but, when the screw was turned, the patient began to suffer such violent pain over the whole of the abdomen, that it was necessary to diminish the pressure; and, as the instrument was afterwards separated from the parts in a fit of vomiting, it was withdrawn A trial was now made to determine the feces towards the rectum by pressure on the external opening; but the plan could not be endured, and the hindrance to the egress of the intestinal matter was so oppressive, that it was discontinued. As the forceps used on the foregoing occasion did not take sufficient hold of the septum, nor divide it properly, the instrument was somewhat altered. A particular description of its improved make has been inserted by Breschet in Graefe's Journal, B. 2, p. 302. Dr. Reisinger has published three cases, in which it was successfully employed by Dupuytren. In the first of these examples, when the instrument had been applied, it embraced the septum so well, that it could not be displaced from it. The colic attacks, vomiting, thirst, furred tongue, and loss of appetite, which ensued, soon gave way after the belly had been fomented; the constriction was then increased, and found to produce less and less indisposition. On the 29th, very little of the feces came out of the artificial anus, and, after a short time, five natural evacuations took place. The blades of the instrument were now completely closed, and, on taking it out, a slough of membrane was found between the blades; a proof, that the septum was destroyed. On the 30th, the patient's health was undisturbed. Clysters were now administered, with the view of promoting evacuations in the natural manner; and, the next day, the patient had a proper motion, without any assistance, and a very small quantity of the feces passed out of the fistulous opening. This aperture was now merely covered with charpie; but, as some high granulations were rising, the powder of colophonium was sprinkled upon them, and compresses and a bandage were applied. The use of clysters was also daily continued, though the patient voided his feces in the natural way. On discontinuing the external pressure, the quantity of discharge from the fistulous opening increased; and, therefore, on the 1st of October, the compresses were again applied, and kept on the part with a spring truss. The treatment ended in a perfect cure.

In another case, Dupuytren enlarged the lower angle of the outer opening with a bistoury, and, after feeling with his finger, that both orifices of the bowel were close to that opening, he applied the forceps. In the evening, the constriction was increased, which was followed by severe colic pains over the whole abdomen. They subsided, however, the following day. From the outer opening, a great deal of slimy excrement was discharged. The constriction was not augmented. On the 5th day, the patient was attacked in the night, with pain and vomiting. The following night he was also very restless. Though the belly was not tense, it could not bear to be touched. On the 11th and 12th days, the patient was nearly free from pain; and, by means of clysters, two natural motions were procured; and, on the 13th, as the patient was easy, Dupuytren began to make pressure on the fistulous opening. On the 26th, the edges of the aperture were touched with lunar caustic; and on the 28th, a compress, supported by a spring truss, was applied. The patient was kept constantly in the horizontal posture; the feces began to be voided the natural way regularly, and the opening contracted in the most favourable manner.

I think the generality of surgeons will agree with Dr. Reisinger, that the foregoing treatment cannot be indiscriminately adopted, in all descriptions of patients, without danger. It should never be tried too soon after the formation of an artificial anus; but, time should be allowed for the irritability, and sensibility of the gut, and especially of the septum, to be lessened by the effect of the air and the pressure of the feces. Nor, should the trial ever be made ere it has been fully ascertained, that nature cannot herself bring about the cure. Breschet mentions an example, in which the foregoing method could not have been practised, in consequence of the mouth of the lower portion of the bowel having been obliterated by the pressure of a large tent, three inches long, which had been worn by the patient two years, and the projecting ridge could not be detected. (See *Graefe's Journ. der Chir. B.* 2, *p.* 298.) Many other interesting observations on this new proposal may be perused in the memoir by Dr. Breschet and in Dr. Reisinger's tract, the title of which is given in the list of works at the end of the present article. In order not to incur the risk of extravasation of the feces in the abdomen, the constriction of the septum should never be increased with imprudent haste, before the adhesive inflammation has had time to be produced between the layers, of which that part is composed

In cases of artificial anus, the appearance of the mucous coat of the bowel undergoes some change, in consequence of exposure to the air and the contact of extraneous bodies; it becomes redder and less villous, but does not cease to secrete a great quantity of mucus: this is one of the principal reasons why it is so difficult to close the fistulous opening, even when the passage for the feces has been restored. The skin, around an artificial anus, is also generally very irritable, and rendered exceedingly painful by the contact of the excrement. (*Breschet in Graefe's Journ. B.* 2, *p.* 303.)

If, after the destruction of the septum, and the re-establishment of a free communication between the two portions of the bowel, the external fistula were not to admit of being healed by pressure and other ordinary means, no doubt could be entertained of the propriety of resorting to the plan of attempting to cure it by paring off the edges and bringing them together with sutures, as sometimes done by Dupuytren, or on the Taliacotian principles, as successfully exemplified by Mr. G. F. Collier. (See *Med. and Physical Journ. for June* 1820.) Dupuytren, for the purpose of making the sides of the fistula remain in contact, or making them approach each other, occasionally applies an ingenious little instrument, consisting of two pads, which, by means of a screw, can be made to embrace the part. An engraving of it may be seen in *Graefe's Journ. B.* 3. *Taf.* 3. *Fig.* 9. For the closure of the fistula, Dupuytren also sometimes has recourse to the actual cautery.

I shall conclude with the relation of an interesting case of artificial anus, complicated with prolapsus, as recorded by my friend Mr. Lawrence.

"If the complaint (a mortified hernia) terminates in the formation of an artificial anus, we must endeavour to alleviate those distressing inconveniences, which arise from the involuntary discharge of wind and feces through the new opening, by supplying the patient with an apparatus, in which these may be received as they pass off. An instrument of this kind, the construction of which appears very perfect, is described by Richter (*Anfangsgr. der Wundarzn. vol.* 5), from the *Traité des Bandages* of Juville. The patient will be best enabled to adapt any contrivance of this sort to the particular circumstances of his own case. It has been found, in some instances, that a common elastic truss, with a compress of lint under the pad, has been more serviceable than any complicated instrument (*Parisian Journal, vol.* 1. *p.* 193,) in preventing the continual flow of feculent matter from the artificial opening." (*Treatise on Hernia, p.* 206.)

"I know," says Mr. Lawrence, "a patient with an artificial anus, in whom the gut often protrudes to the length of eight or ten inches, at the same time bleeding from its surface. This is attended with pain, and compels him to lie down; in which position the intestine recedes. The patient has now discharged all his feces at the groin for fifteen years; and has enjoyed tolerable health and strength during that time. His evacuations are generally fluid; but sometimes of the natural consistence. Whenever he retains his urine, after feeling an inclination to void it, a quantity of clear, inoffensive mucus, like the white of an egg, amounting to about four ounces, is expelled from the anus; and this may occur two or three times in the day." (*P.* 208.)

When the protruded intestine is strangulated, an operation may become necessary for the removal of the stricture. (*Schmucker, Vermischte Chirurgische Schriften, t.* 2.) Two cases, which terminated fatally from this cause, are mentioned by Sabatier, in a memoir in the 5 tom. de l'Acad. de Chir. Mr. Lawrence also refers to Le Blanc, Précis d'Opérations de Chir. tom. 2, p. 445. We should always endeavour to prevent such protrusions, when a disposition to their formation seems to exist, by the use of a steel truss, which should, indeed, be worn by the patient, independently of this circumstance. If the tumor has become irreducible by the hand, an attempt may be made to replace it by keeping up a constant pressure on the part, the patient being at the same time confined to bed. By these means, as we have already noticed, Desault (*Parisian Journal*, *vol.* 1. *p.* 178,) returned a very large prolapsus, and, by pressure on the opening, the feces were made to pass entirely by the anus, although, for four years, they had been voided only through the wound. (*Lawrence*, *p.* 209, 210.)

In cases of mortified hernia, the wound sometimes closes, except a small fistulous opening, which discharges a thin fluid, and cannot be healed. Mr. Lawrence has related, in his excellent treatise on hernia, a case, in which the feces came from the wound some time after an operation, although the bowel did not appear gangrenous when this proceeding was adopted. (*P.* 211.)

In the appendix to this work, the author adds some further account of the case of artificial anus, which he has related. (*P.* 208.) The man is sixty years of age, and appears to be healthy, active, and even younger than he really is. He had had a scrotal hernia, which ended in mortification, and involved the testicle of the same side and a large portion of the integuments, in the destruction. It is now nearly seventeen years since this event, and the feces have, during all this time, been discharged from the groin. He has never made use of a truss, nor taken any step, except that of always keeping a quantity of tow in his breeches.

The prolapsed portion of intestine varies in length and size at different times. It was four inches long when Mr. Lawrence saw it, and the basis, which is the largest part, measured nearly six inches in circumference. The prolapsus never recedes entirely, and it has occasionally protruded to the length of eight or ten inches, being as large as the forearm, and emitting blood. This occurrence is painful, and only comes on when the bowels are out of order. Warm fomentations, and a recumbent position, afford relief, and accomplish a reduction of the bowel.

The projecting part is of a uniform red colour, similar to that of florid and healthy granulations. The surface, although wrinkled and irregular, is smooth, and lubricated by a mucous secretion. It feels firm and fleshy, and can be squeezed and handled, without exciting pain. The man has not the least power of retaining his stools. When these are fluid, they come away repeatedly in the course of the day, and with considerable force. When of a firmer consistence, there is only one stool every one or two days, and the evacuation requires much straining. Such feces are not broader than the little finger. When the patient is purged, the food is often voided very little changed. This is particularly the case with cucumber. In this state, he is always very weak. Ale is sometimes discharged five minutes after taken, being scarcely at all altered. The bowels are strongly affected by slight doses of purgatives.

Consult *Sabatier*, *in Mém. de l'Acad. de Chirurgie*, *t.* 5, 4*to. and in Médecine Opératoire*, *t.* 2. *L'Encyclopédie Méthodique*, *Partie Chirurg. Richter's Anfangsgr. der Wundarzn. B.* 5. *J. R. Tieffenbach*, *Vulnerum in intestinis lethalitas occasione casus rarissimi*, *quo colon vulneratum*, *inversum per* 14 *annos ex abdomine propendens exhibetur*; *Halleri Disp. Chir.* 5. 61. *Parisian Chirurgical Journal*, *v.* 1. *Œuvres Chirurg. de Desault*, *par Bichat*, *t.* 2. *p.* 352, *&c. Schmucker's Chirurgische Schriften*, *vol.* 2. *Lawrence's Treatise on Hernia. Callisen's Systema Chirurgiæ Hodiernæ*, *t.* 2. *p.* 710, *&c. B. Travers*, *Inquiry into the Process of Nature in repairing Injuries of the Intestines*, *chap.* 8, 8*vo. Lond.* 1812. *Scarpa sull' Ernie Memorie Anatomico-Chirurgische*, *fol. Milano*, 1809. *Anzeige einer von dem H. Professor Dupuytren erfundenen*, *und mit dem glücklichsten Erfolge ausgeführten Operationsweise zur Heilung des Anus Artificialis*, *nebst Bemerkungen von Franz Reisinger*; *Augsburg*, 1817. *Breschet*, *in Journ. der Chirurgie von C. F. Graefe und Ph. von Walther*, *B.* 2. *p.* 273, 479. *Berlin*, 1821: *this memoir*, *containing the fullest description of Dupuytren's practice*, *well deserves the careful perusal of every surgeon*, *who wishes to be completely acquainted with the present subject. Hennen's Military Surgery*, *p.* 407. *&c. ed.* 2, 8*vo. Edinb.* 1820. *Three cases from gunshot wounds*; *the cure effected by aiding nature with the exhibition of occasional laxatives and clysters. All irritating plans were avoided. Scarpa represents the artificial ani*, *which follow wounds*, *as far more difficult of cure*, *than those which are the consequence of hernia*, *with mortification*; *yet I have known many of the first description of cases cured.*

AORTA. Aneurisms of this vessel have already been treated of: but there are a few other particulars, relating to it, which merit notice in a dictionary of surgery.

WOUND OF THE AORTA NOT ALWAYS FOLLOWED BY INSTANTANEOUS DEATH.

A case, exemplifying this fact, was recorded by M. Pelletan. In the month of May, 1802, a young man was brought to the Hotel-Dieu. In a duel, he had been run through with a foil, which penetrated above the right nipple, and came out at the left loin. The most alarming symptoms were apprehended; but several days elapsed without any serious complaints taking place. The patient was bled twice, and kept on a very low regimen. Every thing went on quietly for a fortnight. He now complained of severe pains in his loins, and he was relieved by the warm bath. He seemed to be recovering, got up, and went to walk in the garden alloted for the sick; but the pain in his loins quickly returned, attended with difficulty of breathing, constipation, and wakefulness. He now became very impatient, and out of temper with the surgeons for not relieving him.

On the 15th of July, two months after the accident, a deformity of the spine was remarked, about the eighth dorsal vertebra. The patient grew rapidly worse, and died in the utmost agony, saying that he felt suffocated; and tearing off his shirt, that his chest might be free from the pressure of all kinds of clothing.

On the body being opened, the right side of the chest was found full of blood, coagulated in various degrees, and an opening, the diameter of which was equal to that of a writing pen, was detected in the aorta above the crura of the diaphragm. All the adjacent cellular substance was injected with blood, and three of the dorsal vertebræ were found carious. No mark of injury was perceptible in any of the thoracic or abdominal viscera. (*Pelletan Clinique Chirurgicale, t.* 1. *p.* 92—94.)

THICKENING AND CONSTRICTION OF THE AORTA.

Meckel met with two cases, in which the aorta was thickened and considerably constricted, just below its arch; yet, in both subjects, there was every reason to believe, that the abdominal viscera and lower extremities had been duly supplied with blood.

This fluid, which could only pass from the heart with great difficulty, and in small quantities, had, by regurgitating, lacerated the semilunar valves. (*Mem. de l'Acad. Royal'de Berlin,* 1756. *Obs.* 17 *and* 18.) A similar example is recorded by Stoerk. (*Ann. Med.* 11. *p.* 171.) An instance, in which a stricture was met with in the aorta, opposite to the termination of the canalis arteriosus, is described by Sir Astley Cooper. The little finger could hardly pass through the constriction, which impeded the course of the blood through the heart and lungs, and was attended with a considerable dilatation of the right ventricle. (*Surgical Essays, vol.* 1, *p.* 103, 8*vo. Lond.* 1818.)

OBLITERATION OF THE CAVITY OF THE AORTA.

It is observed by Professor Scarpa, that the whole body may be regarded as an anastomosis of vessels, a vascular circle, and he contends, that this remark is so true, that even an obliteration of the aorta itself, immediately below its arch, may take place, without the general circulation of the blood in the body being stopped. Such a disease of the aorta was seen by Paris in the body of a woman. While she lived, the blood, which was expelled from the heart, was transmitted into the trunk of the aorta, below the constriction, and it got there by passing through the subclavian, axillary, and cervical arteries, into the mammary, intercostal, diaphragmatic, and epigastric arteries. From these latter arteries, the blood passed into the vessels of the thoracic and abdominal viscera, and those of the lower extremities. (See *Desault's Journal, t.* 2, *p.* 107. *Brasdor, in Récueil Périodique de la Soc. de Med. t.* 3. *No.* 18.)

Dr. Graham, of Glasgow, published another example, in which the aorta was completely obstructed, just below the canalis arteriosus. The particulars are detailed in the *Med.-Chir. Trans. vol.* 5, *p.* 287.

Dr. Goodison, of Wicklow, in examining the dead body of a woman, in the Hospice de la Pitié at Paris, and endeavouring to trace the origin of the inferior mesenteric artery, discovered a hard tumor, placed upon the aorta, and accompanied with an obliteration of that vessel from the origin of the inferior mesenteric artery downwards the remainder of its length; the left iliac being also rendered impervious down to its bifurcation, and the right for more than one half of its length. The corpora sesamoidea of the semilunar valves of the aorta were considerably enlarged, and the mitral and tricuspid valves presented the appearances termed by Corvisart "vegetations." The arch of the aorta was greatly enlarged, and internally was studded with patches of bone. The vessels given off from the trunk, and especially the lumbar arteries, were all noticed to be considerably increased in size. At the obliterated part of the abdominal aorta, there was a firm bony sheath, covering the vessel for about two inches, and filled with a hard fleshy substance, which extended further upwards, and was firmly adherent to the coat of the artery. It was the inner coat itself which was ossified. For a particular account of the vessels, which were chiefly enlarged for the purpose of continuing the circulation, I must refer to Dr. Goodison's description. The general appearance of the body was not unhealthy; and the lower extremities, which were not emaciated, must have been well supplied with blood. The history of the case could not be traced. Mr. Crampton having carefully compared Dr. Goodison's narrative with the preparation taken from this subject, refers the obliteration of the aorta to the effects of the process, by which an aneurism had been spontaneously cured; in which particular, this case is quite different from those reported by M. Paris and Dr. Graham. (See *Dublin Hospital Reports, vol.* 2, *p.* 193, *&c.* 8*vo.* 1818.)

The next case, which I shall notice, is one of the most memorable in the annals of surgery, since it was nothing less than an operation, in which a ligature was applied to the aorta of a living subject, under circumstances which, as far as my judgment extends, warranted even this desperate attempt to preserve life. Sir Astley Cooper had often placed ligatures round the aorta in dogs, and found that the blood was readily carried by the anastomoses to their posterior extremities. (See *Med. Chir. Trans. vol.* 2, *p.* 158.) This gentleman has ascertained, that if the aortic plexus be tied with the artery, the lower extremities are rendered paralytic, and the animal ultimately dies; but, if care be taken to include only the vessel in the ligature, these consequences do not take place. (See *Lancet, Vol.* 2, *p.* 47.)

A porter, aged thirty-eight, was admitted into Guy's Hospital April 9, 1817, for an aneurism in the left groin, situated partly above, and partly below, Poupart's ligament. The swelling was considerably diffused, and pressure upon it gave a great deal of pain. On the third day from his entrance into the hospital, the tumor increased to double its former size, and the pulsation became less distinct. The blood could be felt in a fluid state within the sac, which was so large that no operation was practicable, without opening the peritoneum. Sir Astley Cooper therefore waited, in order to let the man have the chance of a spontaneous cure. Notwithstanding the practice of venesection and compression, the swelling continued to increase, and, on the 20th of June, a bleeding took place from a point of the tumor, where a slough had formed. The bleeding recurred from time to time, and on the 25th he was so much exhausted by loss of blood that his feces passed involuntarily, and his immediate death was only prevented by pressure on the opening. At nine o'clock in the evening, this experienced surgeon made a small incision into the sac above Poupart's ligament, and introducing his finger, tried if it were practicable to pass a ligature round the external iliac artery, within the cavity: but the thing was found impossible, as, instead of the vessel, "only a chaos of broken coagula" could be perceived. At the moment of withdrawing the finger, two students compressed the aorta against the spine, and the incision was then closed with a dossil of lint. Sir A. Cooper now determined to apply a ligature to the aorta itself. "I made (says he) an incision, three inches long, into the linea alba, giving it a slight curve, to avoid the umbilicus. One inch and a half was above, and the remainder below, the navel," the cut being inclined towards the left side. "Having divided the linea alba, I made a small aperture into the peritoneum, and introduced my finger into the abdomen; and then, with a probe-pointed bistoury, enlarged the opening into the peritoneum to nearly the same extent as that of the external wound. Neither the omentum nor the intestines protruded; and, during the progress of the operation, only one small convolution projected beyond the wound." With his finger-nail he scratched through the peritoneum, on the left side of the aorta, and then gently moving his finger from side to side, he gradually passed it between the aorta and spine, and again penetrated the peritoneum on the right side of the aorta. A blunt aneurismal-needle, armed with a single ligature, was next conveyed under that vessel, and tied, with the precaution of excluding the intestines from the noose. The wound was then closed, by means of the quilled suture and adhesive plaster. During the operation, the feces were discharged involuntarily, and the pulse both immediately, and for an hour after the operation, was 144. An opiate was given, and the involuntary passage of feces soon ceased. The sensibility of the right leg was very imperfect. In the night, the patient complained of heat in the abdomen; but he felt no pain upon pressure; and the lower extremities, which had been cold a little while after the operation, were regaining their heat, but their sensibility was very indistinct. At six o'clock the following morning, the sensibility of the limbs was still imperfect; but at eight o'clock the right one was warmer than the left, and its sensibility returning. At noon, the temperature of the right limb was ninety-four; that of the left, or aneurismal one, eighty-seven and a half. At three o'clock, an enema was ordered. The heat of the right leg was now ninety-six; that of the left, or diseased limb, eighty-seven and a half. It is unnecessary, here, to detail all the various circumstances which preceded the patient's death. Vomiting, pain in the abdomen and loins, involuntary discharge of urine and feces; a weak pulse, cold sweats, &c. were some of the most remarkable symptoms. At eight o'clock on the second morning after the operation, the aneurismal limb appeared livid and cold, more particularly round the aneurism; but the right leg was warm; and between one and two o'clock, the same day, the patient died. On opening the abdomen, there was not the least appearance of peritoneal inflammation, except at the edges of the wound; and the omentum and intestines were of their natural colour. The ligature, which included no portion of intestine or omentum, was placed round the aorta, about three quarters of an inch above its bifurcation. When the vessel was opened, a clot, of more than an inch in extent, filled it above the ligature; and below the bifurcation, another clot, an inch in extent, occupied the right iliac artery, while the left contained a third, which extended as far as the aneurism. The neck of the thigh-bone was also found broken within the capsular ligament, and not united; an accidental complication. As there were no appearances of inflammation of the viscera, Sir Astley Cooper refers the cause of the man's death to the want of circulation in the aneurismal limb, which never recovered its natural heat, nor any degree of sensibility, though the right leg was not prevented from doing so: hence, says this experienced surgeon, "in an aneurism similarly situated, the ligature must be applied before the swelling has acquired any very considerable magnitude." (*Surgical Essays, vol.* 1, *p.* 114, *&c.*)

Indeed, the most important conclusions from this case are—First, that, where no other impediments exist, the circulation will continue in the lower extremities, though the abdominal aorta be tied, or suddenly obstructed. Secondly, that suffering aneurismal swellings to become very large, before the operation is done, exposes the patient to considerable disadvantage, on account of the pressure of the disease upon the surrounding anastomoses, whereby the continuance of the circulation is rendered less certain, than it would be, were the operation done at an earlier period.

Sir Astley Cooper mentions in his lectures, that if he were to perform the operation again, he would cut off the two portions of the ligature close to the knot on the vessel. (See *Lancet, vol.* 2, *p.* 47.) He would adopt this method, because the irritation of the bowels by the ligature seems to him a source of considerable danger.

RUPTURE OF THE AORTA WITHIN THE PERICARDIUM.

The surgical writings of Scarpa, in relation to the formation of aneurisms, have now gained extensive celebrity in the world. It is well known, that this author maintains the doctrine, that, in all aneurisms, the internal and muscular coats of the artery are ruptured, and that the aneurismal sac is not formed of these tunics, but of the dilated cellular sheath, which surrounds the vessel. When a large aneurism bursts, there is always a double rupture; one of the artery, another of the aneurismal sac. The last is that, which is the immediate cause of the patient's destruction, by altering the *circumscribed* state of the aneurism into the *diffused.*

There are some exceptions, however, to the foregoing statement, and Scarpa has not failed to point them out. When the internal and muscular coats of the aorta are ruptured in a situation, where the outside of the vessel is only covered by a thin, tense, closely adherent membrane, such membrane may be ruptured at the same time with the proper coats of the artery, and sudden death be occasioned by the effusion of blood in the cavity of the thorax. These events are liable to happen, whenever the proper coats of the aorta are ruptured, within the pericardium, where the vessel is only covered by a thin layer reflected from this membranous bag. Walter has recorded one example of this kind, and Morgagni several others. A similar case is related by Scarpa. (See *Haller Disput. Chir. Tom.* 5. *Acta Medic. Berlin. Vol.* 8, *p.* 86. *Morgagni de Sed. et Causis Morb. Epist.* 26, *art.* 7. 17. 21. *Epist.* 27, *art.* 28. *Scarpa on Aneurism, transl. by Wishart, p.* 81. *Also Hodgson on the Diseases of Arteries and Veins.*)

STEATOMATOUS TUMORS OF THE AORTA.

Two steatomatous tumors were noticed by Stenzel in the body of a male subject. They were situated in the substance of the membranes of the aorta, immediately below its arch. Notwithstanding these swellings rendered the vessel almost impervious, the man had the appearance of strength, and of having being well nourished. *Hæc corpora fere cor magnitudine æquabant ut omnem propemodum exeunti e sinistri cordis thalamo sanguini spatium præcluderent.* De Steatomatibus in principio arteriæ aortæ, &c. Wittemb. 1723.

This is another striking fact, illustrating the great power of the inosculations to carry on the circulation.

APHÆRESIS, (from αφαιρειν, to remove.) This term was formerly used in the schools of surgery, to signify that part of the art, which consists in taking off any diseased, or preternatural portion of the body.

APONEUROSIS. Matter often collects under aponeuroses, particularly, under those which cover the muscles of the thigh, leg, and forearm. Abscesses are also sometimes met with under the temporal, the palmar, and the plantar fasciæ; in the tendinous thecæ, which include the flexor tendons of the fingers; and, occasionally, also, in the aponeurotic sheath, in which the rectus abdominis muscle is situated.

One particular effect of an aponeurosis, or any kind of tendinous expansion, lying between a collection of matter and the skin, is materially to retard the progress of the pus towards the surface of the body. Hence, if the case be allowed to take its own course, the quantity of matter increases, the pus spreads extensively under the aponeurosis in every possible direction, separates the muscles from such fascia, and the muscles from each other, and the abscess does not burst till a vast deal of mischief has been produced, together with more or less sloughing of the fascia, tendons, &c. These circumstances cannot happen, without a considerable degree of constitutional disturbance, and a permanent loss of the use of certain muscles. Even when a spontaneous opening is formed, and some of the matter escapes, it is often only a very imperfect discharge; for, the aperture generally occurs, not in a depending situation, nor over the main collection of pus, but, at a part, where the aponeurosis is thinnest, and consequently, where the matter has the least resistance to overcome in getting to the surface of the body.

In all such cases, the chief indication is to make an early and a depending opening with a lancet, so as to prevent the extension of the abscess, and to let the matter escape as fast as it is formed. If a spontaneous opening should have occurred in an unfavourable place, a new aperture must be made in a proper situation; or if the former should be sufficiently depending and near the principal accumulation of matter, but too small, it must be rendered larger with a curved bistoury and a director. Whenever any black dead pieces of fascia, or tendons, present themselves at the opening, they must be taken hold of with a pair of forceps, and extracted.

APPARATUS. This implies the preparation, and arrangement of every thing necessary in the performance of an operation, or in the application of dressings. The apparatus varies according to circumstances. Instruments, machines, bandages, tapes, compresses, pledgets, dossils of lint, tents, sponges, basins of water, towels, &c. &c. are parts of the apparatus, as well as any medicinal substances used.

It is a rule in surgery, to have the apparatus ready before an operation is begun. All preparations of this kind should be made, if possible, out of the patient's room and presence, as they might agitate and render him timid.

We have been lately censured by a French surgeon, for our too common neglect of what has been here recommended. "In France (observes M. Roux) we are careful not to let a patient, who is to undergo a serious operation, see any of the requisite preparations for it. We hasten as much as possible the immediate preparatory measures, in order not to prolong unnecessarily the restlessness and moral agitation, which the expectation of an operation, and sometimes of the slightest one, always produces. These precautions are neglected by the English surgeons, at least, by most of those, whom I saw operate. They even neglect them in private practice, where, more commonly than in hospitals, we have to deal with pusillanimous individuals, who are easily alarmed, and whose extreme susceptibility it is of importance to spare. It was in the very room, where the patient lay, of course under his eyes, that the table, and all the necessary instruments for lithotomy, were arranged, at an operation, which I saw done in London, during my stay in that capital, by a gentleman at the head of his profession." (See *Parallèle de la Chirurgie Angloise avec la Chirurgie Françoise, p.* 105.)

M. Roux, in his visit to London, had also too good reason to complain of the slovenly objectionable practice of leaving the application of the tourniquet, and the dressing of the wound after a surgical operation, to mere novices and students. I entirely coincide with him, that, in respect to the dressings in particular, a surgeon is bound to extend his attention and solicitude a little beyond the moment, when the operation terminates.

APPARATUS MINOR; APPARATUS MAJOR; APPARATUS ALTUS. Three ways of cutting for the stone. (See *Lithotomy.*)

AQUA PICIS LIQUIDÆ. *Dubl.* Take of tar two pints; water a gallon. Mix them with a wooden rod for a quarter of an hour, and after the tar has subsided, let the liquor be strained, and kept in well corked bottles. This lotion is often used in cases of porrigo. Ulcers on the legs, are sometimes extensively surrounded with a scorbutic redness, and pimples. In such instances, the aqua picis, used as an application round the limb, over the dressings, is of great service. (See *Liquor.*)

ARGENTI NITRAS. (*Nitrate of silver, lunar caustic.*) One of the best caustics. Its utility for stimulating indolent ulcers, and keeping granulations from rising too high, is well known to every surgeon.

Mr. Hunter sanctions the use of the argentum nitratum, on the first appearance of a chancre, before absorption can be supposed to have taken place. He directs the caustic to be scraped to a point, like a blacklead pencil; so that, when it is applied, every part of the surface of the chancre may be touched with it; and he advises the repetition of this process, till the last slough, which is thrown off, leaves the sore florid and healthy.

This treatment, when the sore is very small, may sometimes be advisable, as a means of lessening the chance of the constitution being infected by absorption. In general, surgeons combine with the plan the moderate use of mercury.

The important use of the argentum nitratum, in the cure of numerous diseases, we shall have occasion to remark in various articles of this work; particularly *Cornea, ulcers of; Iris, prolapsus of; Ulcers; Urethra, strictures of, &c.*

The argentum nitratum is often used in the form of a solution, in the proportion of a dram of the caustic to an ounce of distilled water. In general, this application ought to be at first more or less diluted with distilled water. Cancerous ulcers, and sores about the nose and neighbouring parts of the face, being examples of *lupus*, or *noli me tangere*, are often considerably benefited by the argentum nitratum, both in the solid and fluid state. The solution agrees also very well with certain sores, which occur round the roots of the nails of the fingers and toes. The lotion is sometimes applied with a camel-hair pencil; but in general, by dipping little soft bits of lint in the fluid, laying them on the part, and covering them with a pledget.

ARSENIC is the chief ingredient in a secret remedy, which has long possessed very great celebrity in Ireland for the cure of cancer, and is now well known amongst surgeons, by the name of Plunket's caustic. This application consists of the ranunculus acris, the greater crowfoot, the flammula vulgaris, and the lesser crowfoot, in the proportion of an ounce of each, bruised and mixed with a drachm of the white oxide of arsenic, and five scruples of sulphur. The whole is to be beaten into a paste, formed into balls, and dried in the sun. When required for use, these balls are beaten up with yolk of egg, and spread upon a piece of pig's bladder. The use of the ranunculus is to destroy the cuticle, upon which the arsenic would have no effect; for it is to be observed, that Plunket's caustic was employed for the dispersion of tumors, as well as for the relief of ulcerated cancers. The application is to remain on the part twenty-four hours, at the end of which time, the slough is to be dressed with any simple, unirritating ointment. When arsenic was first recommended as an application for cancers, it used generally to be blended with opium. When Plunket's caustic is employed, so as to form an eschar over a scirrhous tumor, I conjecture, that if it ever do good, it is not by any specific effect of this arsenical application, but simply as a slough, or issue, formed near the disease in any other manner. It is highly probable, also, that the swellings, which have been thus dispersed, have never been complicated with the structure characteristic of true scirrhi. With respect to cancerous ulcers, Plunket's caustic sometimes evidently produces a degree of amendment, which, however, rarely lasts for any considerable time; but, there are many inveterate ulcerations, and anomalous sores, which derive permanent benefit from the application, and are even completely cured by it. Some examples of lupus, ulcerations about the roots of the nails, and reputed carcinomatous sores of the lips, are of this description.

At Paris, an arsenical paste is often used by Dubois, and other surgeons of that capital, for cancerous sores of the penis, and other malignant ulcers. It is composed of 70 parts of cinnabar, 22 of sanguis draconis, and 8 of the white oxide of arsenic, formed into paste with saliva at the time when it is to be employed. "The pain and inflammation, that succeed the use of it (says Mr. Cross,) cannot be equalled by the severest operation with the knife." (*Sketches of the Medical Schools of Paris, p.* 45, *8vo.* 1815.) Even death may be occasioned by the absorption of the poison, as appears from the two annexed facts, the first of which is recorded by M. Roux, in his Médecine Opératoire. "The day after the paste was applied, the patient complained of colic and severe vomiting, and in two days perished in convulsions, *et les plus vives angoisses.* The body went quickly into putrefaction. The internal coat of the stomach and a great part of the intestinal canal, were inflamed, and marked here and there with dark spots. Just before I visited Paris, (adds Mr. Cross,) I dissected in London a woman, who died under similar circumstances, and where the same morbid appearances were presented, &c. (*Op. cit.*)

Justamond's applications to cancer were generally combinations of arsenic and sulphur. One formula was an ounce of yellow arsenic, with half that quantity of armenian bole, and sometimes as much red precipitate. He also employed a sulphuret of arsenic, and a combination of this sulphuret with crude antimony. The arsenical preparation, selected for use, was scraped, and laid on the middle of the sore, the edges of which were moistened with a combination of the muriate of iron and muriate of ammonia. In some instances, we learn, that the effects of the treatment were the correction of the fetid smell, melioration of the appearance of the sore, and separation of the cancerous part.

In the Pharmacopœia Chirurgica, Justamond's arsenical caustic is directed to be made in the following manner. ℞ Antimonii pulverizati ℥j. Arsenici pulverizati ℥ij. These are to be melted together in a crucible. The application may be reduced to any degree of mildness by blending with this pulverized caustic a quantity of opium in the form of powder, which was also supposed to act specifically in diminishing pain.

The powder of white oxide of arsenic, unmixed with other substances, has sometimes been sprinkled upon cancerous and other inveterate ulcers; but, the practice is now abandoned by every judicious surgeon, on account of the violent pain resulting from it, and the not unfrequently fatal consequences of its absorption. Could I suppose that a man, so rash and ignorant as to revive this murderous practice, yet existed in the profession, I should feel disposed to lengthen these remarks; but I am persuaded, that, in this country, at least, more judgment and knowledge everywhere prevail. The white oxide of arsenic, however, may be applied with more prudence in other forms; either in one of those already specified; or, as a lotion, composed of eight grains of the oxide, and the same quantity of subcarbonate of potash, dissolved in four ounces of distilled water; or, as an ointment, formed by rubbing together one drachm of the oxide, and twelve drachms of spermaceti ointment. (See *A. T. Thomson's Dispensatory, p.* 51.)

Febure's celebrated remedy consisted of ten grains of the white oxide of arsenic, dissolved in a pint of distilled water, to which were then added an ounce of the extractum conii, three ounces of the liquor plumbi subacetatis, and a drachm of laudanum. With this fluid, the cancer was washed every morning. Febure likewise gave arsenic internally; and his prescription was two grains of the white oxide, a pint of distilled water, syrup of chichory q. s. and half an ounce of rhubarb. Of this mixture, a table spoonful was given every night and morning, with half a drachm of the syrup of poppies. Each dose contained about one twelfth of a grain of arsenic; but, in proportion as the patient was able to bear an increased quantity, the dose was gradually augmented to six table spoonfuls of the solution.

The arseniate, or rather superarseniate, of potash, is an excellent preparation for internal exhibition. The Dublin Pharmacopœia directs it to be made, as follows; take of white oxide of arsenic, nitrate of potassa, each an ounce. Reduce them separately to powder; then, having mixed them, put them into a glass retort, and place it in a sand-bath, exposed to a gradually raised heat, until the bottom of the retort becomes obscurely red. The vapours, arising from the retort, should be transmitted through distilled water, by means of a proper apparatus, in order that the nitrous acid, extricated by the heat, may be disengaged. Dissolve the residue in four pounds of boiling distilled water, and after due evaporation, set it apart, in order that crystals may form. This preparation has long been known under the name of Macquer's arsenical neutral salt. It may be given in the following way: ℞ Potassæ Superarseniatis gr. ij. Aq. Menthæ Viridis. ℥iv. Spir. Vinosi tenuioris ℥j. M. et cola.

Dosis drachmæ duæ ter quotidie.

The kali arsenicatum, or, as it ought to be called, the superarseniate of potash, may also be given in the form of the pills, made up with crumb of bread, each of which may contain from one sixteenth to one eighth of a grain of the arsenical salt.

The following is Dr. Fowler's method of preparing arsenic for internal use: take of the white oxide of arsenic, and pure subcarbonate of potash, each sixty-four grains. Boil them gently in a Florentine flask, or other glass vessel, with half a pound of distilled water, until the arsenic is dissolved. To this solution, when cold, add half an ounce of the compound spirit of lavender, and as much water as will make the whole equal to a pint, or fifteen ounces and a half in weight. The dose of this solution, of which the liquor arsenicalis L. P. is a near imitation, is as follows: from two years old to four M. ij or iij to v; from five to seven M. v. to vij; from eight to twelve M. vij to x; from thirteen to eighteen M. x to xii; from eighteen upwards M. xii. These doses may be repeated every eight, or twelve hours, the medicine being diluted with thick gruel, or barley water. As the preparation is decomposed by the infusion and decoction of cinchona, it should never be ordered with either of these medicines.

The white oxide of arsenic may be given in the form of pills, made by mixing one grain of it with ten of sugar, and then beating up the mixture with a sufficient quantity of the crumb of bread to form ten pills, one of which is a dose. It will only be in my power to specify here a few of the numerous surgical cases, in which the internal employment of arsenic has been proposed. The following are particularly worthy of attention; tetanic affections; cancer; lupus; elephantiasis; inert cases of lepra; (See *Bateman's Pract. Synopsis of Cutaneous Diseases, p.* 33, *Ed.* 3.); various unnamed malignant ulcers; certain forms, or sequelæ of the venereal disease, or other unintelligible diseases, which cannot be subdued by mercury; different cutaneous affections &c. A longer list of diseases, for which a trial of arsenic is suggested, may be seen in some papers published by Mr. Hill. (*Edinb. Med. and Surg. Journ. Vol.* 5, 6.)

Arsenic has also been recommended by Dr. J. Hunter, for the prevention of hydrophobia. (See *Trans. of a Society for the Improvement of Med. and Chir. Knowledge, Vol.* 1.) Later trials of the medicine, however, in this particular case, do not appear to entitle it to any confidence. Dr. Marcet found it quite unavailing, though not less than three drops of Fowler's solution were taken every other hour, in two drachms of peppermint, or sweetened water. (See *Med. Chir. Trans. Vol.* 1, *p.* 141, 156.) After the symptoms of hydrophobia have once begun, arsenic is decidedly useless.

But, although it fails in hydrophobia, some facts published by Mr. Ireland, and certain observations and experiments, detailed in Dr. Russel's work on Indian Serpents, make it appear a truly valuable remedy for the effects of the bites of serpents. (See *Med. Chir. Trans. Vol.* 2, *p.* 393.)

In cases of poison by arsenic, practitioners universally agree respecting the first indication, which is to empty the stomach as quickly as possible; but, some difference of opinion prevails with regard to the best means of effecting this important purpose. In this country, the common practice is to exhibit an emetic of sulphate of zinc, or sulphate of copper, which (it is said) ought to be preferred, first, because they do not require much dilution for their action, a circumstance of no small importance where poisons act by being absorbed; and, secondly, because they are extremely expeditious, a dose of fifteen, or twenty grains producing almost instantaneous vomiting, without exciting that previous stage of nausea, which so frequently characterizes other emetics, and which produces a state of the vascular system highly favourable to the function of absorption.

(See *Pharmacologia by Dr. Paris, p.* 232. *Vol.* 1. *Ed.* 5.)

On the other hand, instead of the use of violent emetics, like antimon. tart. and sulphate of zinc, which, Orfila says, always increase the irritation created by the poison, he prefers exciting vomiting by making the patient drink large quantities of warm water, milk, water containing sugar or honey, linseed tea, and other mucilaginous fluids, the experiment of tickling the throat with a feather, or finger not being omitted. After as much of the poison has been discharged by vomiting, as can be thus evacuated, the stomach may be mechanically washed out with a long elastic gum catheter and syringe, a plan first proposed by Boerhaave, and afterwards improved by MM. Dupuytren and Renault. (See *Orfila, Toxicologie Generale T.* 1, *p.* 132. *Ed.* 2, 1818. *See also Mr. Jukes's Obs. on this subject in Med. and Phys. Journ. for Nov.* 1822 *and June* 1823; *also Lancet, Vol.* 1.) But, if Mr. Reed's syringe invented for this purpose were at hand, it is by far the best contrivance, and serves to empty the stomach, when this organ cannot be made to discharge its contents by any kind of emetics. By such means, the contents of the stomach may either be pumped out at once, or any fluid may be first injected, and then drawn out again. As arsenic produces its fatal effects chiefly by being absorbed, an important indication, according to this principle, is to administer only such liquids as are least liable to dissolve the arsenic in the stomach. On this account lime-water has been recommended as proper to be drunk after the stomach has been emptied by vomiting. It is remarked by Orfila, that lime-water with milk offers no particular advantage in cases of poison with the solid arsenical acid; but, where this acid is fluid, he admits the great utility of lime-water, as, in this circumstance, an insoluble arsenite of lime is formed, the action of which is very weak. This last observation is confirmed by experiments on dogs. (*Toxicologie Generale, T.* 1, *p.* 233, *Ed.* 2.)

When inflammation of the abdomen, and alarming nervous symptoms prevail, the means of relief are leeches, venesection, the warm-bath, fomentations, emollient clysters, and antispasmodic narcotic medicines.

It should also never be forgotten, that the success of the treatment will depend, in a great measure, upon the regimen observed during the patient's convalescence, which is usually tedious, and he should be chiefly nourished with milk, gruel, cream, rice, and beverages of a softening mucilaginous nature. (See *Orfila, T. cit. p.* 235.)

ARTERIOTOMY, (from *αρτηρια*, an artery, and *τεμνω*, to cut.) The operation of opening an artery, for the purpose of taking away blood for the relief of diseases. (See *Bleeding.*)

ARTERIES. The process, by which a divided, or punctured artery is healed, is particularly considered under the word, *Hemorrhage*; while the general principles, which ought to be observed in the application of the means for the stoppage of bleeding, may be collected partly from the remarks, contained in that part of the work, and partly from what is stated in the articles, *Amputation; Aneurism;* and *Ligature.* As the condition of a bleeding patient admits of no delay, and the preservation of his life entirely depends upon proper measures being immediately taken, no man ought to be suffered to profess surgery, who is not competent to the treatment of wounded arteries, whether injured by accident, or in a surgical operation. As Langenbeck observes, an ignorant practitioner, when called to a case of serious hemorrhage, is thrown into such consternation, as actually deprives him of the power of rendering prompt assistance. Pale as a corpse, and trembling, he beholds the jet of blood; and for the sake of appearing to do something, perhaps, he applies spirit of wine, or a very tight bandage, and cries out for further aid; while simple pressure with the thumb upon a certain point in the vicinity of the injury, would prevent all this confusion, and a dangerous loss of blood. No part of surgery, in fact, is of higher importance, than the treatment of wounded arteries, and it deserves, therefore, to be earnestly studied by every practitioner, whether he move in the higher, or the lower, sphere of the profession. And, as a proof of the necessity of country surgeons making themselves acquainted with the subject, he recites the case of a turf-cutter, who let the instrument with which he worked fall against the lower part of his leg, whereby the posterior tibial artery was wounded. The blood gushed out profusely, and the surgeon who was sent for, applied a tourniquet to the popliteal artery, and thus stopped the bleeding for a time; but, unfortunately, the tourniquet was kept so long on the limb, that the foot mortified, and sloughed away. (*Bibl, für die Chir. B.* 1. *p.* 231, 232, *Gott.* 1806.) From the explanations, delivered in the article *Hemorrhage*, it will be seen, that, in all bleedings from considerable arteries, nothing is equal to the ligature, as a means for preventing the further loss of blood; and it may be laid down as a standing rule; that each extremity of the wounded vessel should be tied as near as possible to the wound in its coats. As Mr. Hodgson has remarked, "the necessity of tying both ends of a wounded artery is evident from the fact, that the anastomoses in all parts of the body, are so extensive, as to furnish a supply of blood, which may pass through the lower extremity of the wounded vessel in a sufficient stream to produce an alarming, and, in some instances, a fatal hemorrhage." (*On Diseases of Arteries, &c. p.* 469.) This correct observation is followed by a case, in which the bleeding from the lower end of a divided brachial artery caused the patient's death. Of course, the inference is, that both extremities of the vessel ought to have been tied directly after the receipt of the wound. With regard to tying the trunk of an artery in a part of the limb, where it can be exposed with facility, when it is difficult to secure its bleeding extremities, as Mr. Hodgson remarks, the practice "was falsely deduced from a knowledge of the fact, that the ligature of an artery at a distance from the disease will effect the cure of an aneurism. But, a more intimate acquaintance with the condition of a limb after such an operation, and the processes, by which the cure of an aneurism is effected after the modern operation, afford a complete illustration of the inefficacy and danger of this mode of treating a wounded artery; for it is now fully proved, that, when an artery is tied, a stream of blood continues to pass through it below the ligature. (*P.* 471.) This well informed surgeon is aware, however, that instances do occur, in which only the upper end of a wounded artery is tied, and yet the patient recovers without hemorrhage from the lower orifice, which is closed by the natural processes.

In the year 1814, in Holland, I took up the femoral artery, in the middle of the thigh, in a case, in which the popliteal artery had given way, ten days after the passage of a musket ball through the ham. I employed only one smallish ligature, which was applied with the precaution of not detaching the artery from its natural connexions. The hemorrhage was effectually stopped, and the wound healed in the most favourable manner. Here, no doubt, the inflammation in the ham had obliterated the portion of the artery immediately below the point, at which it had sloughed, or ulcerated, and, there might even have been from the same cause some deposition of lymph within the upper portion of the popliteal artery, contributing to the success of the operation. But, no doubt, it was the diminution of the impulse of the circulation by the ligature of the femoral artery, which enabled nature to complete the obliteration of the wounded part of the vessel. Sometimes, says Mr. Hodgson, when hemorrhage takes place, a few days after the bleeding from a wounded artery has been stopped by compression, one extremity of the vessel will be pervious, whilst the other will have closed by the natural processes. Cases have even occurred, in which the upper end of the artery has been closed by the natural processes, whilst those processes failed in effecting the obliteration of the lower extremity of the vessel, from which a serious hemorrhage took place. (*Hodgson Op. cit.* 475, *and Guthrie in New Med. and Phys. Journ. Vol.* 4, *p.* 177.) Indeed, in the example, in which I took up the femoral artery myself, it was impossible to say positively, whether the blood came from the part of the popliteal artery above, or below the slough in it, as no incision was made into the ham.

The principle, respecting the application of a ligature to each end of every large divided artery, is to be extended also to punctured arteries, one ligature being placed above, and the other below, the opening in the vessel.

From some observations in the article *Aneurism, p.* 151, it will be seen, that, when the impulse of the circulation has been lessened by the ligature of the main trunk of an artery, some distance above the wound, the hemorrhage from the more remote portion of the vessel, may sometimes be effectually restrained by pressure, which, previously to the stoppage of one great current of blood to the part, had proved unavailing. This fact is worth remembering in cases, in which the arteries of the hand, or foot, are wounded.

Mortification is observed to be more frequent after the ligature of an artery for a wound, than for an aneurism. In wounds, Mr. Hodgson very correctly, I think, refers the difference to the frequent injury of the surrounding parts, and particularly of the veins and nerves, and to the loss of blood, and want of quietude, and proper care after the accident. The principal anastomosing vessels are also sometimes divided. (*P.* 479.)

Having given in the article *Aneurism,* the necessary directions, how to cut down to and tie many of the principal arteries, I shall conclude the present subject with a few instructions how to take up the arteries of the forearm and leg, as delivered by Scarpa, Mr. C. Bell, Mr. Hodgson, and others. Some directions how to act in a case of wounded axillary artery are likewise subjoined.

In order to lay bare the radial artery at the upper third of the forearm, a finger is to be put on the insertion of the tendon of the biceps. A little below this insertion, an incision, about two inches and a half in length, is to be made in the integuments, in the oblique direction, denoted by the inner edge of the supinator radii longus. The subjacent fascia is then to be divided, and the inner edge of the supinator muscle drawn a little from the outer side of the arm: in the space, between that muscle and the flexor carpi radialis, the radial artery immediately presents itself, passing over the tendon of the pronator radii teres, and the flexor longus pollicis, and it then runs down between the latter named tendon and the flexor carpi radialis. (See *Camper's Demons. Anat. Pathol. Lib.* 1, *Tab.* 1, *fig.* 2.) A branch of the musculo-spiral nerve lies on the radial side of the artery.

At the wrist, the radial artery may be taken up by making an incision a little way from the ulnar margin of the flexor carpi radialis. Here the artery is covered by a fascia, over which a small branch of the external cutaneous nerve runs; but the vessel is now unaccompanied with the musculo-spiral nerve, which quits it, and passes under the supinator radii longus, a little below the middle of the forearm.

After the radial artery leaves the fore part of the wrist, it may be taken up by making an incision "on the outside of the insertion of the extensor primi internodii pollicis, and the inside of the extensor tertii internodii pollicis. Betwixt these tendons, the artery lies very deep, and over it is the extreme branch of the muscular spiral nerve. We find the artery going close to the notch, betwixt the os scaphoides and trapezium." (*C. Bell, Op. Surgery, V.* 2, *p.* 373.)

For bringing into view the ulnar artery at the upper third of the forearm, the situation and breadth of the flexor carpi ulnaris muscle must first be ascertained. An incision is then to be made from above downwards, beginning two inches below the inner condyle of the humerus, and following the course of the inner margin of the above muscle to the extent of two inches and a half. The fascia is then to be divided: the flexor carpi ulnaris is to be drawn a little away from the flexor sublimis. In this opening, rather under the margin of the latter muscle, the ulnar artery will be felt with the finger, continuing its course over the flexor profundus. The ulnar nerve is situated on the ulnar side of the artery.

Below the middle of the forearm, the ulnar artery is more superficial, and may easily be taken up my making an incision upon the radial side of the flexor carpi ulnaris, between the tendon of which muscle, and that of the flexor profundus digitorum, the vessel is situated. The artery, however, will not be reached until a thin aponeurosis under the fascia of the forearm has been divided. The nerve is rather more under the tendon of the flexor carpi ulnaris, than the artery. When the ulnar artery arises from the brachial above the elbow, it runs above the fascia, and is easily taken up in any part of its course.

The anterior tibial artery passes forward between the bones of the leg, about an inch below the upper head of the fibula. In order to take up the vessel in this situation, a free cut must be made through the fascia, extended between the heads of the tibia and fibula. The incision is then to be continued more deeply at the edge of the peronæus longus, following the fascia between this muscle and the origin of the extensor digitorum communis. The artery will be met with on the interosseous ligament. (*C. Bell. V.* 2, *p.* 376.)

In order to lay bare the anterior tibial artery, a little above the middle of the leg, the finger is to be passed along the outer side of the spine of the tibia, and the breadth of the tibialis anticus muscle is to be ascertained. Along the outer margin of this muscle, an incision is to be made through the integuments and fascia, two inches and a half in length. The knife is then to be introduced between the outer margin of the tibialis anticus muscle, and the extensor longus of the great toe. In this space, at the depth of about an inch, the anterior tibial artery is situated. (See *Haller's Icon. Anat. Fasc.* 5, *Tab.* 4.) Cutting down to this artery, near the tarsus, where the vessel passes out between the tendons of the tibialis anticus and extensor muscle of the toes, is an easy operation.

The laying bare of the posterior tibial artery, behind the malleolus internus, is also quite easy: an incision, about two inches long, is to be made between the internal malleolus, and the tendo Achillis, down to the posterior surface of the tuberosity of the tibia. At this depth, the tendon of the tibialis posticus muscle, and that of the flexor communis digitorum pedis, run, as in a furrow. Along with these two tendons, but a little nearer to the os calcis, the posterior tibial artery descends to the sole of the foot.

On the contrary, the depth of the posterior tibial artery at the middle, or in the upper third of the leg, makes it very difficult to take up the vessel in these situations. And the difficulties are increased by the spasmodic contractions of the gastrocnemius and soleus muscles. When necessary, however, the artery may be exposed and tied above and below the wound in it, by proceeding as follows: an incision is to be made, three or four inches in length, along the inner side of the crest of the tibia, and the origins of the soleus muscle are to be detached from it to the same extent, and reflected. Under the soleus muscle is found the aponeurosis, which separates the muscles of the calf of the leg into superficial and deep seated. When this fascia has also been divided, the posterior tibial artery may be seen, or felt deeply situated, running on the tibialis posticus and flexor muscle of the toes. (See *Haller, Icon. Anat. Fasc.* 5, *Tab.* 5.)

In taking up the axillary artery, when it is wounded, Scarpa believes, that nothing tends more to embarrass the surgeon, than an injudicious smallness of the first incision through the skin and such other parts as conceal the wound in the artery. An assistant must compress the vessel, from above the clavicle, as it passes over the first rib. When the weapon has penetrated, from below upward, directly into the axilla, the surgeon is to make a free dilatation of the wound upon a director, or his finger. This must be done to a sufficient height to expose a considerable portion of the artery, and the precise situation of the wound in it.

When the weapon has pierced obliquely, or from above downwards, through a portion of the great pectoral muscle, into the axilla, Scarpa advises the surgeon to cut through the lower edge of this muscle, and enlarge the wound, on a director, or his finger, so as to bring fairly into view the injured part of the artery. The thoracic arteries, divided in this operation, must be immediately tied. The clots of blood are then to be removed, and the bottom of the wound cleaned with a sponge, by which means the opening in the axillary artery will be more clearly seen. As this vessel lies imbedded in the brachial plexus of nerves, the surgeon must take care to raise it from these latter parts with a pair of forceps, before he ties it. Two ligatures will be required; one above; the other, below the wound of the arteries.

ASTRINGENTS. Substances which possess the power of making the living fibres become contracted, condensed, and corrugated. They are employed in the practice of surgery chiefly as external applications, either for restoring diminished tonic power, or checking various discharges. Astringent lotions are deemed eligible local remedies for phlegmonous inflammation.

ATHEROMA, (from *αθηρα*, pap.) An encysted tumor, so named from its paplike contents. (See *Tumors Encysted.*)

B.

BALSAMUM COPAIVÆ. Exhibited by surgeons principally in cases of gonorrhea, gleet, and piles: The common dose is from ten to thirty drops, two or three times a day.

BANDAGE.

The use of bandages is to keep dressings, compresses, remedies, &c. in their proper situation; to compress blood-vessels, so as to restrain hemorrhage; to rectify certain deformities by holding the deranged parts in a natural position; and to unite parts, in which there is a solution of continuity. As the application of bandages is an important branch of surgery, authors have not neglected it. Much has been written on the subject, and almost every writer has devised new bandages, perhaps, without much benefit to the art. Unfortunately, it is next to impossible to give very clear ideas of the numerous sorts of bandages by a printed description of them. The surgeon can only acquire all the necessary instruction from experience and practice. Hence, we shall confine ourselves to a general account of the subject.

Bandages should be made of materials possessing sufficient strength to fulfil the end proposed in applying them, and at the same time they should be supple enough to accommodate themselves to the parts, to which they are applied.

Bandages are made of linen, cotton, or flannel. If possible, they should be without a seam, or selvage, which sometimes causes unequal and painful pressure.

There are cases, in which the bandage should have a degree of firmness, that does not belong to the materials usually employed. This circumstance is obvious in hernia, and in all those examples, in which there is occasion for elastic bandages. As we have already observed, linen, flannel, and cotton (calico), are the common materials. The first employment of flannel bandages is imputed to the Scotch surgeons, who preferred them to linen ones, in consequence of their being better calculated for absorbing moisture, while, being more elastic, they yield in a greater degree in cases requiring this property; as in the swelling subsequent to dislocations, fractures, &c. It has been asserted, that linen is better than flannel, because more cleanly; but neither one nor the other will continue clean, unless care be taken to change it often enough. Where the indication is to keep the parts warm, flannel is of course preferable both to linen and calico.

In applying a bandage, care must be taken, that it be put on tight enough to fulfil the object in view, without running any risk of stopping the circulation, or doing harm in any other way. If it be not sufficiently tight to support the parts in a proper manner, it is useless; if it be too tense, it will produce swelling, inflammation, and even mortification.

In order to apply a roller skilfully, the part which is to be covered, must be put in its proper situation; the head of the roller held in the surgeon's hand, and only so much unrolled, as is necessary for the commencement of the application.

In general, the bandage should be applied in such a manner, as will admit of its being most conveniently removed, and allow the state of the subjacent parts to be examined, as often as occasion may require, with the least possible disturbance of them.

For this reason, in fractures of the leg and thigh, the eighteen-tailed bandage is generally preferred to a simple roller. The former may be loosened and tightened, at pleasure, without occasioning the smallest disturbance of the affected limb; a thing which could not be done, were a common roller to be employed.

As soon as a bandage has fulfilled the object for which it is applied, and it has become useless, its employment should be discontinued; for, by remaining too long on parts, it may obstruct the circulation, diminish the tone of the compressed fibres, and vessels, and thus do harm.

Bandages are either *simple* or *compound*. They are also sometimes divided into *general* and *particular*. The latter often derive their names from the parts, to which they are usually applied.

A simple bandage is a long piece of linen or cotton, of an indefinite length, and from three to six inches in breadth. When about to be applied, it is commonly rolled up, and the rolled part is termed its *head*. When rolled up from each end, it is called a *double-headed roller* or *bandage*.

The chief of the simple bandages are the *circular*, the *spiral*, the *uniting*, the *retaining*, the *expellent*, and the *creeping*.

The *circular* bandage is the simplest; consisting merely of a few circles of a roller covering, or over-lapping each other.

The *spiral* bandage is the most frequently used of all; for, it is this, which is seen in such common employment on the limbs, in cases of ulcers, varices, &c. In applying a common roller to the whole of a limb, the bandage must be carried round the part spirally; for otherwise the whole member cannot be covered. When the leg is the part, the surgeon is to begin by surrounding the foot with a few turns. Then carrying the head of the bandage over the instep, he is to convey it backward, so as to make the bandage unroll, and apply itself just above the heel. The roller may next be brought over the inner ankle; thence again over the instep, and under the sole; and the surgeon then brings the bandage spirally upward once more to the outer part of the leg. After this, every circle of the roller is to be applied, so as to ascend up the limb in a gradual, spiral form, and cover about one third of the turn of the roller immediately below it. The unequal diameter of the limb, is one great cause, which brings into view the unskilfulness of a surgeon in this common operation; for, it prevents the roller from lying smoothly, although spirally applied, unless a particular artifice be dexterously adopted. The plan alluded to, is to double back the part of the roller that would not be even, were the application to be continued in the common spiral way, without this manœuvre. When the bulk of the limb increases very suddenly, it is sometimes necessary to fold, or, as it is termed, *reverse*, every circle of the bandage in the above manner, in order to make it lie evenly on the limb. It is manifest, that the pressure of the roller will be greatest where the duplicatures are situated, and hence, when it is an object to compress any particular part, the surgeon should contrive to reverse the turns of the bandage just over the situation where most pressure is desirable.

When a roller is to be applied to the forearm, it is best to put a few of the first turns of the bandage round the hand.

Care must be taken not to make the bandage very tight, if it be intended to wet it afterwards with any lotion; for moisture always renders it still more tense.

Mr. John Bell describes the principal purposes for which a roller is employed, as follows: "Although in recent wounds, it is with plasters and sutures that we unite the parts point to point, yet it is with the bandage that we support the limb, preserve the parts in continual and perfect contact with each other, and prevent any strain upon the sutures, with which the parts are immediately joined, and we often unite parts by the bandage alone. But, it is particularly to be observed, that, in gun-shot wounds, and other bruised wounds, though it would be imprudent to sew the parts, since it is impossible that they should altogether unite, yet the gentle and general support which we give by a compress and bandage, prevents them from separating far from each other, unites the deep parts early, and lessens the extent of that surface, which must naturally fall into suppuration.

"In the hemorrhagy of wounds, we cannot always find the artery; we dare not always cut parts for fear of greater dangers; we are often alarmed with bleedings from uncertain vessels, &c. or from veins as well as arteries: these hemorrhages are to be suppressed by the compress; which compress, or even the sponge itself, is but an instrument of compression, serving to give the bandage its perfect effect. Frequently, in bleedings near the groin, or the arm-pit, or the angle of the jaw, wherever the bleeding is rapid, the vessels uncertain, the cavity deep, and the blood not to be commanded by a tourniquet, and where the circumstances forbid a deliberate and sure operation, we trust to compress and bandage alone.

"Bandage is very powerful in suppressing bleeding. At one period of surgery, it took place of every other method, &c. If a compress be neatly put upon the bleeding arteries, if there be a bone to resist the compress, or even if the soft parts be firm below, and the bandage be well rolled, the patient is almost secure. But such a roller must be applied smoothly from the very extremity of the fingers or toes; the member must be thoroughly supported in all its lower parts, that it may bear the pressure above. It is partial stricture alone that does harm, creates intolerable pain and anxiety, or brings on gangrene. Hemorrhagy requires a very powerful compression, which must therefore be very general, &c. It must not be made only over the bleeding arteries, which is all that the surgeon thinks of in general, &c.

"In abscesses, where matter is working downwards along the limb, seeking out, as it were, the weak parts, undermining the skin, and wasting it, insulating and surrounding the muscles, and penetrating to the bones, the bandage does every thing. The expelling bandage, the propelling bandage, the defensive bandage, were among the names, which the older surgeons gave to the roller, when it was applied for these particular purposes; and these are properties of the roller, which should not be forgotten." (*Principles of Surgery, Vol.* 1.)

Soon after this description of some of the chief surgical uses of the roller, Mr. John Bell proceeds to explain, in what manner this most simple of all bandages may be put on a limb.

"Practice will convince you, that the firmness and neatness of a bandage depend altogether upon these two points; first, upon the turns succeeding each other in a regular proportion; and, secondly, upon making reverses, wherever you find any slackness likely to arise from the varying form of the limb. Thus, in rolling from the foot to the ankle, leg, and knee, you must take care, first, that the turns, or as the French call them, *doloires*, of the roller lie over one another by just one third of the breadth of the bandage; and, secondly, that at every difficult part, as over a joint, you turn the roller in your hand, make an angle, and lay the roller upon the limb, with the opposite flat side towards it; you must turn the bandage so as to reverse it, making, what the French call, a *renversée* of the roller at the ankle, at the calf of the leg, and at the knee. You must be careful to roll your bandage from below upwards, and support the whole limb by a general pressure. That you may be able to support the diseased part with a particular pressure, you must lay compresses upon the hollows and upon the bed of each particular abscess, and change the place of these compresses from time to time, so as now to prevent matter sinking into a particular hollow, now to press it out from a place where it is already lodged, and again to reunite the surface of an abscess already completely formed, from which the matter has been discharged." (*Principles of Surgery, Vol.* 1.)

In the article *Joints*, we have taken notice of the good effects of the pressure of the roller in the cure of some diseases of the knee. Here we shall just introduce Mr John Bell's sentiments upon the subject: "In a diseased bursa, as in a relaxation of the knee-joint, that disease, which, with but a little indulgence, a very little encouragement of fomentations, poultices, bleeding, and low diet, would end in white-swelling of the knee, may be stopped even by so simple a matter as a well-rolled bandage." (*Vol.* 1, *p.* 127.)

The *uniting bandage*, or *spica descendens*, used in rectilinear wounds, consists of a double-headed roller, with a longitudinal slit in the middle of three or four inches long. The roller, having one head passed through the slit, enables the surgeon to draw the lips of the wound together. The whole must be managed, so that the bandage may act equally. When there are sutures, this bandage supports the stitches, and prevents their tearing through the skin. When the wound is deep, writers advise a compress to be applied on each side, in order to press the deeper part of its sides together. When the wound is very long, two or three bandages should be employed, and great care taken, that the pressure is perfectly equable.

Heister, Henckel and Richter describe a sort of uniting bandage, that allows the surgeon to see the wound, over which only small ligatures cross. This contrivance will be best understood by reference to an engraved representation of it in Richter's Elements, B. 1.

When we make use of a single-headed roller, as a *retentive bandage* only, we should remember always to begin the application of it on the side opposite the wound. The obvious reason for so doing is to prevent a further separation of the lips of the wound, as the contrary manner of applying the roller would tend directly to divide them. (*Gooch, Vol.* 1, *p.* 143.)

The intention of the *expellent bandage* is to keep the discharge sufficiently near the orifice of the wound to prevent the formation of sinuses. In general, a compress of unequal thickness is necessary; the thinner part of the compress being placed next, and immediately contiguous to, the orifice of the wound; the thicker part below. Before the bandage is applied, the pus must be completely pressed out, and the rolling begin with two or three circular turns on the lower part of the compress. The bandage must then be carried spirally upwards, but not quite so tightly, as below. It is afterwards to be rolled downward to the place, where it began.

The *creeping* is a simple bandage, every succeeding turn of which only just covers the edge of the preceding one. It is employed in cases, in which the object is merely to secure the dressings, and not to make any considerable, or equable pressure.

A bandage is termed *compound*, when several pieces of linen, cotton, or flannel, are sewed together in different directions, or when the bandage is torn or cut, so as to have several tails. Such are the T bandage, the suspensory, the capistrum, &c,

The *eighteen-tailed bandage* is one of the most compound. It is now in general use for all fractures of the leg and thigh, sometimes for those of the forearm, and frequently, for particular wounds. Its great recommendations are the facility with which it can be undone, so as to allow the parts to be examined, and its not creating, on such an occasion, the smallest disturbance of the disease, or accident.

The eighteen-tailed bandage consists of a longitudinal portion of a common roller, and a sufficient number of transverse pieces, or tails to cover as much of the part as is requisite.

Each of the cross pieces is to be proportioned in length to the circumference of the part of the limb, to which it is to be applied; so that in making this sort of bandage for the leg, or thigh, the upper tails will be twice as long as the lower ones. After laying the long part of the bandage on a table, fix the upper end of it in some way, or another. Then arrange the tails across it, in sufficient number to cover such part of the limb as requires the bandage. Each tail must be long enough to extend about two inches beyond the opposite one, when they are both applied. The tails, being all arranged across the longitudinal band, they are to be stitched in this position with a needle and thread. When the bandage is intended for the leg, a piece of the longitudinal part of the roller below, is to extend beyond the tails. This is usually brought under the sole of the foot, and then applied over the inner ankle directly after the bandage has been put under the limb. Then the surgeon lays down the first of the lower tails, and covers it with the next. In this way, he proceeds upward, till all the cross pieces are applied, the uppermost one of which he fastens with a pin. This bandage has a very neat appearance. The tails are said to lie better, when placed across the longitudinal piece a little obliquely. (*Pott.*)

The T *bandage* is, for the most part, used for covering parts of the abdomen and back, and especially, the scrotum, perinæum, and parts about the anus. Its name is derived from its resemblance to the letter T, and it is, as Mr. John Bell remarks, the peculiar bandage of the body. If the breast, or belly, be wounded, we make the transverse piece, which encircles the body, very broad, and having split the tail-part into two portions, one of these is to be conveyed over each side of the neck, and pinned to the opposite part of the circular bandage, so as to form a suspensory for the latter, and prevent its slipping down. But, says Mr. John Bell, if we have a wound, or disease, or operation, near the groin, or private parts, the tail-part then becomes the most important part of the bandage: then the transverse piece, which is to encircle the pelvis, is smaller, while the tail-part is made very broad. When the disease is in the private parts, perineum, or anus, we often split the tail according to circumstances; but, when the disease is in one groin, we generally leave the tail-part of the bandage entire and broad.

The *scissum linteum*, or *split-cloth*, is a bandage applied occasionally to the head, and consists of a central part, and six, or eight tails, or heads, which are applied as follows:

When the cloth has six heads, the middle, or unsplit part of the cloth is applied to the top of the head. The two front tails go round the temples, and are pinned at the occiput; the two back tails go also round the temples, and are pinned over the forehead; the two middle tails are usually directed to be tied under the chin; but, as Mr. John Bell observes, this suffocates and heats the patient, and it is better to tie them over the top of the head, or obliquely, so as to make pressure upon any particular point. (*Principles of Surgery, Vol.* 1, *p.* 131.)

The old surgeons usually split this middle tail into two parts, a broad, and narrow one. In the broad one, they made a hole to let the ear pass through. This broad portion was tied under the chin, while the narrow ends were tied obliquely over the head. As Mr. John Bell has observed, though this gave the split-cloth the effect of eight tails, yet, the ancient surgeons did not name it the split-cloth with eight-tails. When they split the cloth into eight tails, and especially, when they tied the eight tails in the following particular manner, they called the bandage *cancer*, as resembling a crab in the number of its legs. The *cancer*, or *split-cloth of eight tails*, was laid over the head, in such a manner, that four tails hung over the forehead and eyes, while the other four hung over the back of the head. They were tied, as follows: first, the two outermost tails, on each side in front, were tied over the forehead, while the two middle tails in front were left hanging over the knot. Then the two outermost, or lateral tails behind were tied round the occiput. Next the middle tails were tied, the two anterior ones being made to cross over each other, and pass round the temples to be pinned at the occiput; while the two middle tails behind were made to cross each other, and pass round the temples, so as to be pinned over the ears, or near the forehead. (See *John Bell's Principles, Vol.* 1, *p.* 132.)

The *triangular bandage* is generally a handkerchief doubled in that form. It is commonly used on the head, and, now and then, as a support to the testicles, when swelled. The French term it *couvre-chef en triangle.*

The *nodose bandage*, called also *scapha*, is a double headed roller, made of a fillet four yards long, and about an inch and a half broad. It must be reversed two, or three times, so as to form a knot upon the part, which is to be compressed. It is employed, for the stoppage of hemorrhage, or, for securing the compress, after the performance of arteriotomy in the temples.

The most convenient bandage for the forehead, face, and jaws, is the *four-tailed one* or *single split-cloth.*

It is composed of a strip of cloth, about four inches wide, which is to be torn at each end, so as to leave only a convenient portion of the middle part entire. This unsplit middle portion is to be applied to the forehead, if the wound be there, and the two upper tails are carried backward, and tied over the back part of the head, while the two lower ones are to be tied either over the top of the head, or under the chin, as may seem most convenient.

When the wound is on the top of the head, the middle of the undivided part is to be applied to the dressings. The two posterior tails are to be tied forward, and the two anterior ones are to be carried backward, so as to be tied behind the head. This is sometimes called *Galen's bandage*. It is curious, that writers on bandages should use the terms *head*, and *tail*, synonymously, and hence this *four-tailed bandage* is often called the *sling* with *four heads*. Such confusion of language is highly reprehensible, as it obstructs the comprehension of any, the most simple subject.

If the upper lip be cut, and a bandage needed, which is seldom the case, it is almost superfluous to say, that this bandage will serve the purpose. It serves also in cuts of the lower lip, though in them, also, we trust rather to the twisted suture, than a bandage.

The single split-cloth is particularly useful for supporting a fractured lower jaw, and, in such cases, is the only one employed in modern surgery. This bandage, when used for this particular purpose, namely, supporting the lower jaw, is named *capistrum*, or *bridle*, because it goes round the part somewhat like a bridle.

"In some cases, (says Mr. John Bell) the circumstances require us to support the chin particularly, and then the unslit part of the bandage is applied upon the chin with a small hole to receive the point; but, where the jaw is broken, we pad up the jaw-bone into its right shape, with compresses pressed in under the jaw, and secured by this bandage. When we are in fear of hemorrhage after any wound, or operation, near the angle of the jaw, we can give the sling a very remarkable degree of firmness For this purpose, we tear the band into three tails on each side, and we stitch the bandage at the bottom of each slit, lest it should give way, when drawn firm," &c. (*Principles of Surgery, Vol.* 1.)

We have already described one way of applying a handkerchief, as a bandage to the head, in our notice of the *triangular one*, or *couvre-chef en triangle*. The other manner of applying the handkerchief, called the *grand couvre-chef*, is as follows:

You take a large handkerchief, and fold it, not in a triangular, but a square form. You let one edge project about three finger-breadths beyond the other, in order to form a general border for the bandage. You lay the handkerchief upon the head, so as to make the lower fold, to which the projecting border belongs, lie next the head; while the projecting border itself is left hanging over the eyes, till the bandage is adjusted. The two corners of the outermost fold are first to be tied under the chin; the projecting border is then to be turned back, and pinned in a circular form round the face, while the corners of the fold next the head are to be carried backward and tied.

After the outer corners of this bandage have been tied under the chin; after the inner corners have been drawn out and carried round the occiput; and after the border has been turned back and pinned; the doubling of the handkerchief over each side of the neck hangs in a loose awkward manner. It remains, therefore, to pin this part of the handkerchief up above the ear, as neatly as can be contrived. (See *J. Bell's Principles.*)

The grand couvre-chef has certainly nothing to recommend it, either in point of utility, or elegance. A common night-cap must always be infinitely preferable to it. In the event, however, of a cap not being at hand, it is proper that the surgeon should know, what contrivances may be substituted to fulfil the objects in view.

Having, in the numerous articles of this Dictionary, noticed the mode of applying bandages in particular cases, and allotted a few separate descriptions for such bandages, as are not here mentioned, but, which are often spoken of in books, we shall conclude for the present, with referring the reader for further information to *Rees's Cyclopædia; John Bell's Principles of Surgery, Vol.* 1. *Dict. des Sciences Med. art. Bandage. Galen and Vidus Vidius are reckoned the best of the old writers on the subject; M. Sue, Thillaye, Heister, Juville, Lombard, Bernstein, and J. Bell of the modern ones.*

BARK, *Peruvian.* (See *Cinchona.*)

BELLADONNA. (*Deadly Night-shade.*) A powerful sedative and narcotic. The leaves were first used externally for discussing scirrhous swellings, and they have been subsequently given internally, in scirrhous and cancerous diseases, amaurosis, &c. Five grains of them dried are reckoned a powerful dose: one is enough to begin with. At present, the extract, in doses of one grain, gradually increased to five, is more commonly prescribed.

It is said, that the recent leaves powdered, and made into an ointment with an equal weight of lard, more effectually prevent priapism, and relieve chordee, when rubbed on the penis, than any other application. (*Paris's Pharmacologia, Vol.* 2, *p.* 110, *Ed.* 5.)

From the power, which belladonna is known to possess, of lowering the action of the whole arterial system, it seems to be a fit medicine in many surgical cases, where that object is desirable, particularly in examples of aneurism.

Belladonna has the power of producing a dilatation of the pupil, when applied to the eye-brow and eye-lids. The late Mr. Saunders was in the habit of employing belladonna a good deal for this express purpose. A little while before undertaking the operation for the congenital cataract, he was accustomed to introduce some dissolved extract of belladonna between the eye-lids, or rub the eyebrow and skin about the eye freely with the same application. The consequence was, that, if there were no adhesions of the iris to other parts, a full dilatation of the pupil was produced in less than an hour, and the whole of the cataract was distinctly brought into view. This was unquestionably a considerable improvement in practice, as the iris was kept out of danger, and the operation materially facilitated. I allude here more particularly to Mr. Saunders's own method, in which he introduced the needle through the cornea, in front of the iris, and then conveyed it to the cataract through the enlarged pupil. Belladonna was also externally applied by Mr. Saunders, after the operation, with the view of preventing the edge of the iris from becoming adherent to the edges of the torn capsule. Whenever the state of the eye, behind the pupil, requires to be minutely examined, the plan of dilating this aperture by means of belladonna, very materially facilitates the examination. Stramonium is found to have the same effect upon the iris, as belladonna. Some experiments, in which the fact is clearly proved, were detailed many years ago, by a namesake of my own in the United States. (See *A Dissertation on the Properties and Effects of the Datura Stramonium, &c. by Samuel Cooper, Philadelphia,* 1797. *C. Himly de la Paralysie de l'Iris par une application locale de Jusquiame, &c. 2nd Ed.* 12*mo. Altona,* 1805. *J. Bailey, Observations relative to the Use of Belladonna in painful Disorders of the Head and Face,* 8*vo. Lond.* 1818.)

BINOCULUS, (from *binus,* double, and *oculus,* the eye.) A bandage for keeping dressings on both eyes. Its application will easily be understood by referring to *Monuculus.*

BISTOURY. (*Bistoire,* French.) Any small knife for surgical purposes.

BLADDER, *Puncture of.* The making of an artificial outlet for the urine, is an operation, to which we are obliged to have recourse, after having in vain employed all the other means indicated for the prevention of the bad, and even fatal consequences of a stoppage of the evacuation of this fluid, and distention of the bladder. Various accidents, and diseases, both acute and chronic, may occasion this dangerous state, as will be more particularly noticed in the article, *Urine, Retention of.*

The bladder, which can conveniently hold about a pint and a half of urine, is no sooner dilated, so as to contain two pints, than uneasy sensations are experienced. The desire of discharging the water now becomes urgent, and if the inclination be not gratified, and the bladder be suffered to be dilated beyond its natural state, it loses all power of contraction, and becomes paralytic. The desire, indeed, continues, and the efforts are renewed in painful paroxysms; but, the power is lost, and the bladder becomes more and more distended. When this viscus is dilated in the utmost degree, and neither its own structure, nor the space in the abdomen, can allow a further distention; either the bladder must be lacerated, which it never is, so equally is it supported by the pressure of the surrounding parts, or its orifice must expand and the urine begin to flow. After the third day of the retention, the urine often really begins to flow, and, whatever descends from the kidneys is evacuated in small quantities from time to time, and at this period, the bladder is distended in as great a degree as it ever can be, however long the patient may survive. This dribbling of the urine, which begins, when the bladder is dilated to the utmost, and continues till the eighth, or tenth day, or till the bladder sloughs, has long been understood, and is named by the French, "*urine par régorgement.*" To practitioners, who do not understand it, the occurrence is most deceitful. The friends felicitate themselves, that the urine begins to flow; the surgeon believes it; basins and cloths, wet with urine, are easily produced; but, the patient lies unrelieved. The continued distention of the bladder is followed by universal inflammation of the abdomen. The insensibility, and low delirium of incipient gangrene, are mistaken for that relief, which was expected from the flow of urine, till either hiccough comes on, and the patient dies of fever, and inflammation, or the urine gets into the abdomen, through an aperture, formed by mortification. Let no surgeon, therefore, trust to the reports of nurses and friends, but lay his hand upon the hypogastric region, and tap with his finger, in order that he may distinguish the distended bladder, and the fluctuation of urine. As the bladder suffers no further distention, after the third day, why should it burst? Not from laceration; for it is supported by the uniform pressure of the surrounding viscera; not by yielding suddenly, for it is distended to its utmost on the third day of the retention, and yet seldom gives way before the tenth; not by attenuation, for it becomes thickened. The term *laceration* was never more wrongly applied, than in this instance; for, when there is a breach in the bladder, it is found, on dissection, to be a small round hole, such as might be covered with the point of the finger. The rest of the viscus, and the adjacent bowels, are red and inflamed, while this single point is black, and mortified! Delay is more dangerous, than even the worst modes of making an opening into the bladder, and, while life exists, the patient should have his chance. (See *John Bell's Principles of Surgery, Vol.* 2, *Part* 1, *p.* 262, *&c.*)

That many patients die after paracentesis of the bladder is an undoubted truth, and this circumstance has rather intimidated practitioners against the operation. It appears to me, however, that in general death may be more fairly ascribed to the effects of the disease, than to the puncture of the bladder, and that, if this last measure, or the making of an outlet for the urine in some way or another, were not deferred so long as it often is, the recoveries would be more numerous.

Hence, when relief cannot be obtained by the treatment described in the article, *Urine, Retention of*; when no urine at all has come away, at the end of the third day; or when it only does so in a dribbling manner after this period, while the bladder continues distended, and no catheter can be introduced; the operation should not be delayed. Indeed, in urgent cases, one should rather operate earlier.

No doubt, a man, who is exceedingly skilful in the use of the catheter, and knows how to practise, with science and judgment, all the other means for relieving the retention of urine, will not frequently find it necessary to have recourse to the operation of puncturing the bladder. This is said to have been so much the case with the eminent Desault, that, in the course of ten years, he had occasion only once to perform such an operation in the Hotel Dieu, where diseases of the urethra are always extremely numerous. (See *Œuvres Chir. de Desault, par Bichat, Tom.* 2, *p.* 316.) When however, this superior manual dexterity with the catheter is not the acquirement of the practitioner, the timely performance of the paracentesis of the bladder, or at all events, the making of an outlet for the urine in some way or another, should not be neglected. It is gratifying to know, however, that, at the present day, the absolute necessity for puncturing the bladder is rendered less frequent, not only by the treatment of diseases of the urethra being better understood, than formerly, but also by the very great perfection, to which the construction of elastic gum catheters is brought, instruments, from which the most essential assistance may frequently be derived. Strictures in the urethra and enlargement of the prostate gland, are the two cases most frequently producing a retention of urine: and, in both of them, Sir Astley Cooper considers the operation of puncturing the bladder (with very few exceptions) entirely unnecessary; an opinion, with which my own observations lead me fully to concur. In cases of enlarged prostate gland, a skilful surgeon will almost always succeed in introducing a catheter of proper shape and length; and in examples of retention from stricture, when relief cannot be afforded by ordinary means, the best plan, generally, is not to puncture the bladder, but to make a small opening in the part of the urethra between the stricture and the neck of the bladder; a part which is most commonly much dilated. I shall next treat of the three modes of puncturing the bladder.

1. *Puncture through the Perinæum.*

This operation is said to have been first done by M. Tolet, a French surgeon, the author of a valuable treatise, entitled, "*Traité de Lithotomie, ou de l'Extraction de la Pierre hors de la Vessie, troisième édition, Paris,* 1681." According to Sabatier, it was customary, at the time of Dionis, to make the opening with a narrow pointed scalpel, about four or five inches long, which was plunged into the bladder, at the place where the incision in the apparatus major terminated. (See *Lithotomy.*) The escape of the urine indicated when the surgeon had reached the bladder. A straight probe was conducted along the knife, and, then a cannula was passed along the probe into the bladder, where it was allowed to remain as long as necessary, care being taken to fix it by means of tapes, put through the rings at the broad part of the instrument. The opening was then closed with a linen tent. Dionis first suggested the method of opening the bladder on one side of the perineum, at the part, where Frère Jacques used to perform lithotomy. Dionis conceived, that this mode of operating had advantages, because neither the urethra nor the neck of the bladder, was injured; a narrow scalpel was first introduced, so as to make a passage for the probe, and along this the cannula was guided into the bladder. The idea of substituting for these unsuitable instruments a trocar of convenient length was exceedingly simple, and, for this improvement, which took place in 1721, surgery is indebted to Juncker, (See *Conspectus Chirurgiæ, Tab.* 97, *p.* 674), unless the following passage be correct: "In the year 1717, or 1718, M. Peyronie showed in the King's garden a long trocar, which he had successfully employed in a similar puncture." (*Desault's Parisian Chir. Journ. Vol.* 2. *p.* 267.)

The patient having been placed in the same position as for lithotomy, an assistant is to press with his left hand on the region of the bladder, above the pubes, in order to propel that viscus as far downward into the lesser pelvis as possible, while, with his right hand, he supports the scrotum. The surgeon is then to introduce the trocar at the middle of a line, drawn from the tuberosity of the ischium to the raphe of the perineum, two lines more forward than the verge of the anus. The instrument is first to be pushed in a direction parallel to the axis of the body; and its point is afterwards to be turned a little inwards. Here according to Bichat, there is no occasion to convey the cannula so far into the bladder, as is done, when the operation is performed above the pubes. The portion of this viscus, that is pierced, being incapable of changing its position, with regard to other parts in the perineum, if the cannula only project a few lines into its cavity, it will not be liable to slip out. It would be wrong, indeed, to carry it in further; for, the pressure of its end against the posterior parietes of the bladder would do harm. Lastly, the cannula is to be fixed in its place, by means of the T bandage. (See *Œuvres Chir. de Desault, T.* 3, *p.* 320.) A silver cannula, when kept introduced too long, becomes covered with a thick incrustation, which renders its extraction very difficult and painful; care should be taken to prevent the inconvenience either by withdrawing it entirely, or substituting another for it, according as the circumstances of the case may demand. When Dr. Ehrlich visited London, Mr. Chandler tapped the bladder through the perineum, and introduced a cannula, which, after remaining so three weeks, was so thickly covered with an incrustation, that its extraction produced considerable laceration of the parts, and a great deal of inflammation followed by an urinary fistula. (See *Dict. des Sciences Med. t.* 26, *p.* 205.)

Some writers recommend the introduction of the left index finger into the rectum, in order to draw this intestine out of the way; but Sabatier thinks it better to use this finger for pressing on the part of the perineum, where the puncture is about to be made, so as to make the skin tense, and assist in the guidance of the trocar. (*Médecine Opératoire, T.* 2, *p.* 126.)

The parts, divided in the puncture, are the skin, a good deal of fat, and cellular substance, the levator ani muscle, and that portion of the lower part of the bladder, which is situated on one side of its neck.

The following is the judgment, which Bichat has passed upon this method: In the track, which the trocar has to pass, there is no part, the puncture of which must of necessity give rise to bad symptoms. A surgeon, moderately exercised in the practice of this operation, is tolerably sure of piercing the bladder, which is opened in the most depending situation, and at a point, which constantly bears the same relation to the perinæum. But, the position, in which the patient is placed for the operation, is a great deal more disagreeable, than that for the puncture above the pubes. Several assistants are required to fix him, and one is necessary for compressing the bladder in the hypogastric region. There is a possibility of wounding the vessels of the perineum, and of pricking the nerves, which accompany them. If the point of the trocar be carried too much outwards, it may glide over the external side of the bladder. If it be inclined forwards, it may slip between this viscus and the pubes. If it be turned too much inwards, it may pierce the prostate gland. If directed too much backwards, it may wound the vasa deferentia, the rectum, the extremity of the ureter, and the vesiculæ seminales. Also, while the cannula is kept introduced, the patient can neither walk about, nor sit down; but, must continually keep himself in bed. Lastly, this mode of operating is frequently counter-indicated, by tumors, or other common diseases, in this part of the body, in consequence of retentions of urine. (*Œuvres Chir. de Desault par Bichat, T. 3, p.* 321.)

The puncture of the bladder from the perineum is now almost universally abandoned by British surgeons. "We may esteem it fortunate," says Desault, "if the trocar penetrates directly into the bladder, after piercing the fat and the muscles, situated between the tuberosity of the ischium and the anus; and, as this viscus is subject to much variation in its form, the surgeon will often be defeated, unless he be perfectly clear in his ideas, respecting its situation and figure. This disappointment is not without example, and there is sufficient cause to deter a practitioner from performing this operation, independently of the danger of wounding with the trocar the vasa deferentia, vesiculæ seminales, ureter," &c. (*Parisian Chir. Journ. V.* 2, *p.* 267.)

If there be now any practitioners, who are averse to the total relinquishment of this method, I think the following caution, given by Sabatier, may be of service to them: perhaps, the operation would be more safe, if the surgeon were to begin with making a deep incision in the perineum, as is practised in the lateral way of cutting for the stone, and if he were to desist from plunging the trocar into the bladder, until he had assured himself of the situation of this viscus, and felt the fluctuation of the urine. (*Médecine Opératoire, T.* 2, *p.* 127.) Sir Astley Cooper, in describing this method, also directs an incision to be made in the perineum, as in lithotomy; the bulb of the penis to be pushed towards the patient's right side; the knife then carried within the branch of the ischium till it reaches the prostate gland, which is likewise to be pushed towards the patient's right side; and, lastly, the instrument to be passed obliquely upwards into the bladder, the operator's finger resting on the prostate gland. (*Lancet, Vol.* 2, *p.* 412.)

As in cases of inveterate strictures, the urethra between the obstruction and the bladder is always dilated, I think with Mr. C. Bell, that it may sometimes be better practice to cut into such distended portion of the passage, than puncture the bladder. On this point, many useful remarks may be found in this gentleman's *Surgical Observations, Part* 5, *&c.* the tenor of which I have more particularly considered in the 2d vol. of the 4th ed. of the First Lines of the Practice of Surgery. The practice of opening the urethra behind the stricture, in preference to puncturing the bladder, is also successfully adopted and highly commended by Sir Astley Cooper. (See *Lancet, Vol.* 2, *p.* 413.)

2. *Puncture above the Pubes.*

The invention of the method of tapping the bladder above the pubes was suggested by the possibility of extracting calculi from that viscus, by what is usually denominated the high operation. The first performers of the puncture above the pubes are said to have employed a straight trocar, the very same instrument as was used for tapping the abdomen in cases of dropsy. The consequence was, that when such a trocar was too long, its cannula was apt to hurt the opposite parietes of the bladder, so as to occasion inflammation and a slough, on the separation of which the urine was liable to insinuate itself either into the abdomen, or rectum, as happened in a case mentioned by Mr. Sharp, where no more urine was discharged through the cannula, and the patient died of a sort of diarrhœa. When the trocar is short, the bladder on subsiding and contracting itself, gradually quits the cannula, which becomes useless, and a necessity for making another puncture may be produced. Whatever pains may be taken to direct the trocar obliquely downwards and backwards, so that the cannula may be, in some degree, parallel to the axis of the bladder, one or the other of these accidents, cannot always be prevented.

Their prevention, however, may be effected by merely employing, instead of a straight trocar, a curved one, which will naturally take a suitable direction. This improvement was embraced by Frère Côme, the inventor of the lithotome caché, who also devised a curved trocar, for the paracentesis of the bladder, very superior to the instrument of the same shape previously in use.

To this way of operating, Mr. Sharp was partial, and Mr. Abernethy has recommended it, under certain circumstances. The former remarks, that it is an operation of no difficulty to the surgeon, and of little pain to the patient, the violence done to the bladder being at a distance from the parts affected. It is equally applicable, whether the disorder be in the urethra, or prostate gland, and when there are strictures, the use of bougies may be continued, while the cannula remains in the bladder. (*Critical Inquiry, p.* 125, *edit.* 4.)

Some writers recommend making an incision, about two inches long, through the linea alba, a little way above the pubes, and then introducing a trocar into the bladder. Others deem this preliminary incision quite useless, asserting, that the operation may be performed with equal safety, and less pain to the patient, by puncturing at once the skin, the linea alba, and the bladder. When the trocar has been introduced, the stilette must be withdrawn, and the cannula kept in its position by a riband, passed through two little rings, with which it should be constructed, and fastened round the body. The orifice of the cannula should be stopped up with a little plug, so as to keep the urine from dribbling away involuntarily, and taken out as often as may be necessary. (*Encyclopédie Méthodique: Part. Chirurg. Art. Paracentèse de la Vessie.*)

The trocar should be introduced in a direction obliquely downward and backward; for, as this corresponds with the axis of the bladder, the instrument will be less likely to injure the opposite side of that organ,

Nearly all writers advise the puncture to be made an inch, or an inch and a half, above the pubes. The reasons for so doing are the following: "If the puncture be made close to the os pubis, the bladder in that part, often rising with an almost perpendicular slope, leaves a chasm between it and the abdominal muscles, or to speak more strictly, a certain depth of membrana cellularis only, so that, if the trocar penetrate but a little way, it possibly may not enter into the bladder. If it penetrates considerably, it may pass through the bladder into the rectum, or, if not in the operation itself, some days afterwards, when by the course of the illness and confinement the patient is more wasted. For, the abdominal muscles, shrinking and falling in, occasion the extremity of the cannula to press against the lower part of the bladder, and, in a small time, to make a passage into the rectum." (*Sharp, in Critical Enquiry, p.* 127.) Though the reasons here adduced seem at first as formidable as they are numerous, does not the danger of injuring the peritoneum form an objection to plunging in a trocar at the above distance from the pubes? Certain it is, peritonitis would be more apt to be induced by such practice, than by introducing the instrument immediately above the pubes. Richerand decidedly condemns the plan, principally because the higher the puncture is made, the more apt the bladder will be to quit the cannula, on the urine being discharged. (See *Nosogr. Chir. T.* 3, *p.* 472, *Ed.* 2.) In Desault's works, by Bichat, the puncture is also advised to be made immediately above the pubes. (*T.* 3, *p.* 318.) Some of Mr. Sharp's objections are removed, by taking care to pass the trocar into the bladder in the axis of this viscus, and employing one which is somewhat curved, as Hunter, Frère Côme, Sabatier, &c. have advised. Mr. Sharp confirms the danger of using too long a cannula, by mentioning an accident, which occurred in his own practice. Though he introduced the instrument more than an inch and a half above the os pubis, yet having pushed it full two inches and a half, below the surface of the skin, its extremity in six or seven days insinuated itself into the rectum. (*Critical Enquiry, p.* 127.) The instrument, says an excellent writer, should be more or less long, according as the patient is fat, or otherwise; but, the ordinary length should be about four inches and a half. The curvature should be uniform, and form the segment of a circle, about eight inches in diameter. (*Œuvres Chir. de Desault par Bichat, t.* 3, *p.* 317.)

A catheter left in the bladder longer than ten days, may gather such an incrustation from the urine, as not only to render the extraction of it painful, but even impracticable. Surgeons, therefore, should never leave the cannula in the bladder quite a fortnight: or, if it must be kept introduced so long, Mr. Sharp advises a second one to be introduced, made with an end, like that of a catheter. (*Critical Enquiry, p.* 129.)

Mursinna, however, has reported one example, in which a cannula was kept in for along time without inconvenience; (*Hecker, Annales der Ges. Medecin.* 1810, *Jul. p.* 39.) and two other examples of the same kind are mentioned by Sir Astley Cooper. (*Lancet, vol.* 2, *p.* 410.)

Mr. Abernethy makes an incision, between the pyramidales muscles, passes his fingers along the upper part of the symphysis pubis, so as to touch the distended bladder, and introduces a common trocar, of the middle size, in a direction obliquely downwards. On withdrawing the stilette, he passes a middle-sized hollow elastic catheter, through the cannula, into the bladder. The cannula is withdrawn, and the catheter left in, till the urine passes through the urethra. After a week, as the instrument begins to be stopped up with mucus, it is taken out, and a new one introduced. (*Surgical Observations*, 1804.) It might be objected to this plan of employing a hollow bougie, that, as it is smaller than the wound, the urine is not kept from passing between the instrument, and parts, into which it is introduced, as well as through the tube itself. This happened in Mr. Abernethy's case, and, though no urine in this instance got into the cellular membrane, it might sometimes do so, because, it is not till after inflammation has taken place that the cavities of the cellular substance are closed with coagulating lymph. After a day or two, however, the cannula of the trocar might be withdrawn, and the hollow bougie employed, which would be less likely, than the silver one, to cause ulceration of the posterior part of the bladder.

The following is one of Sir E. Home's conclusions: "When the puncture is made above the pubes, the cannula, which incloses the trocar, is not to be removed, till the surrounding parts have been consolidated by inflammation, so as to prevent the urine in its passage out from insinuating itself into the neighbouring parts; for wherever the urine lodges, mortification takes place. Any advantage, therefore, which may arise from a more flexible instrument remaining in the bladder, is more than counterbalanced by its not filling completely the aperture through the coats of the bladder, and allowing the urine to escape into the cellular membrane." (*Trans. of a Soc. for Med. and Chir. Knowledge, V.* 2.)

There is much truth in the following passage: The abdomen is Inflamed; the preliminary incisions, which prepare for the introduction of the trocar, sometimes pass through several inches of fat, and cellular substance; the incisions must be wide in proportion to their depth; the cannula is no sooner lodged here, than it is displaced, in some degree, by the contraction of the bladder, which, when emptied, subsides under the pubes. The cannula stands so obliquely, that the urine never flows with ease, but, by running out upon the wound, and by being injected among the cellular substance, it causes the wound to inflame; the wound by its proximity to the inflamed peritonæum soon mortifies, and thus, notwithstanding the temporary relief, produced by the emptying of the bladder, the patient dies on the third or fourth day. (*John Bell's Principles of Surgery, Vol.* 2, *p.* 271.)

That this operation is infinitely better, than that of making the puncture in the perineum, is indisputable. There are even now some good surgeons, who seem to prefer it to the method of tapping the bladder from the rectum. In the Œuvres Chirurgicales de Desault, T. 3, p. 324, it has received the preference, and at p. 319 of the same book, a high encomium is bestowed on it, in the following terms. "This operation is easy. The little thickness of the parts which are to be wounded, renders it quick and triflingly painful. The surgeon has occasion for no assistance. The patient is neither intimidated, nor fatigued with the posture in which he is put. It is almost impossible to miss the bladder, except it be exceedingly contracted. There is no risk of piercing the cavity of the abdomen. Anatomy proves, that here the bladder is in immediate contact with the recti muscles, and that when this viscus is distended with urine, it pushes the peritoneum upwards and backwards, under which membrane it enlarges, and thus makes the point of the trocar become more and more distant from the cavity of the abdomen. The patient may easily lie on his side, or abdomen, so as to discharge all the urine contained in the bladder. There are here no nerves, nor vessels, of which the injury can be dangerous. No difficulty is experienced in fixing the cannula, and the presence of this instrument does not hinder the patient from sitting, standing up, or even walking about in his chamber. When the cannula, also, is introduced to the lower part of the bladder, this viscus cannot possibly quit it. Lastly, the wound heals with more facility, than that made in any other method."

Respecting this advice to push the cannula so far into the bladder, it is highly objectionable, for the reason already explained. The writer of the preceding commendation seems to me rather too partial. He has told us of the little thickness of the wounded parts, and, yet a little before bestowing these praises, he has acknowledged, "*il est rare, que dans cette ponction, on traverse directement la ligne blanche: on passe presque toujours sur ses côtés, et l'on divise le peau, l'aponéurose des muscles larges du bas-ventre, les muscles droits, quelquefois l'un des pyramidales, et la paroi antérieure de la vessie.*" (*T.* 3, *p.* 318.)

This operation (according to Sir Astley Cooper) is very easily performed; it is not liable to the objections which were formerly made to it, and it is in general safe. In the female, it is the only proper one in cases of retention of urine from retroversio uteri, and from an obliteration of the meatus urinarius by cancerous disease; for (says he) opening the bladder through the vagina, is a very unsafe and disastrous operation, as the urine afterwards dribbles into that passage, where it occasions the highest degree of excoriation, attended with dreadful suffering and constitutional irritation. "It is an operation, which ought never to be performed." (See *Lancet, Vol.* 2, *p.* 410.)

According to my own judgment, the plan, which is about to be described, is the safest and best, when the circumstances of the case afford a choice; and I think, that it would be for the benefit of the afflicted, if the puncture above the pubes were only performed in cases, in which the enormous enlargement of the prostate gland, and disease in the rectum, prevent it from being safely made from the rectum.

3. *Puncture from the Rectum.*

This method is more generally applicable, than either of the two plans above related. It is not, like the puncture in the perinæum, liable to the objection, that the wound is made in diseased or inflamed parts, which afterwards become gangrenous. Nor is it, like the puncture above the pubes, attended with a chance of the urine diffusing itself in the cellular membrane. It has also the advantage of emptying the bladder completely. The puncture is made sufficiently far from the neck of the bladder not to increase any inflammation existing in that situation; and the operation is really attended with little pain, since there is no skin, nor muscles to be wounded, merely the coats of the bladder and rectum, at a point where these viscera lie in contact with each other. In cases of enlarged prostate gland, and of disease of the rectum, however, some other method should be chosen, though I am of opinion, that, in the first of these cases, puncturing the bladder at all can seldom be absolutely necessary, as the catheter may almost always be introduced by a surgeon, who understands the nature of the disease, and its alteration of the course of the urethra.

We read in the *Philosophical Transactions* for 1776, of a case of total retention of urine, from strictures, where the bladder was successfully punctured from the rectum. The plan was suggested to Mr. Hamilton, who did the operation, by his feeling the bladder exceedingly prominent in the rectum, when his finger was within the bowel.

The patient was placed in the same position as that for lithotomy; a trocar was passed along the finger into the anus, and pushed into the lowest, and most projecting part of the swelling, in the direction of the axis of the bladder. A straight catheter was immediately introduced through the cannula, lest the bladder by contracting should quit the tube, which was taken away, and, as soon as the water was discharged, the catheter was also removed. Notwithstanding the puncture, the bladder retained the urine as usual, until a desire to make water occurred. Then the opening made by the instrument seemed to expand, and the water flowed in a full stream from the anus. The urine came away, in this manner, two days, after which it passed the natural way, with the aid of a bougie, which had been passed through the urethra, into the bladder, and which was used, till all the disease in this canal was cured.

The method is said to have been originally proposed in 1750, by M. Fleurant, surgeon of the hospital *La Charité*, at Lyons; and Pouteau, in 1760, published an account of it, and three cases in which Fleurant had operated. It was also the feel of the bladder, on the introduction of a finger *intrà anum*, which led the latter surgeon to make the puncture in this situation. The urine was immediately discharged, and the cannula supported in its place with the T bandage, until the natural passage was rendered pervious again. But as the cannula was left in the rectum, it annoyed the patient, when he went to stool, and, the inconvenience was vastly increased by the continual dribbling of the urine from the mouth of the instrument. Hamilton avoided both these inconveniences, by withdrawing the cannula at first. In another instance, however, Fleurant left the cannula in the anus and bladder, thirty-nine days, without the least inconvenience.

In order to lessen the tenesmus and other inconveniences, attending the presence of the cannula, Fleurant suggested that it would be better to employ a tube made of a flexible substance, and some of the moderns approve the plan of passing a flexible catheter, through the silver one into the bladder, and withdrawing the latter instrument.

In the first volume of the *Mem. of the Medical Society of London*, two cases are related, in which after tapping the bladder from the rectum, the cannula was immediately withdrawn, without any bad effect; and a similar fact is recorded in the *Medical Communications, Vol.* 1.

A curved trocar, of sufficient length, is the best for performing the operation, and was recommended by Pouteau. As the trocar with a lancet-point may cut blood vessels, which would bleed freely, some authors express their preference to one made with a triangular point.

(*Howship, p.* 215.) It should be introduced into the prominence made by the distended bladder a little beyond the prostate gland, exactly in the centre of the front of the rectum; but not imprudently far up the intestine, lest the peritoneum be injured. For some useful cautions on this head, the profession are indebted to Mr. Carpue, who has very properly adverted to the very low point, to which the portion of peritoneum reflected over the rectum descends. (*Hist. of the High Operation, &c. p.* 178, *8vo. Lond.* 1819.)

The trocar should be introduced in the direction of the axis of the bladder, or nearly in an imaginary line drawn from the spot to be punctured to the middle point between the navel and the symphysis pubis.

The patient should be placed nearly in the same posture, as that adopted in lithotomy; but the hands and feet need not be bound together, it being sufficient to let the assistants support the legs. The left forefinger, smeared with oil, is to be introduced up the rectum, where a portion of the distended bladder will be felt behind the prostate gland, and between the converging vasa deferentia. The vesiculæ seminales, which are on the outside of the vasa deferentia, are less exposed to injury. Behind the prostate gland, as Sir Astley Cooper correctly explains, there is a triangular space, which affords room for the instrument. In the forepart, it is bounded by the meeting of the vasa deferentia, which forms the apex of the triangle; the sides are formed by the vasa deferentia, which diverge as they pass from the prostate backwards; while the basis of the triangle is formed by the peritoneum, which is reflected from the posterior part of the bladder to the rectum. Taking advantage of this space of the bladder, which is not covered by the peritoneum, the trocar is introduced through it into the bladder, about three quarters of an inch behind the prostate gland. The instrument must not be introduced directly behind the prostate, as the vas deferens on one side, or the other, would certainly be wounded. If the trocar be carried ¾ or ½ of an inch behind the prostate, the vasa deferentia will be safe. (*Lancet, Vol.* 2, *p.* 411.) Here the surgeon is to let the end of his finger continue, until, with his right hand, and under the guidance of the left forefinger, he has brought to the same point the extremity of the curved trocar, the concavity of which is to be kept forwards. Great care must also be taken not to let the stilette project out of the cannula, too soon, that is to say, before the end of the tube has been placed exactly upon the spot, at which the puncture is to be made.

It is not necessary to retain the cannula in the puncture, after the inflammation has consolidated the sides of the wound, and there is no danger of the aperture closing up, before another passage is made for the urine. Sir E. Home thinks, that, after about thirty-seven hours, the cannula may be taken out. (*Trans. of a Soc. for Med. and Chir. Knowledge, Vol.* 2.) Indeed, I am not acquainted with any fact, showing the ill effect of removing the cannula early; for, here the urine has only to pass through a mere opening, without any longitudinal extent, like what remains after puncturing above the pubes. The general safety and simplicity of tapping the bladder from the rectum, will always recommend this method to impartial practitioners. The wound is made at a distance from the peritoneum, passes through no thickness of parts, and is quite unattended with any chance of the urine becoming extravasated in the cellular substance. Whether the bladder be morbidly contracted and thickened; whether the neck of the bladder be inflamed; it is equally applicable.

I am happy to join the experienced and judicious Mr. Hey with the advocates for this mode of performing the operation, and as his opinion on this subject must have considerable influence, I shall quote the following passage from his valuable work, particularly as the observations confirm some other points, adverted to in the present article. "It is sometimes impossible, from various causes, to make a catheter pass through the urethra. The puncture of the bladder then becomes necessary, if the retention of urine continues. This operation may be performed, either above the pubes, or through the rectum. I have seen it performed in both these methods; but, give the preference to the latter. It is more easy to the surgeon; and less painful to the patient. Pouteau's curved trocar is a very convenient instrument; and may be used with safety for puncturing the bladder through the rectum; but, the operator should cautiously avoid wounding an artery, which may be felt running towards the anus, where the bladder is most protuberant. The finger, which is introduced into the rectum to guide the trocar, may be conveniently placed a little on either side of this vessel. It is not always necessary to leave the cannula in the bladder, as the urine sometimes begins to flow through the penis, within a few hours after the bladder is emptied. Perhaps, this event may be the most frequent, when the introduction of the catheter has been prevented by a stricture in the urethra. If the wound becomes closed, before the power of expelling the urine is regained, recourse must be had to a repetition of the operation, which gives very little trouble to the patient; neither is he much incommoded by suffering the cannula to remain two or three days in the bladder. This is sometimes necessary, and seldom improper." (*Hey's Practical Observations in Surgery, p.* 430—431, *edit.* 2.)

The objections, made to the puncture through the rectum are three; first, the annoying tenesmus sometimes produced by the presence of the cannula; secondly, the irritation and ulcerated state of the rectum occasionally resulting from the dribbling of the urine through it; and thirdly, the possibility of a sinus being formed between this bowel and the bladder. (*A. Bonn, Bemerkungen ueber der Harnverhalt. &c. Leipz.* 1794.) It seems that Sir Astley Cooper knows of some cases, in which such inconveniences have followed, and, in particular, one instance, in which the patient died, of the subsequent diseased state of the rectum. Hence, the puncture of the bladder from the rectum is not a practice on which he bestows any commendation. (*See Lancet, Vol.* 2, *p.* 412.)

In the foregoing columns, I have briefly adverted to the proposal of cutting into the urethra behind the obstruction, instead of puncturing the bladder. Mr. Grainger, of Birmingham, a few years ago also recommended cutting into the urethra, immediately in front of the prostate, and relieving the bladder by the introduction of a female catheter through the gland, or, (if that could not be accomplished) by the division of its substance with a scalpel. (*Med. and Surg. Remarks, &c.* 8vo. *Lond.* 1815.)

Women rarely stand in need of paracentesis of the bladder, an occasional impossibility of introducing the catheter from a retroversion of the womb, and an obliteration of the meatus urinarius by disease, being almost the only cases ever placing them in this condition. The only method applicable to them is the puncture above the pubes, with the exception of the plan of introducing the trocar directly from the vagina into the bladder; a practice, which Sir Astley Cooper strongly condemns, on account of its leading to the formation of an incurable urinary fistula in the vagina, and a great deal of disease and irritation in that passage from the contact of the urine.

Consult *Sharp on the Operations, Chap.* 15. *and his Critical Enquiry. Ambr. Bertrandi, Trattato delle Operazioni di Chirurgia, accresciuto di note, &c. dai Chirurghi G. A. Penchienati e G. Brugnone,* 8vo. *Torino,* 1802. *Bertrandi was an approver of the puncture from the rectum: so was Le Blanc; Operat. de Chir. T.* 1. *Melanges de Chirurgie, Pouteau, Lyon,* 1760, *p.* 500. *L'Encyclopédie Méthodique, Partie Chirurgicale; art. Paracentèse de la Vessie. Schmucker, Chir. Wahrnehmungen,* 2 *Th. No.* 39: *puncture from the rectum. Sabatier Médecine Opératoire, T.* 2. *Mursinna, Journ. für die Chirurgie, &c.* 4, *p.* 46, 67. *Cases of puncture from the rectum, and above the pubes. In illustration of the operation of puncturing the bladder, Camper's plates are the best: See his Demonst. Anat. Pathol. Lib.* 2. *In this work, the danger of letting the end of any long instrument, when introduced, press against the inside of the bladder, is proved by a case, in which that organ was perforated by the extremity of a catheter, p.* 11. *Kloss, Diss. de Paracentesi Vesicæ Urinariæ per intestinum rectum, Jen.* 1791. *A. Bonn, Anat. Chir. Bemerkungen über die Harnverhaltung, und den Blasenstich. Leip.* 1794: *prefers the puncture above the pubes. J. Howship, in Pract. Obs. on Diseases of the Urinary Organs, p.* 214, 8vo. *Lond.* 1816, *and in Treatise on Complaints affecting the Secretion and Excretion of the Urine, p.* 412, *Lond.* 1823; *thinks the operation from the rectum generally superior to the other methods. Sir E. Home, in Trans. for the Improvement of Med. and Chir. Knowledge, Vol.* 2. *Abernethy's Surgical Observations,* 1804. *John Bell's Principles of Surgery, Vol.* 2. *Œuvres Chir. de Desault par Bichat, T.* 3, *p.* 315, *&c. W. Schmid über die Krankheiten der Harnblase, &c.* 8vo. *Wien,* 1806. *Richerand, Nosogr. Chir. T.* 3, *edit.* 4. *Hey's Practical Observations in Surgery, p.* 430, *edit.* 2. *Parisian Chirurgical Journal, Vol.* 2. *p.* 156, *and p.* 265. *S. T. Sömmering über die schnell und langsam tödtlichen Krankheiten der Harnblase, &c. Frankfurt,* 1809. *The author is an advocate for the puncture above the pubes, in preference to that through the rectum, which he thinks right only in one case, viz. when the bladder is so contracted, that it does not rise out of the lesser cavity of the pelvis, and the fluctuation of the urine can be felt in the rectum, but not above the pubes. In this opinion, he is joined by Langenbeck.* (*Bibliothek.* 3. *B. p.* 719.) *Callisen, Systema Chirurgiæ Hodiernæ, T.* 2, *p.* 277, *&c. Chirurgische Versuche von B. G. Schreger, B.* 1. *p.* 211, *&c.* 8vo. *Nurnberg,* 1811; *gives the preference to the puncture above the pubes. Edward Grainger, Med. and Surg. Remarks, &c. with Obs. on the different modes of opening the bladder in retention of urine, &c.* 8vo. *Lond.* 1815. *Dict. des Sciences, Méd. art. Ischurie.* 1818. *C. Bell, Surgical Obs.* 8vo. *Part* 5, *Lond.* 1818. *C. Averill, Short Treatise of Operative Surgery, p.* 174, *&c. Lond.* 1823.

Bladder, *Tumor extirpated from.* Mr. Warner has recorded a case, in which an excrescence, growing from the inside of a young woman's bladder, was successfully removed. The patient on the 24th of June, 1747, strained herself in endeavouring to lift a great weight, and she was immediately seized with a pain in the small of her back, and a total retention of urine. In April, 1750, she applied to Mr. Warner, who found, that she had never been able, from the moment of the accident, to void a drop of urine without the assistance of the catheter; that she was in continual pain, and had lately been much weakened, by having several times lost considerable quantities of blood, occasioned by the force made use of in introducing the instrument into the bladder.

Mr. Warner, upon examining the parts, with his forefinger, which he had great difficulty in introducing into the meatus urinarius, discovered a considerable tumor, which seemed to be of a fleshy substance, and took its rise from the lower part of the bladder, near its neck. When the patient strained to make water, and the bladder was full, the excrescence protruded a little way out of the meatus urinarius; but, upon ceasing to strain, it presently returned.

A purgative having been given the day before the operation, and the rectum emptied by means of an emollient clyster, Mr. Warner directed the patient to strain, so as to make the swelling project. He then hindered it from returning into the bladder by passing a ligature through it, and endeavoured to draw it further out. The latter object was found impracticable on account of the size of the tumor. Seeing this, Mr. Warner dilated the meatus urinarius on the right side by cutting it upwards, about half way towards the neck of the bladder, when, by pulling the swelling forwards, he was enabled to tie its base, which was very large.

For three days after the operation, a good deal of pain was felt in the abdomen. On the sixth day, the tumor dropped off. From the first day, the urine came away, without assistance, and the patient got quite well. The tumor resembled a turkey's egg in shape and size. (See *Warner's Cases in Surgery, edit.* 4, *p.* 303.)

Perhaps, in this example, tying the tumor was preferable to cutting it away, even though its base was large; for, had the knife been used, there would have been some danger of the bladder becoming filled with blood.

For an account of other tumors of the bladder, I refer the reader to "*A Practical Treatise on the most important Complaints affecting the Secretion and Excretion of Urine; by J. Howship,* 8vo. *Lond.* 1823."

Bladder, *Hernia of.* See *Hernia.*

Bladder, *Insects discharged from.* The instances, in which worms are stated to have been discharged from the bladder, are very numerous. Many cases of this kind are referred to in Voigtel's Handbuch der Pathologischen Anatomie, b. 3. p. 337—342. A few years ago, an interesting example was recorded by Mr. Lawrence. (See *Med. Chir. Trans. V.* 2, *p.* 382, *&c.*)

Bladder, *Deficiency of.* Numerous examples in which this deviation from the natural structure has occurred, are recorded by medical writers. The publications, however, which, as far as I know, contain the most ample information on the subject, are, a Gottingen inaugural dissertation, entitled, "*De Vesicæ Urinariæ Prolapsu Nativo,*" by Dr. Roose, late professor in Brunswick, and a paper, called "*An attempt towards a systematic account of the appearances, connected with that malconformation of the Urinary Organs, in which the ureters, instead of terminating in a perfect bladder, open externally on the surface of the Abdomen,*" *by A. Duncan, jun. in Edin. Med. and Surg. Journal, Vol.* 1. In this last production, may be seen references to all the most noted cases on record, both male and female. (See also *Handbuch der Pathologischen Anatomie von J. F. Meckel,* 1 *B. p.* 650, 8*vo. Leip.* 1812.)

Bladder, *Wounds of.* See *Gunshot Wounds.* Many cases of rupture of the bladder from blows or falls are recorded, followed by fatal extravasation of urine in the abdomen. Two such instances have been recently detailed by Dr. Cusack. (See *Dub. Hospital Reports, Vol.* 2, *p.* 312, *&c.* 8*vo.* 1818. *Also C. Montague in Med. Communications, Vol.* 2, *p.* 284. 1790.)

BLEEDING.

By this operation is understood the taking away of blood for the relief of diseases. Bleeding is called *general,* when practised with a view of lessening the whole mass of circulating blood; *topical,* when performed in the vicinity of the disease, for the express purpose of lessening the quantity of blood in a particular part.

General Blood-letting is performed with a lancet, and is subdivided into two kinds; viz. the opening of a vein, termed *phlebotomy,* or *venesection;* and the opening of the temporal artery, or one of its branches, termed *arteriotomy.*

Topical Blood-letting is performed, either by means of a cupping-glass and scarificator, or leeches, or by dividing the visibly distended vessels with a lancet, as is frequently done in cases of ophthalmy.

PHLEBOTOMY, OR VENESECTION.

The mode of bleeding, most frequently practised, is that of opening a vein; and it may be done in the arm, ankle, jugular vein, frontal vein, veins under the tongue, on the back of the hand, &c. In whatever part, however, venesection is performed, it is always necessary to compress the vein, between the place where the puncture is made, and the heart. Thus the return of blood through the vein is stopped, the vessel swells, becomes conspicuous, and, when opened, bleeds much more freely, than would otherwise happen. Hence, according to the situation of the part of the body where the vein is to be opened, with regard to the heart, the bandage, or other means, for making the necessary pressure, must be applied, either above or below the puncture.

All the apparatus essential for blood-letting, on the part of the patient, is a bandage or fillet, two or more small pieces of folded linen for compresses, a basin to receive the blood, and a little clean water and a towel. The bandage ought to be about a yard in length, and nearly two inches broad, a common riband or garter being frequently employed. The compresses are made by doubling a bit of linen rag, about two inches square. On the part of the surgeon, it is necessary to have a good lancet, of proper shape. He should never bleed with lancets, with which he has been in the habit of opening any kind of abscesses, as very troublesome complaints have been the consequence of doing so. The shape of the instrument is also a matter of some importance. If its shoulders are too broad, it will not readily enter the vein, and when it does enter, it invariably makes a large opening, which is not always desirable. If the lancet be too spear-pointed, an incautious operator would often run the risk of transfixing the vein, and wounding the artery beneath it. More, however, certainly depends on the mode of introducing the lancet, than on its shape.

In blood-letting, the patient may lie down, sit down, or stand up, each of which positions may be chosen according to circumstances. If the patient be apt to faint from the loss of a small quantity of blood, and such fainting can answer no surgical purpose, it is best to bleed him in a recumbent posture. But when the person is strong and vigorous, there is little occasion for this precaution, and a sitting posture is to be preferred, as the most convenient, both for the surgeon and patient. This, indeed, is the common position. In some cases, however, particularly those of strangulated hernia, it is frequently an object to produce fainting, in order that the bowels may be more easily reduced. In this circumstance the patient may be bled in an erect posture, and the wound made large, as a sudden evacuation of blood is particularly apt to bring on the wished-for swoon. For the same reason, if we wish to avoid making the patient faint, we should then make only a small puncture.

Every operator should be able to use the lancet with either hand, and thus bleed the patient in the right or left arm, as circumstances may render most eligible.

At the bend of the arm, there are several veins in which a puncture may be made; viz. the basilic, cephalic, median basilic, and median cephalic. The median basilic vein, being usually the largest and most conspicuous, is that in which the operation is mostly performed; but surgeons should never forget, that it is under this vessel that the brachial artery runs, with the mere intervention of the aponeurosis sent off from the tendon of the biceps muscle. In very thin persons, indeed, the median basilic vein lies almost close to the artery, and nothing is then more easy than to transfix the first of these vessels and wound the last. Hence Richerand advises all beginners to prefer opening the median cephalic, or even the trunk of the cephalic itself, to puncturing either the basilic, or the median basilic, which last are internally situated, and nearer the brachial artery. (*Nosographie Chirurgicale, t.* 3. *p.* 38. *edit.* 2.)

In fat subjects, the large veins at the bend of the arm are sometimes totally imperceptible, notwithstanding the fillet is tightly applied, the limb is put in warm water, and every thing done to make those vessels as turgid as possible. In this circumstance, if the surgeon has not had much experience in the practice of venesection, he will do well to be content with opening one of the veins of the back of the hand, after putting the member for some time in warm water, and applying a ligature round the wrist. In children, a sufficient quantity of blood cannot always be obtained by venesection, and, in this event, the free application of leeches, and, occasionally, the puncture of the temporal artery, are the only effectual methods.

With respect to the choice of a vein in the arm, the most experienced operators give the preference to one which rolls least under the skin. Such a vessel, though sometimes less superficial than another, may commonly be opened with greater facility. The surgeon, however, is always to fix the vein as much as he can, by placing the thumb of his left hand a little below the place where he intends to introduce the lancet.

In bleeding in the arm, the fillet is to be tied round the limb, a little above the elbow, with sufficient tightness to intercept the passage of the blood through all the superficial veins; but never so as to stop the flow of blood through the arteries, which would tend to prevent the veins from rising at all. The veins being thus rendered turgid, the surgeon must choose the one which seems most conveniently situated for being opened, and large enough to furnish as much blood as it may be proper to take away.

Before applying the fillet round the arm, however, the operator should always feel where the pulsation of the artery is situated, and, if equally convenient, he should not open the vein immediately over this part. It is also prudent to examine where a pulsation is situated, on account of the occasional varieties in the distribution of the arteries of the arm. The ulnar artery is sometimes given off from the brachial very high up, and, in this case, it frequently proceeds superficially over the muscles, which arise from the internal condyle, instead of diving under them, in the ordinary manner.

When the external jugular vein is to be opened, the surgeon generally makes the necessary pressure with his thumb. The orifice should be made in the direction of the fibres of the platysma myoides muscle; and the vein is not so apt to glide out of the way, when the surgeon makes the puncture just where it lies over a part of the sterno-cleido-mastoideus muscle.

When blood is to be taken from the foot, the ligature is commonly applied a little above the ankle.

The fillet having been put on the arm, the operator is to take the blade of the lancet, bent to a somewhat acute angle, between the thumb and fore-finger, and, steadying his hand upon the other three fingers, he is to introduce the lancet, in an oblique direction, into the vessel, till the blood rises up at the point of the instrument. Then bringing up the front edge in as straight a line as possible, the wound in the skin will be made of just the same size as that in the vein. The operator next takes away the thumb of his left hand, with which he steadied the vessel, and allows the blood to escape freely, till the desired quantity is obtained. The arm ought to be kept in the same position while the blood is escaping, lest the skin should slip over the orifice of the vein, keep the blood from getting out, and make it insinuate itself into the cellular substance.

When the blood does not issue freely, most surgeons direct the patient to move his fingers, or turn something round and round in his hand. This puts the muscles of the arm into action, and the pressure which they then make on the veins, makes the blood circulate more briskly through these vessels.

The proper quantity of blood being discharged, the fillet is to be untied. The flow of blood now generally ceases; though sometimes, when the orifice is large, and the circulation very vigorous, it still continues. In this circumstance, the operator may immediately stop the bleeding, by placing the thumb of his left hand firmly on the vessel, a little below the puncture.

The blood is next to be all washed off the arm, the sides of the wound placed in contact, and the compresses applied, and secured with the fillet, put round the elbow in the form of a figure of 8, and regularly crossing just over the compresses.

The patient should be advised not to move his arm much till the fillet is removed, which may be done after twenty-four hours.

In order to open the external jugular vein, the patient's head is to be laid on one side, and properly supported. Then the operator is to press upon the lower part of the vein with his thumb, so as to make the part above swell, and then the lancet is to be pushed at once into the vessel, with the cautions already stated.

There is commonly no difficulty in stopping the bleeding, after the pressure is removed. Some practitioners divide the integuments with a scalpel, before the vein itself is opened; but this is quite unnecessary.

Blood-letting in the feet is executed on the same principle as in other parts; but as the blood from the veins in this situation generally does not flow with much celerity, it is customary to immerse the feet in warm water, in order to promote the bleeding.

ARTERIOTOMY.

The only arteries of any size, from which blood is ever taken in practice, are the trunk and branches of the temporal artery, which lie in such a situation, that they may easily be compressed against the subjacent bones, and the bleeding stopped. When the vessel, which the surgeon chooses to open, lies very near the surface, or can be ascertained by feeling, or even seeing, its pulsation, it may be opened at once with a lancet. But, in many instances, it is so deeply situated, that it becomes necessary, in the first place, to make a cut in the skin, and then puncture the vessel.

The bleeding generally stops without any trouble; and may always be suppressed with a compress and bandage. In a very few cases, the blood bursts forth from time to time, and more is lost than is necessary. When this happens, notwithstanding pressure, it is recommended to divide the vessel completely across, which facilitates the process of nature in closing the end of the vessel. Sometimes an aneurism follows, which must be treated on the principles explained in a foregoing article. See *Aneurism*. Cavallini cured the disease by dividing the vessel, and compression. (*Collez. di Casi Chir. t.* 2. *Firenzie*, 1762.)

TOPICAL BLEEDING.—CUPPING.

This is done by means of a scarificator, and a glass, shaped somewhat like a bell. The scarificator is an instrument containing a number of lancets, sometimes as many as twenty, which are so contrived, that when the instrument is applied to any part of the surface of the body, and a spring is pressed, they suddenly start out, and make the necessary punctures. The instrument is so constructed, that the depth, to which the lancets penetrate, may be made greater or less, at the option of the practitioner. As only small vessels can be thus opened, a very inconsiderable quantity of blood would be discharged, were not some method taken to promote the evacuation. This is commonly done with a cupping glass, the air within the cavity of which is rarified, by the flame of a little lamp, containing spirit of wine, and furnished with a thick wick. This plan is preferable to that of setting on fire a piece of tow, dipped in this fluid, and put in the cavity of the glass; "a clumsy expedient, adding unnecessarily to the sufferings of the patient, by cauterizing the skin; doing harm also by rarifying the air more than necessary within the glass, in consequence of which the edges of the cup compress the cutaneous vessels so much as to obstruct the influx of blood. The larger the glass, if properly exhausted, the less pain does the patient suffer, and the more freely does the blood flow." (See *Mapleson's Treatise on the Art of Cupping*, *p.* 63—65. 12*mo. Lond.* 1813.) When the mouth of the glass is placed over the scarifications, and the rarified air in it becomes condensed as it cools, the glass is forced down on the skin, and a considerable suction takes place.

This professor of the said art remarks, that when the operation is about to be done, a basin of warm water, a piece of fine sponge, and a lighted candle, should be provided. As many of the cupping-glasses as may be judged necessary are to be put in the basin. If sixteen or twenty ounces of blood are to be taken away, four glasses, of a size adapted to the surface to which they are to be applied, will generally be required. Each glass is then to be held for an *instant* over the flame of the spirit-lamp, and immediately placed upon the skin. Upon the quickness with which this is done, the neatness and efficacy of the operation will depend. If dry cupping be only intended, the glasses may be allowed to remain on the skin for a few moments, and be replaced five or six times, with a little variation of their position, in order to prevent the skin from being hurt by their pressure. If the intention be to scarify and take away blood, the glass ought not to remain more than a minute, when the scarificator is to be *instantly* applied; for by the quickness with which the application of the scarificator succeeds the removal of the glass, the patient is saved a degree of pain, which he would otherwise suffer from the making of the punctures. When the glasses are so full as to be in danger of falling off, or the blood is coagulated in them, they should be removed, emptied, and applied again. For the sake of neatness, care should be taken to insert the nail under the upper part of the glass, and remove it so as to keep its bottom downwards, the scarifications being at the same time wiped with a sponge, wet in warm water. The glasses also, previously to each application, should be rinsed in warm water, but not dried. For these, and some other useful directions, see *Mapleson's Treatise*, *p.* 64, &c.

Trials have been made of syringes, calculated for exhausting the air from cupping-glasses; but the plan is not found so convenient as that above described.

A common pledget, or bit of rag, is usually applied as a dressing for the punctures made with a scarificator.

If a little smarting be not minded, Mr. Mapleson prefers the application of arquebusade water, or spirits of wine, as it immediately stops the oozing of blood, and prevents subsequent itching. (*P.* 69.)

LEECHES.

Leeches are often preferable to cupping, which is attended with more irritation than many surfaces, under particular circumstances, can bear, especially when the topical bleeding is to be frequently repeated; and they can be used in cases in which it would not be safe or convenient to employ the lancet.

Formerly medicinal leeches were very abundant in England, but owing to their now being in greater request, and to the draining and cultivation of waste lands, it is necessary to import large supplies from the Continent, chiefly from Bourdeaux and Lisbon. As much imposition prevails in this branch of commerce, it should be understood, that, unless a leech be marked with yellow rings, or spots, or with variegated lines, running the whole length of the back, it will generally be found useless. (See *A Treatise on the Medicinal Leech*, *by J. R. Johnson*, *p.* 133. 8*vo. Lond.* 1816.) When leeches are to be kept in any considerable quantity, this gentleman recommends them to be placed in a large vessel, provided with a false bottom, so perforated as to allow them a ready passage. "This false bottom should be raised from three to six inches above the real bottom, or to such an extent as will admit of a turf, of nearly equal dimensions, being placed between them. It should fit closely to the sides, that the earth may not be disturbed by the frequent introduction of fresh water. It is necessary that the vessel be also furnished with a stop-cock, in order that the water may be drawn off as often as may be considered expedient. But previously to our placing the leeches in this vessel, they should be singly examined. If, on being handled, they contract, and feel hard and firm, it affords the best indication of their being healthy; but should they feel flabby, or exhibit protuberances, or white ulcerous specks on the surface, they should be kept in jars by themselves, the water and the turf of which should be frequently renewed." (*Op. cit. p.* 138.)

Sometimes, leeches cannot be easily made to fix on the part to which they ought to be applied; but they will do so, if the place be first cooled with a cloth dipped in cold water, or if it be moistened with cream or milk, and they be confined in the situation with a small glass.

According to Dr. Johnson, the part, on which they are intended to fix, should be as clean as possible; it should, therefore, be first washed with soap and water, and afterwards with water alone, which will be more necessary should any liniment or embrocation have been used. Leeches are often found to bite better, when removed from the water at least an hour previously to their application. In the common practice of putting as many of them as may be required into a wine-glass, and inverting it upon the part affected, there is the disadvantage, that they frequently retire to the upper part of the glass, and cannot be got down again, without some risk of displacing those which have already fastened. To remedy this inconvenience, Dr. Johnson recommends glass vessels of various sizes and figures, but none of them more than an inch deep. But, in his own practice, he prefers applying leeches with his hand. "Bring a leech towards the part whereon you intend to fix it, and as soon as it begins to extend the head, to seek an attachment, endeavour that it may affix itself to the place required." When it evinces no disposition to bite, a little puncture may be made with a lancet, when the animal will fix itself. "When the patient is fearful of the lancet, and one leech only shall have bitten, where several are required, it may be of use to remove it, which is readily done by inserting the nail of the finger between its mouth and the skin. The blood then flowing from the orifice, will induce the remainder to bite with the greatest avidity. As soon as the leeches are gorged, they drop off; this usually happens within ten or fifteen minutes. Sometimes they remain affixed a considerable time, and become indolent; but they are quickly roused from this state by sprinkling them with a few drops of cold water." (*Johnson*, *Op. cit. p.* 141.) When they fall off, the bleeding may be promoted, if necessary, by fomenting the part. When the bleeding continues longer than is desirable, a slight compress will usually stop it; but in more troublesome cases, the compress must be dipped in brandy, or spirits of wine. In young infants, the hemorrhage from the bites of leeches has sometimes proved fatal, and the same thing may happen in adults. An example of each fact is related by Beauchene (*Gazette de Santé*, *Sept.* 1815.) When the bleeding is very troublesome, Autenrieth advises pieces of charpie to be pushed into the orifices of the bites; a method which, he assures us, is perfectly effectual. (*Tubingen Blätter*, *B.* 2. *St.* 1. *p.* 57.)

In order to make a leech disgorge, it is usual to throw a little salt upon it: in a few seconds the blood is ejected, the leech assumes a coiled form, and is seldom found fit for use again before the end of four or five days. As salt, however, frequently blisters the leech, it has been proposed to empty the animal by regular and uniform pressure; but though Dr. Johnson considers this plan better than the other, he admits that it is scarcely practicable, without injuring the internal structure of the leech. He says, the best method, and that from which the animal suffers the least inconvenience, is pouring a small quantity of vinegar upon its head. Leeches which have been recently applied should always be kept by themselves, and allowed to retain, for their nourishment, about one third of the blood which they extract. For a great deal of valuable information respecting leeches, see Dr. Johnson's work, the title of which is above specified.

When leeches are very scarce, their tails may be snipped off, while they are sucking, and the blood will then flow, drop by drop, from the artificial opening, as fast as the animals suck it; or, with the same view, an incision may be made with a lancet, close to the tail. (*Johnson*, *Op. cit. p.* 144.)

SCARIFICATION WITH A LANCET,

is mostly done in cases of inflamed eyes. An assistant is to raise the upper eyelid, while the surgeon himself depresses the lower one, and makes a number of slight scarifications, where the vessels seem most turgid, trying particularly to cut the largest completely across.

ILL CONSEQUENCES SOMETIMES FOLLOWING BLEEDING IN THE ARM.

1. *Ecchymosis.*

The most common is a thrombus, or ecchymosis, a small tumor around the orifice, and occasioned by the blood insinuating itself into the adjoining cellular substance, at the time when it is flowing out of the vessel. Changing the posture of the arm will frequently hinder the thrombus from increasing in size, so as to obstruct the evacuation of blood But, in some instances, the tumor suddenly becomes so large, that it entirely interrupts the operation, and prevents it from being finished. In these cases, however, the most effectual method of preventing the tumor from becoming still larger, is to remove the bandage. By allowing the bandage to remain, a very considerable swelling may be induced, and such as might be attended with great trouble. If more blood be required to be taken away, it ought to be drawn from another vein, and, what is still better, from a vein in the other arm.

The best applications for promoting the absorption of these tumors, are those containing spirit, vinegar, or the muriate of ammonia. Compresses, wetted with any lotion of this sort, may be advantageously put on the swelling, and confined there with a slack bandage.

2. *Inflammation of the Integuments and subjacent Cellular Substance.*

According to Mr. Abernethy, the inflammation and suppuration of the cellular substance, in which the vein lies, are the most frequent occurrences. On the subsidence of this inflammation, the tube of the vein is free from induration. Sometimes the inflammation is rather indolent, producing a circumscribed and slowly suppurating tumor. Sometimes it is more diffused, and partakes of the erysipelatous nature. On other occasions, the affection is of the phlegmonous kind.

When the lancet has been bad, so as rather to have lacerated, than cut the parts; when the constitution is irritable, and especially when care is not taken to unite the edges of the puncture, and the arm is allowed to move about, so as to make the two sides of the wound rub against each other, inflammation will most probably ensue. The treatment of this case consists in keeping the arm perfectly at rest in a sling, applying the saturnine lotion, and giving one or two mild saline purges. When suppuration takes place, a small poultice is the best local application.

3. *Absorbents inflamed.*

Sometimes, particularly when the arm is not kept properly quiet after bleeding, swellings make their appearance about the middle of the arm, over the large vessels, and on the fore arm, about the mid-space, between the elbow and wrist, in the integuments covering the flexor muscles. The swelling at the inner edge of the biceps is sometimes as large as an egg. Before such swellings take place, the wound in the vein often inflames, becomes painful, and suppurates, but without any perceptible induration of the venal tube, either at this time, or after the subsidence of the inflammation. Pain is felt shooting from the orifice in the vein, in lines up and down the arm, and upon pressing in the course of this pain, its degree is increased. On examining the arm attentively, indurated absorbents may be plainly felt, leading to the tumor at the side of the biceps muscle.

The pain and swelling often extend to the axilla, where the glands also sometimes enlarge. Chordlike substances, evidently absorbents, may sometimes be felt, not only leading from the puncture to the swelling in the middle of the arm, but also from this latter situation up to the axillary glands, and from the wound in the vein down to the enlarged glands at the mid-space between the elbow and wrist, over the flexor muscles of the hand.

The enlarged glands very often proceed to suppuration, and the patient suffers febrile symptoms. It may be suspected that the foregoing consequences arise from the lancet being envenomed, and from the absorption of the virulent matter; but the frequent descent of the disease to the inferior absorbents militates against this supposition.

When the absorbents become inflamed, they quickly communicate the affection to the surrounding cellular substance. These vessels, when indurated, appear like small chords, perhaps of one eighth of an inch in diameter: this substance cannot be the slender sides of the vessels, suddenly increased in bulk, but an induration of the surrounding cellular substance.

The inflammation of the absorbents, in consequence of local injury, is deducible from two causes: one, the absorption of irritating matter; and the other, the effect of the mere irritation of the divided tube. When virulent matter is taken up by the absorbents, it is generally conveyed to the next absorbent gland, where its progress being retarded, its stimulating qualities give rise to inflammation, and, frequently, no evident disease of the vessel, through which it has passed, can be distinguished.

When inflammation of the absorbents happens, in consequence of irritation, the part of the vessel nearest the irritating cause, generally suffers most, while the glands, being remotely situated, are not so much inflamed.

The treatment of the preceding case consists in keeping the arm perfectly quiet in a sling, dressing the puncture of the vein with any mild simple salve, covering the situation of the inflamed lymphatics with linen wet with the saturnine lotion, and giving some gently purging medicine.

When the glandular swellings suppurate, poultices should be applied, and if the matter does not soon spontaneously make its way outward, the surgeon may open the abscess. (See *Abernethy's Essay on this subject.*)

4. *Inflammation of the Vein.*

When the wound does not unite, the vein itself is very likely to inflame. This affection will vary in its degree, extent, and progress. One degree of inflammation may only cause a slight thickening of the venal tube, and an adhesion of its sides. Abscesses, more or less extensive, may result from an inflammation of greater violence, and the matter may sometimes become blended with the circulating fluids, and produce dangerous consequences, or the matter may be quite circumscribed, and make its way to the surface. When the vein is extensively inflamed, a good deal of sympathetic fever is likely to ensue, not merely from the excitement, which inflammation usually produces, but also from the irritation continued along the membranous lining of the vein towards the heart. If, however, the excited inflammation should fortunately produce an adhesion of the sides of the vein to each other, at some little distance from the wounded part, this adhesion will form a boundary to the inflammation, and prevent its spreading further. The effect of the adhesive inflammation in preventing the extension of inflammation along membranous surfaces, was originally explained by Mr. Hunter. In one case, Mr. Hunter applied a compress to the inflamed vein, above the wounded part, and he thought that he thus succeeded in producing an adhesion, as the inflammation was prevented from spreading further. When the inflammation does not continue equally in both directions, but descends along the course of the vein, its extension in the other direction is probably prevented by the adhesion of the sides of the vein to each other. (See *Obs. on the Inflammation of the internal coats of Veins in Trans. of a Soc. for the Improvement of Med. & Chir. Knowledge, Vol.* 1, *p.* 18, *&c.*) More information on this subject will be found under the head of *Veins.*

Mr. Abernethy mentions his having seen only three cases, in which an inflammation of the vein succeeded venesection. In neither of these did the vein suppurate. In one, about three inches of the venal tube inflamed, both above and below the puncture. The integuments over the vessel were very much swollen, red, and painful, and there was a good deal of fever, with a rapid pulse, and furred tongue. The vein did not swell, when compressed above the diseased part. In another instance, the inflammation of the vein did not extend towards the heart, but only downward, in which direction it extended as far as the wrist.

The treatment is to lessen the inflammation of the vein, by the same means, which other inflammations require, and to keep the affection from spreading along the membranous lining of the vessel, towards the heart, by placing a compress over the vein, a little way above the puncture, so as to make the opposite sides of the vessel adhere together.

Mr. Abernethy conceives a case possible, in which the vein may even suppurate, and a total division of the vessel be proper, not merely to obviate the extension of the local disease, but to prevent the pus from becoming mixed with the circulation. Were such a proceeding deemed right, I think Mr. Brodie's method of cutting the vessel would be best. However I have never heard of any case, in which the practice has been adopted. As for the scheme of tying the vein above the diseased part of it, the severe effects frequently following this method, must, as Mr. Dunn has reminded me, render it less eligible, than an incision. In the case of an inflamed vein, Dr. Chapman states, that nothing is so efficacious as blisters; a practice said to have been first suggested by Dr. Physick. (See *a fatal case of Inflammation of the vessel from Venesection in Philadelphia Journ. Feb.* 1824.) I was lately favoured by Mr. Howship with a view of the state of the parts in a case, where a lady had died after an inflammation of the veins of the arm, brought on by venesection: they were considerably thickened, and, in some places quite solid and impervious. (See *Veins.*)

5. *Inflammation of the Fascia of the Fore-Arm.*

Sometimes, in consequence of the inflammation arising from the wound of the lancet in bleeding, the arm becomes very painful, and can hardly be moved. The puncture often remains unhealed, but without much inflammation of the surrounding integuments. The fore-arm and fingers cannot be extended without great pain. The integuments are sometimes affected with a kind of erysipelas; being not very painful, when slightly touched, but when forcibly compressed, so as to affect the inferior parts, the patient suffers a good deal. The pain frequently extends towards the axilla and acromion: no swelling, however, being perceptible in either direction. These symptoms are attended with considerable fever. After about a week, a small superficial collection of matter sometimes takes place a little below the internal condyle: this being opened, a very little pus is discharged, and there is scarcely any diminution of the swelling or pain. Perhaps, after a few days more, a fluctuation of matter is distinguished below the external condyle, and this abscess being opened, a great deal of matter gushes from the wound, the swelling greatly subsides, and the patient's future sufferings are comparatively trivial.

The last opening, however, is often inadequate to the complete discharge of the matter, which is sometimes originally formed beneath the fascia, in the course of the ulna, and its pointing at the upper part of the arm depends on the thinness of the fascia in this situation. The collection of pus descends under the lower part of the detached fascia, and a depending opening for its discharge becomes necessary. This being made, the patient soon gets well.

In these cases, neither the vein nor the absorbents appear inflamed. The integuments are not much affected, and the patient complains of a tightness of the fore-arm. Matter does not always form, and the pliability of the arm, after a good while, gradually returns again.

Mr. Watson relates a case, which was followed by a permanent contraction of the fore-arm. Mr. Abernethy is of opinion, that a similar contraction of the fore-arm, from a tense state of the fascia, may be relieved by detaching the fascia from the tendon of the biceps, to which it is naturally connected. Mr. Watson seems to have obtained success in his first case, by having cut this connexion.

The treatment of an inflamed fascia, in consequence of venesection, has in it no peculiarity. General means for the cure of inflammation should be employed. The limb should be kept quiet, and the inflamed part relaxed. As soon as the inflammation abates, the extension of the fore-arm and fingers ought to be attempted, and daily performed, to obviate the contraction, which might otherwise ensue. (*Abernethy.*)

Mr. C. Bell objects to calling the affection an inflammation of the fascia, because he sees no proof of this part being inflamed, and he conceives that the symptoms proceed from the inflammation spreading in the cellular membrane, and passing down among the muscles, and under the fascia. The fascia acts as a bandage, and from the swelling of the parts beneath, it binds the arm, but is not itself inflamed, and contracted. When necessary to divide the fascia, Mr. Charles Bell thinks it would be better to begin an incision near the inner condyle of the humerus, and to continue it some inches down the arm, rather than perform the nice, if not dangerous operation, of cutting the fascia, at the point, where the expansion goes off from the round tendon of the biceps.

When the elbow joint and fore-arm continue stiff after all inflammation is over, Mr. C. Bell recommends frictions with camphorated mercurial ointment, &c. and the arm to be gradually brought into an extended state by placing a splint on the fore part of the limb. (*Operative Surgery, Vol.* 1, *p.* 65.)

6. *Ill Consequences of a Wounded Nerve.*

Mr. Abernethy informs us, that Mr. Pott used to mention two cases, in which the patients suffered distracting pains, followed by convulsions and other symptoms, which could only be ascribed to nervous irritation, arising from a partial division of the nerve, and he recommended its total division, as a probable remedy. Dr. Monro related similar cases, in which such treatment proved successful.

Hence, it is highly necessary to know the characteristic symptoms of the case, particularly, as all the foregoing cases would be exasperated by the treatment just now alluded to. It is to Mr. Abernethy that we are indebted for several valuable remarks elucidating this subject. He informs us, that the two cutaneous nerves are those which are exposed to injury. Most frequently all their branches pass beneath the veins, at the bend of the arm; but sometimes, although the chief rami go beneath these vessels, many small filaments are detached over them, which it is impossible to avoid wounding in phlebotomy.

Mr. Abernethy thinks the situation of the median nerve renders any injury of it very unlikely. If, however, a doubt should be entertained on this subject, an attention to symptoms will soon dispel it. When a nerve is irritated at any part, between its origin and termination, a sensation is felt, as if some injury were done to the parts, which it supplies. If, therefore, the cutaneous nerves were injured, the integuments of the fore arm would seem to suffer pain; if the median nerve, the thumb, and two next fingers would be painfully affected.—(*Abernethy.*)

What are the ills likely to arise from a wounded nerve? If it were partially cut, would it not, like a tendon, or any other substance, unite? It seems probable that it would do so, as nerves, as large as the cutaneous ones of the arm, are very numerous in various situations of the body, and are partially wounded in operations, without any peculiar consequences usually ensuing. The extraordinary pain sometimes experienced in bleeding, may denote that a cutaneous nerve is injured. The situation of the nervous branches is such, that they must often be partially wounded in the operation, though they probably unite again, in almost all cases, without any ill consequences. Yet, says Mr. Abernethy, it is possible, that an inflammation of the nerve may accidentally ensue, which would be aggravated, if the nerve were kept tense, in consequence of its partial division. Mr. Abernethy thinks the disorder arises from inflammation of the nerve in common with the other wounded parts. This gentleman supposes, that an inflamed nerve would be very likely to communicate dreadful irritation to the sensorium, and that a cure would be likely to arise from intercepting its communication with that organ.

The general opinion is, that the nerve is only partially divided, and that a complete division would bring relief. Mr. Pott proposed enlarging the original orifice. It is possible, however, that the injured nerve may be under the vein, and, if the nerve be inflamed, even a total division of it, at the affected part, would, perhaps, fail in relieving the general nervous irritation, which the disease has occasioned. To intercept the communication of the inflamed nerve with the sensorium, however, promises perfect relief. This object can only be accomplished by making a transverse incision above the orifice of the vein. The incision need not be large, for the injured nerve must lie within the limits of the original orifice, and it need only descend as low as the fascia of the fore-arm, above which all the filaments of the cutaneous nerves are situated. As the extent of the inflammation of the nerve is uncertain, Mr. Abernethy suggests even making a division of the cutaneous nerve still further from the wound made in bleeding.

Examples are recorded, in which not only extraordinary pain was occasioned by the prick of the lancet; but, erysipelas of the skin ending in gangrene of the whole limb, and the death of the patient. (*Richerand, Nosog. Chir. T.* 2, *p.* 390, *Edit.* 2.) A case, in which the greater part of the integuments of the arm, had been destroyed by erysipelas, thus produced, I once saw under the care of Mr. Vincent, in St. Bartholomew's hospital.

In former times, it was customary to refer many of the bad symptoms occasionally following venesection, to a puncture of the tendon of the biceps; but, this doctrine is now in a great measure renounced, the experiments of Haller having completely proved, that tendons and aponeuroses are, comparatively speaking, parts endued with little or no sensibility.

In the foregoing account, the various ill consequences occasionally arising from venesection are represented separately: no doubt, in some cases, they may occur together.

See *R. Butler's Essay concerning Blood-letting, &c. 8vo. Lond.* 1734. *M. Martin, Traité de la Phlébotomie et de l'Artériotomie, 8vo. Paris,* 1741. *Qucsnay, Traité des Effets et de l'Usage de la Saignée,* 12*mo. Paris. G. Vicusseux, De la Saignée, et de son Usage dans la plupart des Maladies,* 8*vo. Paris,* 1815. *J. J. Walbaum, De Venæsectione, Gott.* 1749. (*Haller, Disp. Chir.* 5, 477.) *B. Bell's System of Surgery. Essay on the ill Consequences, sometimes following Venesection, by J. Abernethy. Medical Communications, Vol.* 2. *Richerand, Nosographie Chirurgicale, T.* 2, *p.* 416, *Edit.* 4. *J. Hodgson on the Diseases of Arteries and Veins,* 8*vo. Lond.* 1815. *B. Travers in Surgical Essays, part* 1. 8*vo. Lond.* 1818. *Chapman, in Philadelphia Journ. Feb.* 1824. *M. Freteau, Traité Elementaire sur l'Emploi legitime et methodique des Emissions Sanguines, &c.* 8*vo. Paris,* 1816. *Mapleson's Treatise on the Art of Cupping,* 12*mo. Lond.* 1813; *and Dr. J. R. Johnson's valuable Treatise on the Medicinal Leech, including its Medical and Natural History, with a description of its Anatomical Structure, and Remarks upon the Diseases, Preservation, and Management of Leeches,* 8*vo. Lond.* 1816.

BLEEDING. (See *Hemorrhage and Arteries.*)

BLE'NORRHAGIA, or *Blénorrhœa.* (from βλεννος, mucus, and ρεῶ, to flow.) A discharge of mucus. Swediaur, who maintains, that gonorrhœa is attended with a mucous, and not a purulent discharge, prefers the name of blenorrhagia for the disease. However, in treating of gonorrhœa, we shall find, that this last appellation is itself not altogether free from objections.

BLEPHAROPTOSIS. (from βλεφαρον, the eyelid, and πτωσις, a falling down.) Called also *ptosis.* An inability to raise the upper eyelid. (See *Ptosis.*)

BLEPHARO'TIS. An inflammation of the eyelids.

BLINDNESS. This is an effect of many diseases of the eye. See, particularly, *Amaurosis; Cataract; Cornea, Opacities of; Gutta Serena; Hydrophthalmia; Leucoma; Ophthalmy; Pterygium; Pupil, closure of; Staphyloma, &c.*

BLISTERS. Applications, which, when put on the skin, raise the cuticle in the form of a vesicle, filled with a serous fluid. Various substances produce this effect; but, the powder of cantharides is what operates with most certainty and expedition, and is now invariably made use of for the purpose. The blister plaster is thus composed; ℞ *Cantharidis in pulv. subtilissimum tritæ* ℔j, *Emplastri ceræ* lbiss. *Adipis præp.* lbss. The wax plaster and lard being melted, and allowed to become nearly cold, the powdered cantharides are afterwards to be added.

When it is not wished to maintain a discharge from the blistered part, it is sufficient to make a puncture in the cuticle to let out the fluid; but, when the case requires a secretion of pus to be kept up, the surgeon must remove the whole of the detached cuticle with a pair of scissars, and dress the excoriated surface in a particular manner. Practitioners used formerly to mix powder of cantharides with an ointment, and dress the part with this composition. But, such a dressing not unfrequently occasioned very painful affections of the bladder, a scalding sensation in making water, and most afflicting stranguries. An inflammation of the bladder, ending fatally, has been thus excited. The treatment of such complaints consists in removing every particle of cantharides from the blistered part, which is to be well fomented, and making the patient partake abundantly of mucilaginous drinks. Camphor is now suspected to prove more hurtful, than useful,

These objections to the employment of salves, containing cantharides, for dressing blistered surfaces, led to the use of mezereon, euphorbium, and other irritating substances, which, when incorporated with ointment, form very proper compositions for keeping blisters open, without the inconvenience of irritating the bladder, like cantharides.

The favourite application, however, for keeping open blisters, is the powder of savine, which was brought into notice by Mr. Crowther, in the first edition of his book on the White Swelling. In the last edition, this gentleman remarks, that he was led to the trial of different escharotic applications, in the form of ointment, in consequence of the minute attention, which caustic issues demand; and among other things, he was induced to try powdered savine, from observing its effects in the removal of warts. Some of the powder was first mixed with white cerate, and applied as a dressing to the part, that had been blistered; but, the ointment ran off, leaving the powder dry upon the sore, and no effect was produced. Mr. Crowther next inspissated a decoction of savine, and mixed the extract with the ointment, which succeeded better, for it produced a great and permanent discharge. At last, after various trials, he was led to prefer a preparation analogous to the unguentum sambuci P. L. The following formula answers every desirable purpose: ℞ *Sabinæ recentis contusæ* lbij. *Ceræ flavæ* lbj. *Adipis suillæ* lbiv. *Adipe et cera liquefactâ, incoque sabinam et cola.*

The difference of this formula from that which Mr. Crowther published in 1797, only consists in using a double proportion of the savine leaves. The ceratum sabinæ of Apothecaries' Hall, he says, is admirably made; the fresh savine is bruised with half the quantity of lard, which is submitted to the force of an iron press, and the whole is added to the remainder of the lard, which is boiled until the herb begins to crisp; the ointment is then strained off, and the proportion of wax, ordered, being previously melted, is added. On the use of the savine cerate, immediately after the cuticle, raised by the blister, is removed, it should be observed, says Mr. Crowther, that experience has proved the advantage of using the application lowered by a half, or two-thirds, of the unguentum ceræ. An attention to this direction will produce less irritation and more discharge, than if the savine cerate were used in its full strength. He found fomenting the part with flannel wrung out of warm water, a more easy, and preferable way of keeping the blistered surface clean, and fit for the impression of the ointment, than scraping the part, as has been directed by others. An occasional dressing of the unguentum resinæ flavæ, he found very useful in rendering the sore free from an appearance of slough, or rather dense lymph, which is sometimes so firm in its texture, as to be separated by the probe, with as much readiness, as the cuticle is detached after blistering. As the discharge diminishes, the strength of the savine dressing should be proportionally increased. The ceratum sabinæ must be used, in a stronger, or weaker degree, in proportion to the excitement produced on the patient's skin. Some require a greater stimulus, than others, for the promotion of the discharge, and this can only be managed by the sensations, which the irritation of the cerate occasions.

Mr. Crowther tried ointments, containing the flowers of the clematis recta, the capsicum, and the leaves of the digitalis purpurea. The two first produced no effect: the last was very stimulating. He also tried caustic potassa, mixed with spermaceti cerate, in the proportion of one dram to an ounce: it proved very stimulating, but produced no discharge. One grain of the oxymuriate of mercury, blended with two ounces of the above cerate, proved so intolerably painful, that at the end of two hours, it became necessary to remove the dressing; and the patient was attacked with a severe ptyalism. (*Practical Observations on the White Swelling, &c., a new edition, by B. Crowther*, 1808.)

Instead of keeping a blister open, it is frequently a judicious plan to renew the application of the emplastrum cantharidis, after healing up the vesication first produced, and to continue, in this manner, a succession of blisters, at short intervals, as long as the circumstances of the case may demand. Where the skin is peculiarly irritable, and, particularly, in young children, where the emplastrum cantharidis sometimes acts so violently as to produce sloughing, or, in any cases, where the plaster produces strangury and irritation of the urinary organs, I am informed, that the inconvenience may be avoided, and the cuticle raised very well, if a piece of silk paper be interposed between the plaster and the integuments. Mr. A. T. Thompson recommends for the same purpose a piece of thin gauze, wet with vinegar, and applied smoothly and closely over the plaster. (*Dispensatory, p.* 717, *Ed.* 2.) For infants, a proportion of opium has sometimes been added to the emplastrum lyttæ, in order to render its action less violent; a proposal made I believe, by the late Mr. Chevalier. Others recommend the plan of not letting the blister continue so long applied to children, as to other descriptions of patients. (See *Paris's Pharmacologia, Vol.* 2, *p.* 186, *Ed.* 5.)

BOIL. (See *Furunculus.*)

BONES *Diseases of. See Antrum; Caries; Exostosis; Joints; Mollities; Necrosis; Osteosarcoma; Rickets;* and *Venereal Disease.* The following works, relative to the pathology of the bones, deserve notice:—*F. C. Spoendli, De Sensibilitate Ossium Morbosa*, 4to. *Gott.* 1814. *A. Murray, De Sensibilitate Ossium Morbosa; (Ludw. Script. Neur.* 4.) *O. Mur-*

ray, Diss. Acad. de Sensibilitate Ossium Morbosa. Frank. Del. Op. 12. *J. G. Sturmius, De Vulneribus Ossium. Helmst.* 1743. *A. Bonn, Tab. Ossium Morbosorum præcipue Thesauri Hoviani, fol. Amst.* 1785, 88. *C. F. Clossius, ueber die Krankheiten der Knochen, 12mo. Tubing.* 1799. *A. G. Naumann, De Ostitide, 4to. Lips.* 1818. *R. Nesbitt, Human Osteogeny; two Lectures on the nature of Ossification, 8vo. Lond.* 1736. *Sandifort, Museum Anatomicum Lugduno Batavæ Descriptum, 2 Vol. fol. Lugd.* 1793. *Weidmann, De Necrosi Ossium, fol. Francof.* 1793; *Brodie on Diseases of Joints, 8vo. Lond.* 1818; *Howship in Med. Chir. Trans.; and various other publications specified at the end of the article, Necrosis.*

BOUGIE,—Is a smooth flexible instrument, which is introduced into the urethra for the cure of diseases of that passage; (See *Urethra,*) and is so named from its generally containing wax in its composition, and bearing some resemblance to a wax taper, in French, bougie. However, the kinds of bougies are various, and some of them, employed in modern surgery, so far from having any similitude to a wax-taper, are formed altogether of metal. They admit of being divided into those which are solid; and others, which are hollow, and are more commonly named catheters. (See *Catheter.*)

The exact period, when bougies were first used, is a doubtful point in the history of surgery. By Andrew Lacuna, a Spanish physician, the invention is ascribed to a Portuguese empiric, and in 1551, the same author published what had been communicated to him upon this subject. In the year 1554, Amatus Lusitanus published a work, in which he refers to several witnesses to prove, that the empirical practitioner, above alluded to, had learned from him the use of bougies, while, on the other hand, he candidly owns, that he himself was indebted to Aldereto, of Salamanca, for a knowledge of these instruments. In 1553, however, Alph. Ferri, of Naples, endeavoured to show, that his acquaintance with the utility of bougies reached as far back as 1548, and, of course, that he had anticipated Lacuna, and perhaps even Aldereto. But, instead of representing himself as the original inventor of bougies, he mentions that they were known to Alexander of Tralles, which, if true, carries back the invention to the sixth century. A. Ferri, also, before describing bougies and escharotic ointments, mentions various means for examining the state of the urethra, and, amongst other things, cylinders made of flexible lead, and of different sizes. Escharotic ointments for what were termed *carnosities* of the urethra, and bougies, were also described by Petronius in 1565, and afterwards by A. Paré. The oldest bougies, which were wicks of cotton, or thread, covered with wax, and escharotic plasters, were in time succeeded by those composed of linen smeared with wax. This change was made with the view of letting them have a hollow construction: an improvement, which was first noticed by Fabricius ab Aquapendente. (*Op. Chir.* 1617.)

In the middle of the 17th century, the manner of making and using bougies was well known to Scultetus, as appears from his Armamentarium Chirurg. tab. 13, fig. 9, 10.

The making of bougies has now become so distinct a trade, that it may be considered superfluous to treat of the subject in this dictionary. However, though a surgeon may not actually choose to take the trouble of making bougies himself, he should understand how they ought to be made. Swediaur recommends the following composition: ℞ Ceræ flavæ lbj. Spermatis ceti ʒiij, Cerussæ acetatæ ʒv. These articles are to be slowly boiled together, till the mass is of proper consistence. Mr. B. Bell's bougie plaster is thus made: ℞ Emplastri lythargyri ℥iv, Ceræ flavæ ℥iss, Olei Olivæ ʒiij. The two last ingredients are to be melted in one vessel, and the litharge plaster in another, before they are mixed. In Wilson's Pharmacopœia Chirurgica, I observe this formula: ℞ Olei Olivæ lbiis, Ceræ flavæ lbj, Minii lbiss. Boil the ingredients together over a slow fire, till the minium is dissolved, which will be in about four or six hours. The composition for bougies is now very simple, as modern surgeons place no confidence in the medicated substances, formerly extolled by Daran. The linen, which may be considered as the basis of the bougie, is to be impregnated with the composition, which is generally wax and oil, rendered somewhat firmer by a proportion of resin. Some saturnine preparation is commonly added, as the urethra is in an irritable state, and the mechanical irritation might otherwise increase it. Of whatever composition bougies are made, they must be of different sizes, from that of a knitting-needle to that of a large quill, and even larger. Having spread the composition, chosen for the purpose, on linen rag, cut this into slips, from six to ten inches long, and from half an inch, to an inch, or more in breadth. Then dexterously roll them on a glazed tile into the proper cylindrical form. As the end of the bougie, which is first introduced into the urethra, should be somewhat smaller than the rest, the slips must be rather narrower in this situation, and, when the bougies are rolled up, that side must be outward, on which the plaster is spread.

Daran, and some of the older writers, attributed the efficacy of their bougies to the composition used in forming them. On the contrary, Mr. Sharp apprehended that it was chiefly owing to the pressure, which was made on the affected part; and Mr. Aiken adds, that as bougies of very different compositions, succeed equally well in curing the same diseases in the urethra, it is plain, that they do not act from any peculiar qualities in their composition, but by means of some common property, probably their mechanical form.

As the healthy as well as the diseased parts are exposed to the effects of bougies made of very active materials, modern surgeons always prefer such as are made of a simple unirritating composition.

Plenck recommended bougies of catgut, which may be easily introduced into an urethra, even when it is greatly contracted, their size being small, their substance firm, and dilatable by moisture. It is objected to catgut, however, that it sometimes expands beyond the stricture, and gives great pain on being withdrawn. Formerly, catgut bougies were sometimes coated with elastic gum, a valuable material, of which I shall next speak.

The invention of elastic bougies and catheters originated with Bernard, a silversmith at Paris, who, in the year 1779, presented some instruments of this kind to the Academy of Surgery, which period was prior to the claim made by Professor Pickel of Wurzburg to the discovery. (See *Journ. de Med. an* 1785.)

For the composition of bougies, elastic resin, or gum, is thought to be very desirable, as it unites firmness and flexibility. Mr. Wilson, in his Pharmacopœia Chirurgica, is inclined to think that the art of making these instruments, consists in finding a suitable solvent for the Indian gum. As this substance, if dissolved in æther, completely recovers its former elasticity, upon the evaporation of this fluid, it is supposed that æther, though rather too expensive, would answer.

I find it positively asserted, however, in a modern work of great repute, that the idea of elastic gum being the substance really employed, is a mistake, as the material used is nothing more than linseed oil, boiled for a considerable time, and used as a varnish for the silk, linen, or cotton tube. (See *Dict. des Sciences Méd. art. Bougie.*)

Very cheap and good elastic gum bougies are made by Feburier, No. 51, Rue du Bac at Paris, who has twelve different sizes. His elastic gum catheters are also well made, though, for smoothness and regularity, I think they are not equal to some, which are now constructed in London; but, I believe, Feburier's smallest size is rather less than any which are made in this city; an advantage, which no doubt our artists will soon be able to give their productions. This ingenious mechanic does not employ catgut in the composition of the elastic gum bougies, for which he is so celebrated. These bougies are most excellent, when you can get them to pass; for they dilate the stricture with the least possible irritation. But, sometimes, they cannot be introduced, when a wax bougie can; and from the trials, which I have made of them, I conceive this arises from their elasticity and continual tendency to become straight, when they reach the perinæum, so that the point presses on the lower surface of the urethra. Hence, when the obstruction is on that side, it must be very difficult to get the end of the bougie over it.

A few years ago, Mr. Smyth discovered a metallic composition, of which he formed bougies, to which some practitioners impute very superior qualities. These bougies are flexible, have a highly polished surface, of a silver hue, and possess a sufficient degree of firmness for any force necessary in introducing them for the cure of strictures of the urethra. The advocates for the metallic bougies assert, that such instruments exceed any other bougies, which have yet been invented, and are capable of succeeding in all cases, in which the use of a bougie is proper. They are either solid, or hollow, and are said to answer extremely well as catheters; for, they not only pass into the bladder with ease, but may also be continued there for any convenient space of time, and thus produce essential benefit. (*W. Smyth, Brief Essay on the Advantages of flexible Metallic Bougies*, 8*vo. Lond.* 1804.) The greatest objection, which has been urged against them, is, that they are attended with a risk of breaking. I have heard of an eminent surgeon being called upon to cut into the bladder, in consequence of a metallic bougie having broken, and a piece of it passing into that organ, where it became a cause of the severe symptoms which are commonly the effect of a stone in the bladder. For the particulars of an interesting case, in which a metallic bougie broke in the urethra, the reader may consult *London Med. Repository, Vol.* 9. *No.* 51. It has also been objected to metallic bougies, that, although they are sufficiently flexible, they are quite destitute of elasticity.

The bougie, with its application, says Mr. Hunter, is perhaps one of the greatest improvements in surgery, which these last thirty, or forty years have produced. "When I compare the practice of the present day, with what it was in the year 1750, I can scarcely be persuaded, that I am treating the same disease. I remember, when, about that time, I was attending the first hospitals in the city, the common bougies were, either a piece of lead, or a small wax candle, and, although the present bougie was known then, the due preference was not given to it, nor its particular merit understood, as we may see from the publications of that time."

Daran was the first, who improved the bougie, and brought it into general use. He wrote professedly on the diseases for which it is a cure, and also of the manner of preparing it, but, he has introduced much absurdity into his descriptions of the diseases, the modes of treatment, and the powers and composition of his bougies.

When Daran published his observations on the bougie, every surgeon tried to discover the composition, and each conceived, that he had found it out, from the bougies, which he composed producing the effects described by Daran. It was never suspected, that any extraneous body, of the same shape and consistence, would do the same thing. (*See a Treatise on the Venereal Disease, p.* 116. *Sharp's Critical Inquiry, Ch.* 4; *Aikin on the External Use of Lead; Daran Obs. Chir. sur les Maladies de l'Uretre,* 12*mo. Paris,* 1748, *and* 1768; *Olivier, Lettre dans laquelle on démontre les avantages que l'on peut retirer de l'usage des bougies creuses, &c.* 8*vo. Paris,* 1750; *Desault, Journ. de Chir. T.* 2, *p.* 375, *and T.* 3, *p.* 123, 1792; *Smyth's Brief Essay on flexible metallic bougies,* 8*vo. Lond.* 1804; *Dict. des Sciences Medicales, T.* 3, *p.* 265, *&c.* 8*vo. Paris,* 1812.)

Of armed bougies, as well as of some other kinds, and of the manner of using bougies in general, I shall speak in the article *Urethra, Strictures of.*

BRAIN. (For concussion, compression of, &c. see *Head, Injuries of;* for the hernia of, see *Hernia Cerebri.*)

BREAST. (See *Mammary Abscess; Mamma, Removal of; Cancer, &c.*)

BRONCHOCELE. (from βρογχος, the windpipe, and κηλη, a tumour.) The Swiss call the disease *gotre,* or *goitre.* Heister thought it should be named *tracheocele.* Prosser, from its frequency in the hilly parts of Derbyshire, called it the *Derbyshire neck;* 1769. and, not satisfied respecting the similitude of this tumor to that observed on the necks of women on the Alps, the *English Bronchocele.* By Alibert the disease is called *Thyrophraxia.*

1. The simple bronchocele or thyrophraxia, is the most common form of the disease, and is a

mere enlargement of the thyroid gland. The integuments covering the part, are quite unchanged. Women are observed to be more subject to it than men. It is also well known to be in general free from danger, the office of the thyroid gland not being of such importance in the animal economy, as to be essential to the continuance of life. Alibert has seen one example, in which the tumor became cancerous, and destroyed the mother of a family.

Becomes Cancerous

2. The compound bronchocele is that which presents the greatest variety, and astonishes every beholder. Sometimes a more or less voluminous cyst is formed round it, filled with a pultaceous, or purulent matter. Sometimes, in compound bronchoceles, calcareous, and other heterogenous substances are found. In two cases, Alibert found, on the outside of the enlarged gland, a yellow fatty mass; and, in a third instance, the gland itself formed a true sarcoma. (*Nosologie Naturelle, T.* 1, *p.* 464—465, *folio, Paris,* 1817.)

The term *bronchocele,* always signifies in this country, an enlargement of the thyroid gland, which, with the disease of the surrounding parts, sometimes not only occupies all the space from one angle of the jaw to the other, but forms a considerable projection on each side of the neck, advancing forward a good way beyond the chin, and forming an enormous mass, which hangs down over the chest. The swelling, which is more or less unequal, in general has a soft spongy elastic feel, especially when the disease is not in a very advanced state; but, no fluctuation is usually perceptible, and the part is exceedingly indolent. The skin retains nearly its ordinary colour; but, when the tumor is of very long standing, and great size, the veins of the neck become more or less varicose.

According to Prosser, the tumor generally begins between the eighth and twelfth years. It enlarges slowly during a few years; but, at last, it augments rather rapidly, and forms a bulky pendulous tumor. Women are far more subject to the disease, than men, and the tumor is observed to be particularly apt to increase rapidly during their confinement in childbed. Sometimes bronchocele affects the whole of the thyroid gland, that is to say the two lateral lobes, and the intervening portion, and it is in this kind of case, that it is not unusual to remark three distinct swellings, for the most part of unequal size. Frequently, only one lobe is affected; while, in many other cases, the three portions of the thyroid gland are all enlarged, and so confounded together, that they make, as it were, only one connected globular mass. Finally, in some dissections, the thyroid gland has been found quite unchanged, the whole of the tumor having consisted of a sarcomatous disease of the adjacent lymphatic glands and cellular membrane. (*Postiglione, p.* 21.) When only one lobe of the thyroid gland is affected, it may extend in front of the carotid artery, and be lifted up by each diastole of this vessel, so as to have the pulsatory motion of an aneurism. (*A. Burns' Surgical Anatomy of the Head and Neck, p.* 195, *and Parisian Chirurgical Journ. Vol.* 2, *p.* 292, 293.) + Alibert believes, that he first made the remark, that the right lobe was more frequently enlarged, than the left. (*Nosol. Nat. T.* 1, *p.* 465.) The same thing was invariably noticed in every case seen by Mr. Rickwood in the neighbourhood of Horsham in Sussex. (See *Med. and Phys. Journ. for Aug.* 1823.)

The ordinary seat of bronchocele, as Flajani remarks, is the thyroid gland; but, sometimes cysts are formed in the cellular membrane. (*Collez. d'Oss. T.* 3, *p.* 277.) And Postiglione also observes, that the swelling is sometimes encysted, and filled with matter of various degrees of consistence, resembling honey, &c.; in some cases, it is emphysematous, or filled with air; and, in other instances, it is sarcomatous, having the consistence of a gland, which is enlarged, but not scirrhous. These different characters prove, says he, that the treatment ought not to be the same in all cases. (*Memoria sulla Natura del Gozzo, p.* 20.)

Bronchocele is common in some of the valleys of the Alps, Apennines and Pyrennees. Indeed, there are certain places, where the disease is so frequent, that hardly an individual is totally exempt from it. Larrey, in travelling through the valley of Maurienne, noticed, that almost all the inhabitants were affected with goitres of different sizes, whereby the countenance was deformed, and the features rendered hideous. (*Mém. de Chir. Mil. T.* 1, *p.* 123.) And Postiglione remarks, that in Savoy, Switzerland, the Tyrol, and Carinthia, there are villages, in which all the inhabitants without exception have these swellings, the position and regularity of which are there considered as indications of beauty. (*Memoria sulla Natura del Gozzo, p.* 22.) In many, the swelling is so enormous, that it is impossible to conceal it by any sort of clothing. A state of idiotism is another affliction, which is sometimes combined with *goitre,* in countries, where the latter affection is endemic. However, all, who have the disease, are not idiots, or cretins as they have been called; and in Switzerland, and elsewhere, it is met with in persons who possess the most perfect intellectual faculties. Where bronchocele and cretinism exist together, Foderé, and several other writers, ascribe the affection of the mind to the state of the thyroid gland. (See *Traité sur le Goître et le Cretinisme,* 8*vo. Paris, an* 8.) However, this opinion appears to want foundation, since the mental faculties are from birth weak, and, in many the idiotism is complete, where there is no enlargement of the thyroid gland, or where the tumor is not bigger than a walnut, so that no impediment can exist to the circulation to or from the brain. (*Burns on the Surgical Anatomy of the Head and Neck, p.* 192.) The direct testimony of Dr. Reeve also proves, that, in countries, where cretins are numerous, many people of sound and vigorous minds have bronchocele. (See *Dr. Reeve's Paper on Cretinism, Edin. Med. and Surgical Journal, Vol.* 5, *p.* 31.) Hence, as Mr. A. Burns remarked, the combination of bronchocele and cretinism must be considered as accidental; a truth, that seems to derive confirmation from the fact, that, in some parts of this country, bronchocele is frequent, where cretinism is seldom or never seen.

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Bronchocele is not confined to Europe: it is met with in almost every country on the globe. Professor Barton, in his travels amongst the Indians, settled at Oneida, in the state of New

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York, saw the complaint in an old woman, the wife of the chief of that tribe. From this woman, Barton learned, that bronchoceles were by no means uncommon amongst the Oneida Indians, the complaint existing in several of their villages. He found, also, that the disease resembled that seen in Europe, in respect to its varieties. He did not indeed himself see the pendulous bronchocele, which descends over the breast; but, he understood, that it was not uncommon amongst the women on the banks of the Mohawk river, who wore a particular dress for its concealment. In North America, bronchocele attacks persons of every age; but, it is most frequently seen in adults; a difference from what is noticed in Europe. Bronchocele is said to be frequent in Lower Canada. Bonpland, the companion of Humboldt, informed Alibert, that the disease was endemic in New Granada, and that it prevailed in such a degree in the little towns of Honda and Monpa, on the banks of the Magdalen river, that scarcely any of the inhabitants were free from it. The blacks, and those who led an active laborious life, however, are reported to be free from the complaint. Some of the natives of the Isthmus of Darien, are said to be terribly disfigured by it. (*Alibert, Nosol. Nat. T.* 1, *p.* 469. *Also Observations sur quelques phénomènes peu connus qu'offre le goître sous les tropiques, dans les plaines et sur les plateaux des Andes, par A. de Humboldt, in Journ. de Physiologie par F. Magendie, T.* 4, *p.* 109. *Paris,* 1824.)

In European women, bronchocele usually makes its appearance at an early age, generally between the eighth and twelfth year, and it continues to increase gradually for three, four, or five years, and is said sometimes to enlarge more, during the last half year, than for a year, or two, previously. It does not generally rise so high as the ears, as in the cases mentioned by Wiseman. Sometimes, however, this happens, as we see in the case of Clement Desenne, of whom Alibert has given an engraving. In this patient, a part of the tumor, as large as a hen's egg, projected into the mouth. (*Nosol. Nat. T.* 1, *p.* 466.) The swelling extended from the ears to the middle of the breast. A seton produced a partial subsidence of it; but, when it was withdrawn, the orifices closed. After two years more, the swelling became painful, suppuration took place, and fifteen pints of matter were discharged; and six ounces every day after the swelling had burst, came away with the dressings for three months, but, notwithstanding all this suppuration, and more afterwards, the tumor was only partially lessened. The disease mostly has a pendulous form, not unlike, as Albucasis says, the flap, or dewlap of a turkey-cock, the bottom being the largest part of the tumor. Alibert mentions a case, in which the swelling hung down to the middle of the sternum, and the large mass, which was quite a burden to the patient, used to become hard, and as it were frozen, in very cold weather. This author, however, cannot be right, when he adds, that it was an inert body, *destitute of vitality!* (*Nosol. Nat. T.* 1, *p.* 466). In another curious instance, the tumor formed a long cylinder, which reached down to the middle of the thigh, the diameter becoming gradually smaller downwards. (*P.* 468.) The common seat of bronchocele is the thyroid gland; but, frequently, the surrounding cellular membrane is more or less thickened, and contributes to the swelling. Sometimes also the neighbouring lymphatic glands are affected, when its base is widened, and extends from one side of the neck to the other. In this circumstance, the swelling gradually loses itself in the surrounding parts, and is not circumscribed, as in ordinary instances. (*Postiglione Mem. sulla Natura del Gozzo, p.* 20.) It is soft, or rather flabby to the touch, and somewhat moveable, but after a few years, when it has ceased enlarging, it becomes firmer, and more fixed. When the disease is very large, it generally occasions a difficulty of breathing, which is increased by the patient's catching cold, or attempting to run. In some subjects, the tumor is so large, and affects the breathing so much, that a loud wheezing is occasioned; but, there are many exceptions to this remark. Sometimes, when the swelling is of great size, patients suffer very little inconvenience; while others are greatly incommoded, though the tumor is small. In general, the inconvenience is trivial. The voice is sometimes rendered hoarse, and, in particular cases, the difficulty of speech is very considerable. (See *Flajani, Collez. d'Oss. T.* 3, *p.* 271.)

The difficulty of respiration, produced by the pressure of the tumor, and the enlargement of other glands, as this author remarks, is the most dangerous effect of the disease, since by disordering the pulmonary circulation, it renders the pulse irregular and intermittent, and a strong throbbing is excited in the region of the heart, followed by fatal disease of the lungs themselves: consequences, often not suspected to have any connexion with the bronchocele, though it is in reality the immediate cause of them. (*Vol. cit. p.* 278.)

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The causes of bronchocele are little known. To the doctrine, that bronchocele is caused by the earthy impregnation of water used for drink, the following objections offer themselves. 1. The water of Derbyshire, in districts, where this disease is considered endemic, contains much supercarbonate of lime; but that in common use about Nottingham, where the disease is also prevalent, is impregnated with sulphate of lime. However, that the disease is not produced by water, impregnated with sulphate of lime, is evident; for, as Alibert observes, the waters of Saint-Jean, Saint-Sulpice, and Saint-Pierre, where bronchocele is frequent, contain much less of this earth than the waters of Upper Maurienne, where the disease is hardly ever noticed, though the houses are built upon a vast quarry of gypsum. The same fact was observed by Bonpland in New Granada. (*Nosol. Nat. T.* 1, *p.* 471.) Nor, as Foderé explained, can the cause of the disease be correctly referred to the use of any particular kind of food. Certain localities, however, seem to contribute to its frequency; for, this author observed, that the disease is not prevalent in very high places, nor in open plains; but, that it becomes more and more common, as we descend into deep valleys, made by torrents, where there is a good deal of marsh, and abundance of fruit-trees. The air is here constantly humid. 2. Abstinence from unboiled water does not diminish, or interrupt the gradual progress of the disease. 3. Patients are cured of the disease, who still continue to drink water from the same

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source as before, without taking any precaution, as boiling, &c. 4. The disease in this country is less frequently found among men. 5. Many instances may be related of a swelling in the neck, sometimes very painful, and generally termed bronchocele, being produced very suddenly, by difficult parturition, violent coughing, or any other unusually powerful effort. (See *Edin. Med. and Surgical Journal, Vol.* 4, *p.* 279.) When the gland is suddenly enlarged during a violent exertion, the distention is said to be produced by the passage of air from the trachea into the substance of the thyroid gland, and surrounding cellular membrane. But, whether this statement be a fact or not, it is unquestionably true, that, in many patients, the tumor always increases, when they speak loud, sing, or make any effort. (*Flajani Collez. d'Oss. &c. T.* 3, *p.* 276, *and Postiglione, p.* 24.) The disease is sometimes seen in scrofulous subjects; but, there is every reason to believe, that it is quite independent of the other disorder, as Prosser, Wilmer, and Kortum have particularly explained. The following are some points of difference, between bronchocele and scrofula, as indicated by Dr. Postiglione. 1. The true bronchocele is simply a local disease of the neck, the constitution being unaffected. On the contrary, scrofula extends its effects to the whole system, attacking not only the lymphatic glands, but also the muscles, cellular membrane, ligaments, cartilages, and bones. 2. Both diseases chiefly occur in young subjects; but, bronchocele often begins at a later age than scrofula, and does not, like the latter, spontaneously disappear, as the patient approaches puberty, and gains strength. 3. Scrofulous glands often suppurate and ulcerate; bronchocele rarely undergoes these changes. 4. The thickening of the upper lips of scrofulous subjects, is not an attendant on bronchocele; and, while the former patients generally enjoy their mental faculties in perfection, as long as they live, the latter disease in certain countries is often joined with cretinism. Scrofula is likewise always hereditary; while bronchocele is not so: no healthy persons become scrofulous by living a long while amongst scrofulous patients; but many individuals contract bronchocele by going from a country where this disease is unknown, and taking up their residence in places where it abounds. 5. Nature alone often cures scrofula, while art is rarely successful; on the contrary, bronchocele is seldom cured by nature, but very frequently by art. 6. The muriate of lime, recommended by Fourcroy for the cure of scrofula, is always useless: but, in bronchocele, it proves a valuable remedy. (*Postiglione Memoria sulla Natura del Gozzo, &c. p.* 25.) The error of confounding bronchocele with scrofula is now generally acknowledged. At the hospital St. Louis, says Alibert, scrofulous patients are numerous, while those with bronchocele are very rare. (*Nosol. Nat. T.* 1. *p.* 465.) In Derbyshire, Genoa, and Piedmont, bronchocele has been attributed to drinking water cooled with ice. To this theory, many of the objections, concerning the earthy impregnation of water, stand in full force; with this additional reflection, that "In Greenland, where snow-water is commonly used, these unsightly protuberances are never met with, nor, (says Watson) did I ever see one of them in Westmorland, where we have higher mountains, and more snow, than in Derbyshire, in which country, they are very common. But what puts the matter beyond a doubt, is, that these wens are common in Sumatra, where there is no snow, during any part of the year." (*Watson's Chemical Essays, Vol.* 2, *p.* 157.) The above opinion was also refuted by Foderé, who remarks, that the Swiss, who reside at the bottom of the Glaciers, are the least subject to the disease. Bronchoceles are also said to be unknown in Lapland.

snow water

none in Westmorland.

Respecting the influence of particular water in bringing on the disease, Dr. Odier gives credit to the opinion, because it has appeared to him, that distilled water prevented the increase of the tumor, and even tended to lessen its bulk. (See *Manuel de Médecine Pratique*, 8*vo. Genev.* 1811.) However, that every explanation, hitherto devised of the causes of bronchocele, is quite unsatisfactory, is fully proved by the observations of the celebrated Humboldt. Persons afflicted with bronchocele (he remarks) are met with in the lower course of the Magdalen river, (from Honda to the conflux of the Cauca); in the upper part of its course (between Neiva and Honda); and on the flat high country of Bogota, six thousand feet above the bed of the river. The first of these three regions is a thick forest, while the second and third present a soil destitute of vegetation; the first and third are exceedingly damp; the second is peculiarly dry; in the second and third regions, the winds are impetuous; in the first, the air is stagnant. To these striking differences, we will add those relative to temperature. In the first and second regions, the thermometer keeps up, all the year, between 22 and 33 centigrade degrees; in the third, between 4 and 17 degrees. The waters drunk by the inhabitants of Mariquita, Honda, and Santa-Fé de Bogota, where bronchoceles occur, are not those of snow; and issue from rocks of granite, free-stone, and lime. The temperature of the waters of Santa-Fé and Mompox, drunk by those who have this disease, varies from 9 to 10 degrees. Bronchoceles are the most hideous at Mariquita, where, the springs, which flow over granite, are according to my experiments, chemically more pure, than those of Honda and Bogota, and where the climate is much less sultry, than upon the banks of the Magdalen River. Perhaps, it may be thought, that the atony of the glandular system (?) depends less upon the absolute temperature, than upon the sudden refrigeration of the atmosphere, the difference of temperature in the night and day; but, in the Magdalen valley, where the constancy of low tropical regions prevails, the extent of the scale that the thermometer pervades in the course of the whole year, is only a small number of degrees; &c. (*Humboldt, in Journ. de Physiologie par F. Magendie, T.* 4, *p.* 116.)

The same distinguished observer confirms previous accounts of the variety of bronchoceles amongst the original copper-coloured natives of America and negroes. It appears also, that in South America, bronchocele is progressively extending itself from the lower provinces to the flat elevated regions of the Cordilleras; and this, in so serious a degree that in 1823 the subject was adverted to in a report made to Congress by M. Restreppo, one of the Colombian ministers.

An observation, lately made by an intelligent

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writer, would lead one to conclude, that cretinism depends upon malformation of the head. Speaking of goitre, as it appears among the inhabitants of the valley of Maurienne, Baron Larrey informs us, that, in many of these people, with this frightful deformity is joined that of the cranium, of which the smallness and excessive thickness are especially remarkable. (*Mém. de Chir. Milit. T.* 1. *p.* 123.) Dr. Leake thinks, that tumors of this sort may be owing to the severity of the cold damp air, as they generally appear in winter, and hardly ever in the warm dry climates of Italy and Portugal. The latter part of the observation, however, is not correct, for Dr. Postiglione and other Italian writers assure us, that the disease is extremely common in some of the warmest parts of Italy. "*Quì in Napoli, e per tutto il regno, si veggono molti gozzuti, ma non in numero tale, come in Casoria, ed in pochi altri villaggi.*" (*p.* 21.) Prosser is inclined to consider the bronchocele as a kind of dropsy of the thyroid gland, similar to the dropsy of the ovary; and he mentions, that Dr. Hunter dissected one thyroid gland, which had been considerably enlarged, and contained many cysts filled with water. These, he erroneously concludes, must have been hydatids. Dr. Baillie remarks, that when a section is made of the thyroid gland, affected with this disease, the part is found to consist of a number of cells, containing a transparent viscid fluid.

In all probability, the ordinary bronchocele is entirely a local disease, patients usually finding themselves, in other respects, perfectly well. The tumor itself frequently occasions no particular inconvenience, and is only a deformity. There is no malignancy in the disease, and the swelling is not prone to inflame, or suppurate, though, as Dr. Hunter remarks, abscesses do occasionally form in it. Alibert's case of bronchocele becoming cancerous is singular. Mr. Gooch never knew life to be endangered by this sort of tumor, however large, a remark very much at variance with the observations of some other practitioners; but, he had seen great inconvenience arise from it, when combined with quinsy. In fact, the pressure of a large bronchocele may not only greatly afflict the patient by rendering respiration difficult, but actually cause death by suffocation. (See *Obs. sur un Goitre volumineux, comprimant la Trachrée-artère; par L. Windslow, in Bulletin de l'Athénée de Méd. &c.*) "Some persons, as Alibert remarks, have the disease all their lives, without suffering any inconvenience from it; some experience a suffocating oppression of the breathing; and in others there is an impediment in the circulation, and a tendency to apoplexy, arising from the strangulation, which afflicts them." (*Nosol. Nat. T.* 1, *p.* 466.) Dr. Hunter says, that the bronchocele frequently appears two, or three years before, or after the commencement of menstruation, and that it sometimes spontaneously disappears, when this evacuation goes on in a regular manner. Mr. A. Burns affirms the same thing. On the contrary, according to Prosser, this change in the constitution hardly ever affects the tumor.

TREATMENT OF BRONCHOCELE.

That certain localities, perhaps not yet correctly understood, contribute to the origin of this disease, is well proved by a fact stated by Alibert, viz. that change of air has more effect on the complaint than medicines, as he has known many Swiss ladies, who came to Paris with bronchoceles, in whom the tumor subsided after they had resided some time in that city. (*Nosol. Nat. T.* 1, *p.* 473.)

A blister, kept open, has put a stop to the growth of the tumor; but, this method is not much followed at present, as better plans of treatment have been discovered. A few years ago, the favourite mode of curing bronchocele, consisted in giving internally burnt sponge, and occasionally a calomel purge, at the same time, that frictions were made upon the tumor itself. The utility of burnt sponge in the treatment of bronchocele, as Dr. Coindet and others have now fully proved, depends upon the iodine in its composition.

The efficacy of burnt sponge, was thought to be greatest, when exhibited in the form of a lozenge, composed of ten grains of this substance, ten of burnt cork, and the same quantity of pumice stone. These powders were made into the proper form with a little syrup, and the lozenge was then put under the tongue and allowed to dissolve. To the latter circumstance, much importance was attached. Some practitioners gave a scruple of burnt sponge alone, thrice every day, while others added a grain of calomel to each dose. A purge of calomel, was ordered about once a week, or fortnight, as long as the patient persevered in the use of the calcined sponge; but, when mercury was combined with each dose of this medicine, no occasional purgative was deemed requisite.

External means may very materially assist the above internal remedies. Frequently rubbing the swelling with a dry towel; bathing the part with cold water; rubbing the tumor two or three times a day, with the liq. ammon. acet. or the camphor liniment; are the best steps of this kind which the surgeon can take.

"In the treatment of bronchocele," says Mr. A. Burns, "repeated topical detraction of blood from the tumor is highly beneficial. Electricity also has sometimes a marked effect; but, there is no remedy which I would more strongly advise, than regular and long continued friction over the tumor. By perseverance in this plan, a bronchocele, treated in London, was materially reduced in the course of six weeks. Its good effects I have likewise witnessed myself; and it is a remedy highly recommended by Girard in his '*Traité des Loupes.*' It has also been much used in scrofulous tumors by Mr. Grosvenor of Oxford, and by Mr. Russel of Edinburgh." (*Surgical Anatomy of the Head and Neck, p.* 204.)

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Mr. A. Burns recommends the friction to be made with flannel, covered with hair powder, and the part to be rubbed, at least, three times a day, for twenty minutes.

In two cases of bronchocele, related by Dr. Clarke, the patients were cured, by "the steady use of the compound plaster of ammoniac and mercury, conjoined with the internal exhibition of burnt sponge, and occasional purgatives." (See *Edinb. Med. and Surgical Journal, Vol.* 4, *p.* 280.)

We learn from Professor Odier, that in Geneva, bronchocele used to be cured by burnt sponge, exhibited in powder, or infused in wine, and combined with purgatives to prevent the cramps of the stomach, which sometimes accompany the disappearance of the swelling. Muriate of barytes has likewise been recommended. (See *Manuel de Médecine Pratique.*)

Mr. Wilmer, credulously imputing great influence to the changes of the moon, used to begin with an emetic, the day after the full moon, and to give a purge the ensuing day. The night following, and seven nights successively, he directed the above-mentioned lozenge to be put under the tongue at bed-time, and administered every noon a bitter stomachic powder. On the eighth day, the purge was repeated, and, in the wane of the succeeding moon, the whole process, except the emetic, was renewed. (*Cases in Surgery, Appendix.*) This, which is often called the Coventry plan of treatment, is said to be greatly assisted, by rubbing the tumor with an ointment, containing tartar emetic.

Prosser succeeded with his medicines, though the patient was nearly twenty-five years old, and the swelling had existed more than twelve years. It is said, that no instance of cure has been known, after the patient was twenty-five. Prosser orders one of the following powders to be taken early in the morning, an hour or two after breakfast, and at five, or six o'clock in the evening, every day, for a fortnight, or three weeks. The powder may be taken in a little syrup, or sugar and water: ℞ Cinnab. ant. op. levigat. milleped. ppt. et pulv. ā ā gr. xv. Spong. calcin. ℈. M.

These powders should be taken for two, or three weeks, and then left off for a week or nine days, before a repetition. At bed-time, every night, during the second course of the powders, some purgative pills, composed of mercury, the extractum colocynthid. comp. and rhubarb, are to be administered; and in general it will be proper to purge the patient with manna, or salts, before beginning with the powders. Prosser put no faith in external applications.

Some have recommended giving two scruples of calcined egg-shells, every morning, in a glass of red-wine; half a drachm of the sulphuret of potash every day, dissolved in water; or ten, or fifteen drops of the *tinct. digit.* twice a day, the dose being gradually increased. Muriated barytes; cicuta; and belladonna, have also been exhibited. Postiglione commends the muriate of lime as a medicine possessing great efficacy. The remedy is made into a bolus with honey, to which is sometimes added burnt sponge with cinnamon in powder. He employs also frictions with flannel, liniments, and sometimes purges with calomel. The bolus is placed under the tongue, and allowed to dissolve there. (*P.* 59, *&c.*)

Sir J. Wylie, physician to the Emperor of Russia, prescribes 3 grains of the submuriate of mercury, 3 of the ammoniacal muriate of iron, 4 of burnt sponge, and 10 of the bark of laurus cassia, divided into twelve doses, one of which is given twice a week, with a gentle anodyne at night. He also directs twenty-four lozenges to be made, by triturating an ounce of burnt sponge, with an equal quantity of the powder of gum arabic, and fifteen grains of cinnamon, first blended with a sufficient quantity of the syrup of orange peel. One of these lozenges is put under the tongue daily, and allowed to dissolve there. Lastly, to the tumor itself, he applies a plaster composed of half an ounce of litharge, a drachm of the submuriate of mercury, and 10 grains of antim. tartariz. (*Alibert, Nosol. Nat. T.* 1. *p*, 474.)

The virtues of burnt sponge in the cure of certain forms of bronchocele, are now ascertained to be owing to the iodine which it contains. Iodine was discovered in 1813 by Courtois, manufacturer of saltpetre at Paris; but six years elapsed before it was tried as a medicine. From the first memoir of Dr. Coindet, addressed in 1820 to the Helvetian Society of Natural Sciences, it appears, that, as he was searching for a formula in the work of Cadet de Gassicourt, he found, that Russell had recommended the ashes of the *fucus vesiculosus*, or bladder-wrack, under the name of æthiops vegetabilis, for the cure of bronchocele; and he was led from analogy, between this substance and burnt sponge, so long celebrated for its efficacy in the treatment of bronchocele, to suspect, that iodine was the active principle of both. "The great and unequalled success, which resulted from its use, in the treatment of bronchocele, at once indicated the power of iodine as a therapeutic agent, and encouraged Dr. Coindet to pursue his researches in rendering it an efficient article of the materia medica; and about the close of the same year, when Dr. Coindet had employed iodine in treating goitre for six months at least his conjecture was confirmed by the discovery which Dr. Fyfe, of Edinburgh, made, that this substance was actually contained in the ashes of the burnt sponge:" &c.

"It has been generally understood among the profession that the happy conjecture, which introduced iodine, into medical treatment, originated with Dr. Coindet, of Geneva; yet, we find, that his claim to this honour is disputed by one of his countrymen, Dr. J. C. Straub, of Hoswyl, in the Canton of Berne.

"Dr. Straub, whose communication is found in Professor Meisner's Physical Intelligence of the General Helvetian Society for 1820, states, that, before the discovery of iodine, attempts had been made to compound a substitute for burnt sponge, but without success; and that this failure, and his observation of the similarity of smell between iodine, burnt sponge, and other marine productions, led him to suspect the existence of iodine, or its salts, in these substances, and that its absence in the artificial compounds was the cause of failure in these experiments. This conjecture, which appears to have been made previously to 1819, led Dr. Straub to examine the real burnt sponge, and he informs us, that, though his time did not permit him to ascertain exact quantities, yet he obtained from 1½ oz. of burnt sponge, as much iodine as to render his conjecture probable, and to be astonished, that the ingredient should have escaped notice. He was therefore at once induced to think of its use in medicine; and in the same paper, from which we obtain these facts, impressed with the poisonous quality ascribed by Orfila to iodine, he recommended first the trial of its salts, especially the hydriodates of soda and lime, and then that of the substance itself. ×

"The communication of Dr. Straub is dated Dec. 1819, and was actually published in Pro-

× See also the Bridgewat
treatise by Dr Prout where

fessor Meisner's periodical work in Feb. 1820, five months at least before the first memoir of Dr. Coindet was communicated to the Helvetian Society of Natural Sciences at Geneva. It is unnecessary to have recourse to any supposition of injustice done to Dr. Straub; much less would it be right to deprive Dr. Coindet of the merit of originality in substituting the direct and certain action of iodine, for the irregular, and sometimes inert, qualities of burnt sponge in the treatment of goitre. Coincidence of this kind is not uncommon in science; in the present instance, the ingenuity of Dr. Straub does not diminish the merit of Dr. Coindet. (See *Edinb. Med. and Surg. Journal, N.* 80, *p.* 210, *&c.*)

That iodine is a medicine of considerable efficacy in bronchocele, not a doubt can be entertained, after the many cases now recorded in proof of the fact; and that it will be found useful in some other chronic tumors, especially those of a scrofulous nature, seems highly probable, if such probability be not already converted into certainty. In bronchocele, friction with the ointment on the swelling, may often be advantageously conjoined with the use of one of the preparations for internal exhibition.

In the *Archives Générales de Médecine* for July 1823, Dr. Coster mentions the opportunity which he had had of remaining eight months at Geneva with Dr. Coindet, and of observing correctly the good effects of iodine in enlargements of the thyroid gland, and in scrofulous tumors. Dr. Coindet first of all employed this medicine under the form of alcoholic tincture, and obtained very surprising effects from its administration in goitre. He next tried friction on the tumor itself with an ointment, composed of the hydriodate of potass and lard; and the success of this practice was so great, that of nearly 100 individuals affected with goitre, whose cases Dr. Coster collected, more than two thirds were completely cured by it. Soon after these successful results, iodine was employed sometimes internally, and sometimes in the form of friction, in scrofula. "I shall not affirm (says Dr. Coster) that success was as uniform in the latter, as in the former disease, but it is certain, that scrofulous tumors yield sooner to the action of iodine, than to that of any other remedy at present known: when the tumors, whether of the thyroid gland, or of the lymphatic glands, are hard and renitent, experience proves, that the effects of iodine are much more prompt, when the frictions are preceded by the application of leeches, and a low regimen. Notwithstanding these precautions, however, the tumor sometimes continues stationary." In such a case, Dr. Coster put the tumor twice a day, for ten or twelve minutes, under the influence of the positive pole of the voltaic pile, taking care to change sides each time of using it; so that in the morning, he made use of friction with iodine on the right side, and the action of the pile on the left, and, in the evening, applied the friction to the left side, and the galvanism to the right. In 20 days, not the least trace of the bronchocele was left. It is stated, that, in this instance, the voltaic pile, unassisted with the frictions of iodine, were as ineffectual as the friction by itself had been. For the preparations and doses of *Iodine, see this word.*

Petit, Heister, and Schmucker, make mention of inveterate bronchoceles, which gradually subsided, in consequence of suppuration. Volpi states, that such ulcerations are not unfrequent. He has published two facts of this kind, which occurred after a nervous fever; and he records a third case, where the swelling inflamed in consequence of a blow, suppurated, and sloughed, so as entirely to disappear. (See *Léveillé Nouvelle Doctrine Chir. T.* 4, *p.* 128.) A similar fact is recorded by Zipp. (*Siebold Samml. Chir. Beob.* 2 *B. p.* 229.)

Suppuration

The disease in its inveterate form, has also been sometimes removed by the application of caustic; (*Mesny in Journ. de Médecine, T.* 24, *p.* 75; *Timœus, Cas. p.* 283.) the establishment of issues; (*Jeitteles Obs. Med.*) the making of an incision into the swelling, or the introduction of a seton through it. (*Foderé Essai sur le Goître et le Crétinage, p.* 75; *Klein in v. Siebold Sammlung Chir. Beobacht.* 2 *B. p.* 11; *Flajani, Collezione d'Osservazioni di Chirurgia, T.* 3, *p.* 283.)

Caustic.

X Bad.

Bronchoceles have sometimes been removed by the part having been accidentally or purposely burnt to a considerable depth. (*Motte in Blegny Zodiac ann.* 2 *Febr. Obs.* 11; *Severinus de Efficaci Medicina, p.* 220.) The disappearance of bronchoceles has also been known to follow a wound. (*Schmidtmüller über die Ausführungsgänge der Schilddruse, p.* 37; *Landshut,* 1805.) A. Burns sometimes employed blisters, and found them useful. (*Surgical Anatomy of the Head and Neck, p.* 204.) With respect to caustic, which is spoken of by Celsus, (*lib.* 7, *cap.* 13.) Flajani states, that its operation is tedious and painful, and attended with danger; and what he says about the practice of an incision, is not more encouraging. Where the disease contains a cyst, he prefers making an opening with a trocar, though he confesses, that this plan is apt to be followed by a relapse, when the cyst is very thick and hard; in which circumstance, it will be necessary to have recourse either to an incision, or the seton, for the purpose of exciting suppuration. Should the disease, however, be merely composed of one cyst of moderate size, Flajani recommends its entire removal. "Of all these methods, (says he,) proposed for the extirpation of bronchoceles, the seton is the least dangerous, and by means of it a radical cure may be generally effected without any severe symptoms, as I have found by experience in many cases. On the contrary, I have been an eyewitness of the fatal consequences induced by the other plans. I was called to assist a gentleman, about forty years of age, brought to death's door by a bleeding, which arose from the application of caustic to the forepart of the neck. As tourniquets, bandages, &c. proved quite ineffectual, it was indispensable to make pressure on the part with the finger of an assistant, for twenty-four hours, ere the hemorrhage could be stopped; a copious suppuration ensued; and it was three months before the parts were healed. I was likewise present (says he) at the opening of a similar, but larger swelling in the same situation, the disease having afflicted an elderly respectable patient for several years. The incision caused the evacuation of a small quantity of serum, contained in the cellular membrane, but the following day, the tumor inflamed, the difficulty of

Blister

Seton

X

states that in 1616 he employed the Hydriodate of respiration increased, and for some days, the patient was in great danger. At length, suppuration was established, followed by a destruction of a great deal of the cellular membrane, and several sinuses, and, in five months, the patient lost his life. On examination of the body, the lungs were found tuberculated, an effect of the impediment to the circulation of the blood through the smaller vessels of those organs." (*Flajani Collezione d'Osserv. T.* 3, *p.* 283, *8vo. Roma,* 1802.)

The first proposer of the employment of setons for the cure of diseases of the thyroid gland, is perhaps not exactly known: but it is certain, that the method has been known, and occasionally practised, ever since the middle of the last century. "Dr. Monro senior, (as a well informed writer has observed,) mentions in his lectures, that he had seen a dropsy in the centre of the gland, complicated with bronchocele, cured by a seton, although the glandular swelling still continued." (*A. Burns on the Surgical Anatomy of the Head and Neck, p.* 191.) This statement is given on the authority of some MS. notes taken by Dr. Brown, from Dr. Monro's lectures. According to Girard, many cases in his time had been communicated to the Royal Academy of Surgery at Paris, in which the disease had been got rid of either by means of a seton, drawn through the swelling, or the application of an issue. (*Lupiologie, &c. 8vo. Paris,* 1775.) The occasional success of setons was also adverted to by Richter in the year 1788. (*Bibliothek, B.* 9. *p.* 478.) And, the plan is spoken of in another work, published in 1790, as being eligible, where the disease is conjoined with a cyst. (*Encyclopédie Méthod. Partie Chir. T.* 1, *p.* 231.) The practice was particularly noticed by Foderé in his valuable treatise on bronchocele; and Alibert mentions the seton as being used at the Hospital St. Louis. (*Nosol. Nat. T.* 1, *p.* 466, *fol. Paris,* 1817.)

Quadri's
practice
by
Somerville

In November, 1817, Dr. Quadri, of Naples, tried this practice, which he erroneously supposed to be quite new. "By means of a trocar-pointed needle, six and a half inches long, I passed (says he) a seton from above downwards through the gland, at the depth of about four lines from its surface. Suppuration took place in forty-eight hours. On the 18th of November, the seton escaped, when the matter was squeezed out, and the irritation, occasioned by replacing it, produced an abscess on the right side of the neck, which was opened on the 23d, when it was found, that the suppuration had effected the destruction of nearly the whole gland." The woman, who was thirty-six years of age, was seen by Dr. Somerville, in April 1818, with the circumference of her neck lessened, from sixteen to thirteen inches, French measure. In another case, referred to, a seton was passed through each side of the thyroid gland, and the result was a removal of the tumor on the side, where the seton was maintained long enough; but, on the opposite side, the seton being withdrawn too early, the matter collected in a sac, and at the end of four months, a sinus and discharge still continued, the patient refusing to have a counter opening practised. When the seton does not prove stimulating enough, Dr. Quadri sometimes enlarges it, or attaches to it escharotic, or irritating substances. He also frequently uses two setons. In one example, in endeavouring to perforate the gland rather deeply, Dr. Quadri appears to have injured the larger branches of the thyroid arteries, as more than an ounce of blood was discharged, and the tumor swelled, as if injected with blood. The bleeding, however, ceased spontaneously. He states, that the seton has been passed through the tumor not less than sixteen times, the direction being varied in every instance, without untoward accident; and he is confident, that, unless the needle be pushed deep enough almost to touch the thyroid cartilage, the trunks of the thyroid arteries will not be exposed to injury, while the branches, in the track of the needle, will not cause any danger. He insists also upon the propriety of retaining the seton in the tumor a considerable time; and observes, that it remains to be ascertained, whether this practice will answer in every description of bronchocele? For these and several other cases and particulars, the profession are indebted to Dr. Somerville. (See *Med. Chir. Trans. Vol.* 10, *p.* 16, *&c.*)

Mr. Gunning applied a seton in a case of bronchocele in St. George's Hospital; but, in this instance, the irritation brought on sloughing, and the patient after a time died. The particulars of this case, and of three successful examples of the practice in England, have been lately recorded. One of the successful cases was treated by my friend, Mr. James, of Exeter, another by Mr. A. C. Hutchinson, who has taken the trouble to collect the history of them, and the third by Mr. A. T. Thomson. (See *Med. Chir. Trans. Vol.* 11, *p.* 235.) Percy and Dupuytren have also employed setons in bronchocele with success. The plan, however, is sometimes inefficient, as is proved by two cases under Dr. Kennedy, of Glasgow. (See *London Med. Repository, No.* 99, *Feb.* 1822.) The exact nature of cases relieved by this practice, and their difference from other examples, which are benefited by treatment of a different kind, are still desiderata in Surgery.

The diseased thyriod gland has been successfully extirpated; but, the operation is one of so much danger, that it ought never to be attempted, except under the most pressing circumstances. The many large arteries naturally distributed to the gland itself; their still greater size in bronchocele; and the vicinity of the carotid arteries, and important nerves, render the undertaking a thing of no common difficulty.

Mr. Gooch relates two cases, which do not encourage practitioners to have recourse to the excision of enlarged thyroid glands. In one, so copious an hemorrhage took place, that the surgeon, though equally bold and experienced, was obliged to stop in the middle of the operation. No means availed in entirely suppressing the bleeding, and the patient died in a few days. In the other, the same event nearly took place, the patient's life being saved only by compressing the wounded vessels with the hand, day and night, for a whole week, by persons who relieved each other in turn. This was found the only way of stopping the hemorrhage, after many fruitless attempts to tie the vessels.

Hemorrhage is not the only risk: Dupuytren removed a large bronchocele that caused dangerous pressure upon the trachea: the whole gland was taken away, and the four thyroid arteries and many veins secured. Only a few spoonfuls of blood were lost. The woman, however, died soon after the operation, with pale face, hurried respiration, cold skin, sickness, &c. denoting injury of some important nerves.

I do not mention these facts to deter surgeons from the operation altogether, because it is proved by modern experience, and especially by six cases in which Dr. Hedenus, of Dresden, has successfully removed the thyroid gland, that not only it is occasionally a necessary proceeding, but one that may be well accomplished by a skilful operator, as will be particularly explained in a future article. (See *Thyroid Gland.*) When bronchoceles by their pressure dangerously obstruct respiration, deglutition, and the return of blood from the head; and when the disease resists the efficacy of iodine, a seton, blisters, and every other plan of treatment found deserving of trial; what can be done with the view of saving the patient, but the bold operation of cutting away the swelling, or that of exposing and tying one or both of the upper thyroid arteries?

When the quantity of blood flowing into a tumor, is suddenly, and greatly, lessened, the size of the swelling commonly soon undergoes a considerable diminution. The experiment was once made by Sir W. Blizard: he tied the arteries of an enlarged thyroid gland, and, in a week, the tumor was reduced one-third in its size. The ligatures then sloughed off; repeated bleeding took place from the arteries, and by the extension of hospital gangrene, the carotid itself was exposed. The patient died; yet, as Mr. A. Burns observes, this does not militate against a repetition of the experiment; as the same thing might have happened from merely opening a vein, and, in the confined air of an hospital, has actually happened. (*Surgical Anatomy of the Head and Neck*, *p.* 202.)

In fact, the rationality of the experiment prevented surgeons from being intimidated by the failure in question, and, with that laudable spirit for the improvement of operative surgery every where diffusing itself through the profession, other gentlemen were soon found who had judgment enough to make further trials of the practice. In a young man, twenty-four years of age, whose breathing was much impeded by a bronchocele, and whose upper thyroid arteries were very large and affected with strong pulsations, Walther, of Landshut, tied the left of these vessels, the left side of the gland being the largest. The operation was done on the 3d of June, 1814. An incision, an inch and a half in length, was made in the direction of the inner edge of the sterno-cleido-mastoid muscle, where the throbbing of the artery was quite distinct. By a second stroke of the knife, the platysma-myoides was divided in the same direction, and to an equal extent. The vessel was then exposed by a cautious dissection, and separated from the surrounding parts, and one arterial branch, which was divided, was immediately secured. A ligature, composed of three silk-threads, was then conveyed with an aneurism-needle under the left thyroid artery, and tied with two simple knots. The wound was then closed with adhesive plaster, and the ends of the ligatures brought out at the angles. The ligature on the large artery came away on the 12th day; and, without any febrile symptoms, or other bad consequences, the wound was perfectly healed on the 23d day. As early as the 3d day after the application of the ligature, the left part of the tumor began to be less tense, and the throbbing feel in it soon ceased. By degrees, it dwindled away, becoming as it lessened harder, and, as it were, cartilaginous. In a fortnight, the left half of the swelling was one-third smaller, than before the operation; and, at length, only one third of it remained, while the right side also was somewhat smaller. On the 17th of June, Walther took up the right superior thyroideal artery, which was more difficult to get at, as it lay more deeply, and was much concealed under the enlarged gland, which had pushed it out of its natural situation. The operation lasted three-quarters of an hour, and several large and small arteries which were cut were tied. With respect to the thyroid artery itself, it could not be tied without including a part of the gland in the ligature. No unfavourable symptoms followed this second operation; the ligatures were detached in good time, and the wound healed up very well. The right portion of the bronchocele also now diminished; but, though it was originally smaller than the left, it did not dwindle away so completely as the latter. The remains of the tumor, however, two years afterwards, produced no inconvenience, and respiration was quite easy. (See *Neue Heilart der Kropfes, &c. von Ph. Fr. von Walther, p.* 25, *&c. 8vo. Sulzbach*, 1817.) On the 29th of December, 1818, Mr. H. Coates, of Salisbury, took up the superior thyroideal artery for the cure of a bronchocele, which, in a young woman, aged seventeen, made pressure on the trachea œsophagus, attended with a great noise in breathing. The superior thyroideal arteries were in this instance large, and pulsated strongly. Mr. Coates cut down upon the left of these vessels, separated it from its accompanying nerve, and passed under it a small round ligature, which was drawn moderately tight, and tied. The next day, there was head-ach, and some swelling of the neck and side of the head, with increased difficulty of swallowing, and febrile symptoms. These complaints, however, were relieved by bleeding and antimonial medicines. The ligature came away on the 9th day, and, on the 14th, the wound was completely healed. On the 14th of February, the breathing being much improved, and the tumor reduced nearly to one half of its former size, the patient was well enough to be discharged from the Infirmary. (See *Med. Chir. Trans. Vol.* 10, *p.* 312.) My friend Mr. Rose once mentioned to me a case, in which a similar operation, done by Mr. Brodie, did not produce any material diminution of the tumor.

Dr. Parry has remarked a frequent coincidence, either as cause or effect, between enlargement of the thyroid gland and cardiac diseases. (*Elements of Pathology*, *&c. p.* 181.) And, another modern writer mentions, that he has lately seen three cases of this complication. (*Medico Chir. Journ. Vol.* 1, *p.* 181.) A case is detailed by Flajani, where the disease was accompanied with extraordinary palpitations of the heart. (See *Collezione d'Osservazioni*, *&c. di Chirurgia*, *T.* 3, *p.* 270.) In the instance here referred to, there was great irregularity of the pulse, and the oppression of the breathing was such, that the

[illegible] Hunt.

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patient was obliged to submit to venesection at least every month, whereby he had been rendered quite emaciated.

Albucasis gave the first good account of bronchocele. Wilmer's Cases and Remarks in Surgery, with an Appendix on the Method of Curing the Bronchocele in Coventry, 8vo. *Lond.* 1779. *Prosser, An Account and Method of Cure of Bronchocele, or Derby-neck*, 8vo. *Lond.* 1769. *Also 3d Edit.* 4to. *Lond.* 1782. *Memoirs of the Med. Society of London*, 217. *Gooch's Chirurgical Works, Vol.* 2, *p.* 96.—*Vol.* 3, *p.* 157. *Desault's Parisian Chirurgical Journal, Vol.* 2, *p.* 292. *Œuvres Chirurgicales de Desault, par Bichat, T.* 2, *p.* 298. *V. Malacarne, Lettre sur l'Etat de Cretins, (Frank Del. op.* 6.) *Edinb. Med. and Surgical Journal, Vol.* 4, *p.* 279. *Odier's Manuel de Médecine Pratique*, 8vo. *Geneve*, 1811. *Dr. Reeves's Paper on Cretinism, in Edinb. Med. and Surg. Journal, Vol.* 5. *Traité du Goître, et du Cretinisme, par F. E. Foderé*, 8vo. *Paris, an.* 8. *Richter's Aufangsgründe der Wundarzneykunst, B.* 4, *Kap.* 13, *von Kropfe. Surgical Anatomy of the Head and Neck, by A. Burns, p.* 191, *&c. Larrey, Memoires de Chirurgie Militaire, Tom.* 1, *p.* 123. *T.* 3, *p.* 199, *&c. J. F. Ackermann, über die Kretinen, eine besondere Menschenabart in den Alpen.* 8vo. *Gotha*, 1790. *B. S. Barton, A Memoir concerning the Disease of Goitre, as it prevails in different parts of North America*, 8vo. *Philadelphia*, 1800. *Memoria Patologico-Practica sulla Natura di Gozzo, &c. del Dottor Prospero Postiglione*, 12*mo. Firenze*, 1811. *Kortum Comment. de Vitio Scrophuloso, T.* 2. *Giuseppe Flajani, Collezione d' Osservazionie Riflessioni di Chirurgia, T.* 3. *p.* 270, *&c.* 8vo. *Roma*, 1802. *Quadri in Med. Chir. Trans. Vol.* 10, *p.* 16. *Dict. des Sciences Med. art Bronchocele ; Ph. Fr. Walther, Neue Heilart des Kropfes durch die Unterbindung der obern Schildrüsen-Schlagadern, nebst der Geschichte eines durch die Operation geheilten Aneurismâs der Carotis.* 8vo. *Sulzbach*, 1817. *H. Coates, in Med. Chir. Trans. Vol.* 10, *p.* 312, *&c. Léveillé Nouvelle Doctrine Chir. T.* 4, *p.* 125, *&c. Lassus, Pathologie Chirurg. T.* 1. *p.* 408, *&c. Petit, Œuvres Posthumes, T.* 1, *p.* 255. *Haller, Opuscula Pathologica, Obs.* 5, *p.* 16. *J. L. Alibert, Nosologie Naturelle, T.* 1. *p.* 464, *&c. fol. Paris*, 1817. *A. C. Hutchinson, Cases of Bronchocele, or Goitre, treated by Seton : Med. Chir. Trans. vol.* 11. *p.* 235, *&c. A. de Humboldt, Observations sur quelques Phenomènes peu connus qu' offre le Goitre sous les Tropiques, dans les Plaines et sur les Plateaux des Andes : in Journ. de Physiologie par F. Magendie, T.* 4, *p.* 109, 8vo. *Paris* 1824. *Observations on the remarkable Effects of Iodine in Bronchocele and Scrofula : being a translation of three Memoirs published by J. R. Coindet, M. D. Lond.* 1821. *J. C. Straub, in Naturwisssenschaftlicher Anzeiger der Allgemeiner Schweizerischer Gesellschaft, &c. herausgegeben von Fr. Meisner*, 4to. *Bern. Feb.* 1820. *Brera Saggio Clinico sull' Iodio, &c. Padova*, 1822. *W. Gairdner, M.D. Essay on the Effects of Iodine, with practical Observations on its use in Bronchocele, Scrofula, &c. Lond.* 1824. *H. S. Roots, in Med. Chir. Trans., Vol.* 12, *p.* 310. *Coster, in Archives Générales de Médecine, Juillet* 1823. *J. Kennedy, in London Med. Repository for Feb.* 1822. *J. A. W. Hedenus, Ausrottung der Schildrüse, in Journ. der Chir. von C. F. Graefe and Ph. Von Walther, B.* 2, *p.* 237, *&c. or Journ. of Foreign Medicine, Vol.* 5, *p.* 317, *&c. For the best plates of the disease, see Dr. Baillie's Series of Engravings, &c. Fasc.* 2, *Tab.* 1.

BRONCHOTOMY. (from βρογχος, the windpipe, and τεμνω, to cut.) This is an operation, by which an opening is made into the larynx, or trachea, either for the purpose of making a passage for the air into and out of the lungs, when any disease prevents the patient from breathing through the mouth and nostrils; or of extracting foreign bodies, which have accidentally fallen into the trachea; or, lastly, in order to be able to inflate the lungs in cases of suspended animation. The operation is also named *tracheotomy.* Its practicable nature and little danger are founded on the facility with which certain wounds of the windpipe, even of the most complicated kind, have been healed, and on the nature of the parts cut, which are not furnished with any vessel of consequence.

When the incision is made in the larynx, the operation is termed *laryngotomy.* With respect to bronchotomy, its performance cannot be regarded as either difficult, or dangerous: "*dummodo*, (says Fabricius ab Aquapendente,) *qui secat sit anatomes peritus, quia sub hoc medico et artifice, omnia tutissimè et felicissimè peraguntur.*"

Bronchotomy is occasionally practised in order to enable the patient to breathe, when respiration through the mouth and nostrils is impeded by disease.

Cynanche laryngea sometimes creates a necessity for the operation, and this is particularly the case, when the disease is situated in the edges of the rima glottidis, which opening becomes so contracted as scarcely to leave the smallest space. For this reason, and on account of the tension of the ligaments of the glottis, the voice is rendered excessively acute, and hissing as it were. The suffocation is imminent; the lungs not being expanded, the blood accumulates in these organs, and more or less impediment prevails to the return of the blood from the head. There can be little doubt, that many patients who have perished under these circumstances, might have been saved by a timely incision in the trachea. The majority of writers, who have treated of bronchotomy, as a means of preventing suffocation in inflammatory diseases of the larynx, have regarded this operation as the ultimate resource. Both the Greeks and Arabians were of this sentiment; and Avicenna only recommends bronchotomy in violent cases of cynanche, when medicines fail, and the patient must evidently die from the unrelieved state of the affection. Rhazes also advised the operation only when the patient was threatened with death. Thus, in former times, though practitioners were aware of the principle, on which bronchotomy became necessary, they generally found the operation fail, because it was delayed too long, and rarely done, ere effusion had commenced in the lungs themselves.

Bronchotomy, says Louis, will always be done too late, when only practised as an extreme measure. In cases of inflammation about the throat, the danger of perishing by suffocation, as this author remarks, has been known from the very dawn of medicine. The advice of Hippocrates, to remedy this urgent symptom, is a proof of it, and he observes, that the danger is evinced when the eyes are affected and prominent, as in persons who have been strangled, and when there is great heat about the face, the throat, and neck, without the appearance of any external defect. He recommends *fistulæ in fauces ad maxillas intrudendæ, quâ spiritus in pulmones trahatur.* No doubt, he would have advised more, had it not been for the doctrine of his time, that wounds of cartilages were incurable.

This method, defective as it was, continued till the time of Asclepiades, who according to Galen, was the first proposer of bronchotomy. Since Asclepiades, this operation has always been recommended, and practised in cases of quinsy, threatening suffocation, notwithstanding the inculcation of Cælius Aurelianus, who treated it as fabulous. The mode of doing it, however, has not been well detailed by any body who put it in practice, except Paulus Ægineta, who is precise and clear. "We must (says he) make the incision in the trachea, under the larynx, about the third or fourth ring. This situation is the most eligible, because it is not covered by any muscle, and no vessels are near it. The patient's head must be kept back, in order that the trachea may project more forward. A transverse cut is to be made between two of the rings, so as not to wound the cartilage, only the membrane." The knowledge of this method, and its advantages in cases of the *angina strangulans*, when practised in time, ought, according to Louis, to have rendered its performance a general practice.

The convulsive angina of Boerhaave, which particularly affects those, who can only breathe well in an upright posture, has also been adduced as a case demanding the prompt performance of bronchotomy. Mead, in his *Precepta et Monita Medica*, mentions a case, in which the patient had been bled very copiously twice in the space of six hours, but he died notwithstanding this large evacuation. The same author noticed in Wales, especially on the seacoast, an epidemic catarrhal quinsy, which carried the patients off in two or three days. In these instances, bleeding was not of much use, and bronchotomy, which was not performed, was the only means by which the patients might have been saved.

In cases of angina and croup, some modern practitioners have been less sanguine in their expectation of benefit from bronchotomy than Louis was. From the observations of Dr. Cheyne, it would appear, that in croup, the operation cannot be necessary for the purpose of admitting air into the trachea; for, in those who have died of the disease, he has found a pervious canal of two-eighths of an inch in diameter, and through a tube of such diameter, even an adult can support respiration for a considerable time. According to the same writer, bronchotomy is equally unfitted for the removal of the membrane formed by the effusion of lymph; for, from its extent, variable tenacity, and adhesions, this is, in almost every case, totally impracticable; and even could the whole membrane be removed, still the function of respiration would be but little improved, the ramifications of the trachea and bronchial cells remaining obstructed. (See *Cheyne's Pathology of the Larynx and Bronchia.*)

No doubt, Dr. Cheyne's statement of what is found in the dead subject is correct; and, yet, the operation may be necessary to prevent suffocation, which might otherwise be induced, partly by the diminution of the natural passage for the air by disease, and partly by the action of the muscles of the glottis; a circumstance, to which Dr. Cheyne has not assigned sufficient importance. On this point, the sentiments of Mr. C. Bell are more correct: speaking of the membrane of croup, formed by the effusion of coagulable lymph, and of the cause of death in these cases, he says, "It has not appeared to me, that it was the violence of the inflammation, which destroyed the patient, nor the irritation directly from the inflamed membrane; but that the presence of this secreted membrane, acting like a foreign body, at the same time occasions spasms in the glottis, obstructs the passage, and confines the mucus. But, I am bound to state, in the strongest terms, that death is ultimately a consequence of effusion in the lungs, occasioned by the continued struggle and difficulty; for, on opening the chest, I have uniformly found, that the lungs did not collapse, and that the bronchiæ were full of mucus. This corresponds with the symptoms; for, before death, the violence of the cough and struggle has given place to coldness and insensibility, with a pale swelling of the face and neck, and *when the child has fallen into this state, giving freedom to the trachea will be of no avail.*" *(Surg. Obs. p.* 16.*)*

In the cases of croup, which Mr. Chevalier examined after death, he found the trachea obstructed with mucus, and he believed, that it is more by this secretion, than by that of coagulable lymph, that suffocation is finally produced. At all events, he succeeded in saving a boy on the point of suffocation, by making an incision in the trachea, and letting out an ounce, or an ounce and a half of reddish brown, frothy mucus. And a case, of a very similar description, in which the same practice answered, I attended, a few years ago, with Mr. Lawrence, and Dr. Blicke. This case, however, was different from Mr. Chevalier's, in the circumstance of a tube being required for a couple of days after the operation, when the removal of the instrument was followed by no inconvenience.

Pelletan joins several modern writers, in representing bronchotomy as generally useless in cases of croup; the only example, in which he thinks the operation might be serviceable, being that in which the disease is confined to the larynx; a case, which he sets down as uncommon, and difficult to be distinguished. "*En supposant enfin l'angine avec concrétion bien caractérisée, on se trouvera encore entre la crainte de pratiquer une opération inutile, si les concrétions se prolongent jusque dans les bronches, et l'impossibilité de juger si ces concrétions sont bornées au larynx. C'est en effet dans ce seul cas que l'opération peut être fructueuse ; elle facilitera la respiration pendant que la nature, aidée de l'art, travaillera à dissoudre, détacher, et faire expectorer les fausses membranes qui oblitèrent la glotte et le larynx.*" *(Clinique Chir. T.* 1, *p.* 28.*)*

Of course, the degree of success, which will attend the practice of bronchotomy in cases of this nature, must always mainly depend upon the operation being done early enough, and in cases, where the lungs are not too seriously affected; for, if the effects of pneumonia are far advanced, the patient's chance of recovery will be hopeless, whether the trachea be opened or not. In order, also, to have a reasonable chance of success, in cases threatening suffocation, from inflammation of the parts about the fauces, as sometimes happens, the operation must not be deferred too long. We see this fact exemplified in two cases recorded by Flajani; in one, where the operation had not been allowed till a late period of the disease, the patient died; in the other, where the practice was adopted earlier, life was preserved. (*Collezione d' Osservazioni, &c. T.* 3, *p.* 230—233.)

A few years ago, Dr. Baillie published three cases, in which death was produced in the adult subject, and, in a very few days, by a violent inflammation of the larynx and trachea. The disease had a strong resemblance to croup; yet, was different from it. There was not the same kind of ringing sound of the voice as in croup, and no layer of coagulable lymph was formed upon the surface of the inner membrane of the larynx and trachea, which, according to Dr. Baillie, uniformly attends the latter disease. In one of these cases, the cavity of the glottis was found to be almost obliterated, by the thickening of the inner membrane of the larynx at that part. The inner membrane of the trachea was likewise inflamed; but, in a less degree. The lungs were sound. If, in thirty hours, no relief should be derived from bleeding ad deliquium, and the exhibition of opiates, Dr. Baillie conceives, that, in this sort of case, it might be advisable to perform the operation of bronchotomy at the upper part of the trachea, just under the thyroid gland. This operation, he thinks, would probably enable the patient to breathe, till the inflammation in the larynx, more especially, at the aperture of the glottis, had time to subside. (See *Trans. for the Improvement of Med. and Chir. Knowledge, Vol.* 3, *p.* 275, 289.)

An acute affection of the membrane of the glottis, proceeding rapidly to a fatal termination by suffocation, has also been particularly described by Drs. Farre and Percival. (See *Med. Chir. Trans. Vols.* 3 *and* 4.) In some bodies, which Mr. Lawrence examined after death, he found appearances analogous to those mentioned by the above physicians. "The patients died of suffocation: but the progress of the complaint was much slower than in those cases; the symptoms were not acute, nor did the inspection of the parts disclose any evidences of active inflammation. The membrane, covering the chordæ vocales, was thickened, so as to close the glottis, and a similar thickening extended to a small distance from these parts, accompanied with an œdematous effusion into the cellular substance under the membrane. The epiglottis did not partake of the disorder. In one or two instances, this thickened state of the membrane was the only change of structure observed; but in others it was attended either with ulceration of the surface near the glottis, appearing as if it had been formed by an abscess, which had burst; or with a partial death of one or more of the cartilages of the larynx, viz. the arytenoid, thyroid, or cricoid. The rest of the air passages and the lungs were healthy." (*Med. Chir. Trans. Vol.* 6, *p.* 222.)

In such examples, this gentleman is a zealous advocate for the early performance of bronchotomy, and he has cited several instances, in which this operation was successfully performed, both for the relief of quinsy and the extraction of foreign bodies from the trachea.

What Bayle called *l'œdeme de la glotte*, no doubt, was the same kind of disease as that noticed by Mr. Lawrence: one case of it, in which tracheotomy was performed with success, and another, in which the patient died suddenly suffocated, in consequence of the operation not being done, have been very recently published by Mr. Liston. (See *Edinb. Med. and Surg. Journ. Vol.* 19, *p.* 568.)

The affections of the larynx, requiring bronchotomy, would seem, indeed, to be more numerous and diversified, than is usually supposed; thus, Mr. C. Bell mentions the case of a medical student, who was attacked with shivering, fever, and sore throat, and in three days died of suffocation. On dissection, no obstruction in the larynx was observed, but only an inflammation of its membrane, and a spot like a small pox *pustule*, upon the margin of the glottis. (*Surgical Obs. Part* 1, *p.* 14.)

Children sometimes inadvertently drink boiling water from the spout of a tea-kettle. "The effects of this accident (says Dr. Hall) are not, as might be supposed *à priori*, the symptoms of inflammation of the œsophagus and stomach, but of inflammation of the glottis and larynx, resembling those of *croup;* and the case constitutes another instance, in which the operation of laryngotomy, or of tracheotomy, may be performed with the effect of preventing impending suffocation, and perhaps of saving life." (*Med. Chir. Trans. Vol.* 12, *p.* 2.) The cases and remarks collected by Dr. Hall, Mr. Gillman, and Mr. Stanley on this new subject cannot fail to be highly interesting to practitioners. In a case of the foregoing description, Mr. Wallace of Dublin, performed tracheotomy with success. (See *Lond. Med. and Phys. Journ. for July* 1822.) Mr. Burgess, who has seen five cases, in which boiling water was taken into the throat, thinks that death, when it follows, is almost always produced by obstructed respiration. In one of the examples which he has recorded, bronchotomy was the means of saving the child. (See *Dublin Hospital Reports, Vol.* 3.)

Great mechanical injury of the larynx, caused by a blow, or fall, may create the necessity for bronchotomy, as is proved by a case lately reported by Mr. Liston. (See *Ed. Med. and Surgical Journ. Vol.* 19, *p.* 570.)

2. The compression of the trachea by foreign bodies, lodged in the pharynx, or by tumors, formed outwardly, and of sufficient size to compress the windpipe, but not admitting of immediate removal, is an equal reason for operating, more or less expeditiously, according to the symptoms. Mr. B. Bell mentions two instances of suffocation from bodies falling into the pharynx. Respiration was only stopped for a few minutes; but, the cases were equally fatal, notwithstanding the employment of all the usual means. This

author thinks, there was every reason to believe, that bronchotomy would have been attended with the greatest success, if it had been performed in time, before the effects of the suffocation had become mortal. The operation should also be done, when the trachea is dangerously compressed by tumors. The author of the article *Bronchotomie*, in *l'Encyclopédie Méthodique*, says, that about twenty years ago, he opened a man, who had died of an emphysema, which came on instantaneously. He had had, for a long while, a bronchocele, which was of an enormous magnitude towards the end of his life. The cavity of the trachea was so obliterated, that there was scarcely room enough to admit the thickness of a small piece of money. Doubtless, bronchotomy, performed before the emphysema made its appearance, might have prolonged this man's days.

In cases of this last description, Desault would have advised the introduction of an elastic gum catheter into the trachea from the nose, in order to facilitate respiration. This practice, I believe, has not hitherto been attempted by English surgeons. (See *Œuvres Chir. de Desault, T.* 2, *p.* 236, &c.)

Habicot successfully performed this operation on a lad fourteen years old, who, having heard, that gold, when swallowed, did no harm, attempted to swallow nine pistoles, wrapped up in a piece of cloth, in order to hide them from thieves. The pacquet, which was very large, could not pass the narrow part of the pharynx; and here it lodged, so that it could neither be extracted, nor forced down into the stomach. The boy was on the point of being suffocated by the pressure, which the foreign body made on the trachea; and his neck and face were so swollen and black, that he could not have been known. Habicot, to whose house the patient was brought, attempted in vain, by different means, to dislodge the foreign body. At length, perceiving the patient in evident danger of being suffocated, he resolved to perform bronchotomy. This operation was no sooner done, than the swelling and lividity of the face and neck disappeared. Habicot pushed the pieces of gold down into the stomach with a leaden probe, and the pistoles were, at different times, discharged from the anus, eight or ten days afterwards. The wound of the trachea very soon got quite well. (See *Mem. de l'Acad. de Chirurgie, tome* 12, *p.* 243, *Edit. in* 12*mo.*)

In such a case, Desault would have introduced an elastic gum catheter into the larynx, instead of performing bronchotomy, which could not answer, were the foreign body low down. (See *Œuvres Chirurg. de Desault, T.* 2, *p.* 247.)

3. Foreign bodies in the trachea, may render it necessary to practise bronchotomy. Here I ought rather to say, perhaps, laryngotomy, which by several modern surgeons is deemed most applicable. (*Desault; C. Bell, Surg. Obs. Part* 1, *p.* 47, *&c.*)

Louis, in an excellent memoir, on extraneous substances in the trachea, has proved, more convincingly than all other preceding writers, the necessity of the operation in circumstances of this kind. The following case fell under his observation.

On Monday, the 19th of March, 1759, a little girl, seven years old, playing with some dried kidney-beans, threw one into her mouth, and thought she had swallowed it. She was immediately attacked with a difficulty of breathing, and a severe convulsive cough. The little girl said, she had swallowed a bean, and such assistance as was thought proper, was given her. Want of success was the cause of several surgeons being successively sent for, who vainly employed the different means, prescribed by art, for extracting foreign bodies from the œsophagus, or forcing them into the stomach. A fine sponge, cautiously fastened to the end of a whalebone probang, was repeatedly introduced through the whole extent of the œsophagus. The little girl, who made a sign with her finger, that the foreign body was situated in the middle of the neck, thought that she felt some relief, when the sponge was conveyed below the place which she pointed out. She had, every now and then, a violent cough, the efforts attending which produced convulsions in all her limbs. Deglutition was unobstructed; and warm water and oil of sweet almonds had been swallowed without difficulty. Two whole days had been passed in sufferings, when the relations called in Louis. The little girl, with all possible fortitude and sense, was several times held in her friends' arms, ready to die of suffocation. Louis, well aware of what had happened, came into the room, where the patient was. She was sitting up in her bed, suffering no other symptom, than a very great difficulty of breathing. Louis inquired where she felt pain, and she made such a sign in reply, as left no doubt concerning the nature of the accident. She put the index finger of her left hand on the trachea, between the larynx and sternum. The fruitless attempts which had been made in the œsophagus, with a view of dislodging the foreign body; the nature and the smallness of this body, which was not such as would be stopped in the passage for the food; and the facility of swallowing, were negative proofs, that the bean was not in the œsophagus. Respiration was the only function disturbed; it was attended with difficulty, and a rattling in the throat. The little girl expectorated a frothy fluid, and she pointed out so accurately the painful point where the object producing all her sufferings was situated, that Louis did not hesitate to declare to the relations, from this single inspection, that the bean was in the windpipe, and that there was only one way of saving the child's life, which was to make an incision, for the purpose of extracting the foreign body. He apprised them, that the operation was neither difficult nor dangerous, that it had succeeded as often as it had been practised, and that the very pressing danger of the case only just allowed time to take the opinion of some other well-informed surgeons, respecting the indispensable necessity for such an operation. Louis thought this precaution necessary, in order to acquire the confidence of the parents, and to shelter himself from all reproach, in case the event of the case should not correspond with his hopes. Louis went home to prepare all the requisites for bronchotomy, and, in two hours, he was informed the surgeons, who were consulted, waited for him. Since Louis went away, the child had become quiet, and was lying on its side asleep. The opinion he had delivered, had been ill-explained by the friends and attendants, and had been discussed, before his return. They, who had been rendering their assistance, on the supposition, that the foreign body was in the œsophagus, evinced surprise at the proposal of extracting, by an operation, a substance, the presence of which, in any part of this tube, was not obvious. Louis explained his advice, in regard to bronchotomy, and did not expect a doubt to be set up against so positive a fact. It was objected, that a substance as large as a bean could not insinuate itself into the trachea. He brought every one into his sentiment, by a short explanation of cases of this sort, with which he himself was acquainted. The little girl was examined; she was better, than when Louis saw her before, and a very palpable emphysema was seen above the clavicle, on each side of the neck, a symptom which did not exist two hours previously. This swelling made Louis conclude, that the urgency for the operation was still greater. The friends, whose confidence had been shaken by the opposition he had experienced in bringing about unanimity, were in the greatest embarrassment, when they were told, that the child might die of an operation, which he had represented as only a simple incision, free from all danger. Louis was repeatedly asked, if he would be responsible for the child's life during the operation, and he in vain replied, that if there were any thing to fear during the operation, it would be from the accident itself, and not from the assistance rendered. This distinction was not perceived, and Louis withdrew, at the same time refusing his consent to the exhibition of two grains of emetic tartar, the effect of which would be useless, and might be dangerous. The medicine was given in the night: the child was fatigued with its operation, and quite unbenefited. On Tuesday morning, Louis found the little girl very quiet, and they who had paid their visits earlier, found her wonderfully well. The respiration, however, continued to be still attended with a rattling noise, which Louis had observed in the evening, when the breathing was much more laborious. The child was nearly suffocated several times in the course of the day, and died in the evening, three days after the accident.

Bordenave, who had seen the patient, informed Louis of the child's death on Friday. The body was opened, before a numerous assembly of persons. After making a longitudinal incision through the skin and fat, along the trachea, between the sterno-hyoidei muscles, Bordenave slit open the trachea, cutting three of its cartilages. At this instant, every one could see the bean, and Louis took it out with a small pair of forceps. It was manifest, from the ease, with which this foreign body was extracted, that the operation would have had, on the living subject, the most salutary effect. The relations had to regret having sacrificed a child, which was dear to them, to an irresolution and a timidity, which the most persuasive arguments could not remove. (*Mem. de l'Acad. Royale de Chirurgie, T.* 12, *p.* 293, *&c. Edit. in* 12*mo.*)

This case strikingly illustrates the symptoms, which result from the presence of foreign bodies in the trachea, and shews the only surgical proceeding which can be of use. But, among the phenomena, apparently difficult of explanation, is the calm, which, at intervals, followed the afflicting cough. (See *Dr. Hunt's Case in Med. Chir. Trans. Vol.* 12, *p.* 27.) Anatomy, however, has dispelled much of the doubt on this matter. It is known, that the whole canal of the trachea is much less sensible, than the rima glottidis. A foreign body, like a bean, may remain a certain time in that canal without much inconvenience, the passage being only somewhat obstructed, according to the position of the substance. It may even remain several days, months, or years, without producing any symptom of its presence, except a trivial sensation of obstruction, and this is what happens, when the body lodges in one of the ventricles of the larynx. Facts of this kind are to be found in Tulpius, Bartholine, and many other observers. But, when the extraneous substance quits its situation, and is carried into the trachea, the irritation, which it produces there, and particularly, about the larynx, occasions coughing, and if, in the fits, the foreign body should become fixed between the lips of the glottis, it may cause instantaneous death, as probably has happened in many of the cases of suffocation from extraneous substances.

Another remarkable circumstance which deserves more attention, as it confirms the presence of a foreign body in the trachea, is the emphysema, which appeared about the clavicle, towards the termination of the case. Louis did not believe, that any of the persons, who saw the patient, could entertain a just idea of the origin of this symptom. The supposition, that the obstruction, which the foreign body caused, for two days, to the free passage of the air, might have occasioned a forcible distention of the trachea, and a rupture of the membrane, which connects together the cartilaginous rings of this tube, was dispelled by the examination after death. The windy tumor had not originated in the circumference of the trachea: here its limits were only seen. The very substance of the lungs, and the mediastinum, were emphysematous. The air, confined by the foreign body, had ruptured the air-cells, during the violent fits of coughing, and thus insinuated itself into the interlobular cellular substance of the lungs. Thence it had passed into the cellular substance of the lungs; and afterwards into that connecting the pleura pulmonalis with the outer surface of these organs; and by the communication of the cells with each other, it had produced a prodigious swelling of the cellular substance, between the two layers of the mediastinum. The emphysema, in its progress, at length made its appearance above the clavicles. The swelling of the lungs, and the circumjacent parts, in consequence of the insinuation of air into the cellular substance, is a manifest cause of suffocation. The tumefaction appears to be so natural an effect of the presence of a foreign body in the trachea, that one can hardly believe it is not an essential symptom, though, before Louis, no author had made mention of it.

Foreign bodies in the trachea, however, do not always cause death so suddenly, which may be owing to their smallness, their smoothness, or the situation in which they are fixed. An example is related in *Les Ephémérides des Curieux de la Nature, Decad.* 2. *Ann.* 10. As a monk was swallowing a cherry, the stone of the fruit passed into the trachea. A violent cough, and excessive efforts, as it were, to vomit, were the first symptoms of the accident, and of these the patient thought he should have died. A sleep of some hours followed this terrible agitation, and the patient afterwards did not feel the least inconvenience during a whole year. At the end of this time, he was attacked by a cough, attended with fever. These symptoms became worse and worse, every day. At length the patient evacuated a stone as large as a nutmeg. It was externally composed of tartareous matter, to which the cherry-stone had served as a nucleus. A copious purulent expectoration followed the discharge of the foreign body, and the patient died consumptive some time afterwards. No mention is made of the body being opened; but, from the symptoms, there is every reason to believe, that an abscess must have arisen in the substance of the lungs, from the presence of the foreign body. That foreign bodies in the trachea, even when they do not induce pressing symptoms of suffocation, may ultimately kill the patient by inducing disease of the lungs, is proved by several cases on record, and, particularly by one, which occurred to Desault; a cherry-stone was lodged in one of the ventricles of the larynx; the patient would not consent to an operation, and died in two years *d'une phthisie laryngée.* (See *Œuvres Chir. de Desault*, *T.* 2, *p.* 258.)

Some valuable observations, confirming the necessity of an early recourse to bronchotomy, in cases, where foreign bodies are lodged in the trachea, have been published by Pelletan. In one case, in which a bean had fallen into a child's trachea, and in which the most urgent symptoms of suffocation had prevailed for four days, and convulsions during the last thirty-six hours of this space of time, M. Pelletan performed the operation, which a timid practitioner, under whose management the young patient was first placed, had neglected to do at an earlier period. Upon the incision being made into the trachea, the bean was immediately thrown out to the distance of two feet, and the child for a time was relieved. The little boy was so extremely weak, that it was at one time supposed he was dead. However, with some assistance, he gradually revived, even regained his senses, called his parents, and asked for such things as he wanted.

This hopeful state lasted eight or ten hours, after which, convulsions came on again, and the child died fourteen hours after the operation.

Notwithstanding the turgid appearance of all the blood-vessels of the brain, as detected after death, the little boy had yet received a degree of relief at the instant of the foreign body being extracted. Pelletan deems it unnecessary to insist on the great probability of success, that would have attended the operation, had it been performed at an earlier period.

Of such success, Pelletan gives us the following example.

In the month of May, 1798, a child, about three years old, was brought to the Hôtel Dieu, who, in playing with some French beans, and putting them into its mouth, let one of them slip into the trachea. For three days, the child was afflicted with a continual cough, and sometimes the symptoms of suffocation were most pressing. This time had been spent in administering emetics, introducing instruments into the œsophagus with the design of forcing the foreign body into the stomach, and in inspiring the relations with a pernicious confidence, arising from the very long intervals of repose, which the child experienced, during which, however, a rattling in the throat continued, a characteristic mark of the accident. Pelletan immediately decided to perform the operation. The child was very fat, and this circumstance, together with the small diameter of the trachea at this age, rendered the exposure of the anterior portion of this tube difficult. Pelletan was at this moment struck with the reflection, that bronchotomy should never be attempted except by men of science, coolness, and experience in operations. The rings of the trachea, however, were at length cut, and there was no sensible interval, between the incision and the expulsion of the foreign body. The bean had swelled considerably with the moisture. The child seemed restored to life; it spoke freely; it was only troubled with coughing, the effect of a small quantity of blood insinuating itself into the trachea, which fluid was instantly rejected again. This event has the appearance of convulsions, and may alarm those, who do not understand it; but according to Pelletan, it is the guarantee of the patient's life, by expelling incessantly, and without difficulty, whatever happens to get into the trachea. The wound was healed in twenty days, and the child's voice was not perceptibly altered.

In another interesting case, recorded by the same writer, a pebble was lodged in the windpipe, and the case, not being understood, was treated, for about three weeks, as a simple inflammation of the lungs. At last, bronchotomy was performed, and, by placing the child in a horizontal position, the stone was soon discharged through the incision. The patient was immediately relieved; but, the effects of the inflammation of the lungs, and injury which these organs had sustained, could never be entirely cured, and the child died phthisical eight months afterwards.

Pelletan details other cases, in which the foreign body, being fixed in the trachea, could not be forced out by the breath, as soon as the incision was made, but, required further means to disengage it. In one instance, Pelletan made a long cut in the windpipe of a child; but, nothing made its appearance. A probe, wrapped round with some oiled linen, was then introduced several times up and down the larynx, without creating a great deal of uneasiness, and the child continued to respire very well through the opening in the trachea. The foreign substance was presently brought to the wound and extracted: it proved to be part of the jaw of a mackarel, with many sharp teeth in it. This child soon experienced a perfect recovery.

In another instance, a young man came to the Hôtel Dieu, in consequence of being afflicted, for six weeks, with a severe cough, frequently accompanied with a sense of suffocation. These complaints, on inquiry, were ascertained to arise from a button-mold having fallen into the trachea. An opening was, therefore, made in this tube; but, though the button could be felt, it could not be extracted with the finger. The cricoid cartilage was now divided, and the foreign body taken out of the left ventricle of the larynx. The man recovered.

In one case, related by Pelletan, a piece of tendon of veal got down the glottis, and gave rise to most dangerous symptoms. The foreign body was described as being so large, that this surgeon could not but suppose, that the complaints were owing to its lodgment in the œsophagus, as it seemed to be incapable of entering the glottis. The introduction of instruments down the pharynx, however, produced no relief; but, on dividing the thyroid cartilage, Pelletan passed his finger within the larynx, and, without knowing it, pushed the piece of tendon towards the glottis, when, with the aid of a probang, it was forced into the pharynx and swallowed. The patient experienced immediate relief, and got quite well. (*Clinique Chir. T.* 1.)

With respect to bronchotomy, or laryngotomy, for cases in which extraneous substances are supposed to be lodged in the trachea, one important caution seems necessary, viz. whenever the foreign body is above a certain size, a probang should always be passed down the œsophagus before the windpipe is opened, for very similar symptoms to those, which proceed from extraneous substances in the trachea, may be caused by the lodgment of foreign bodies in the œsophagus. In fact, bronchotomy has actually been performed, while the extraneous substance was in the œsophagus, from which last situation no attempt was made to displace it, and the patient lost his life. (See *Œuvres Chir. de Desault, T.* 2, *p.* 261.) Examples, in which various extraneous bodies have been successfully extracted by means of bronchotomy, are recorded by Engel. (*Sendschreiben an Schmid, &c. Augsp.* 1750; *Guincourt, Journ. de Méd. Vol.* 12, *p.* 44; *Heister, Wahrnehmungen,* 1, *p.* 1026; *Wendt. Hist. Tracheotomiæ, &c. Uratisl.* 1774. *Dr. Hunt, in Med. Chir. Trans. Vol.* 12, *&c.*)

4. Bronchotomy has been proposed in cases, in which the tongue is so enlarged, as totally to shut up the passage through the fauces. Richter mentions an inflammation of the tongue, in which it became four times larger than in the natural state. Valescus had made the same observation: "*Ego aliquando vidi ità magnificatam linguam propter humores, ad ejus substantiam venientes, et ipsam imbibentes, quod quasi totum os replebat, et aliquando ex ore exibat.*" (*Lib.* 2, *cap.* 66.) Such prodigious swellings of the tongue are said sometimes to occur in malignant fevers, and the small-pox. They are also sometimes quite accidental, as, for instance, the cases which happen from the stings of insects, or the unskilful employment of mercury. Mr. B. Bell gives an example of the latter sort. He says, that the patient had taken, in a very short time, so large a quantity of mercury, that the part became alarmingly swoln in a few hours, and, though all the usual remedies were tried, none had the least effect. Bronchotomy was delayed till the patient was nearly suffocated; but he was restored as soon as an opening was made in the trachea. Some have objected to this practice, alleging, that scarifying the tongue will bring relief in time. (*Encyclopédie Méthodique; partie Chirurgicale, art. Bronchotomie.*) Malle's observations on the swelling of the tongue, and the most effectual means of relieving it, seem to confirm the latter sentiment. (*Mém. de l'Acad. de Chirurgie, T.* 14, *p.* 408, *&c. Edit. in* 12*mo.*)

In cases of the preceding description, Desault would have advised the introduction of an elastic gum catheter, from the nose into the trachea, in order to enable the patient to breathe, until the swelling of the tongue had subsided. (See *Œuvres Chir. de Desault, T.* 2, *p.* 246.)

5. Bronchotomy has been recommended, when both the tonsils are so enlarged, that they quite impede respiration. Here, the inflammatory swelling is not meant; this commonly soon suppurates, and the spontaneous bursting of the tumor, or the opening of it with a pharyngotomus, generally removes all necessity for so extreme a measure. But, even in acute inflammation and great enlargement of the palate, tonsils, &c. attended with imminent danger of suffocation, the practice has been sometimes deemed necessary, as the cases, cited from Flajani, in the preceding columns, are sufficient to prove. The disease, however, which I here wish particularly to specify, as sometimes rendering bronchotomy indispensable, is a chronic enlargement of the tonsils, the case mentioned in the article *Tonsils.* From the remarks on the disease, however, it will be seen, that more is to be expected from the excision of the tonsils, than from the operation now in question. Besides, before the glands are so large as to threaten suffocation, they should be cut away, in preference to performing bronchotomy, which might relieve the urgency, but could not remove the cause of the difficulty of breathing. In general, there is no urgent danger of suffocation, till the swelling is such as not only to shut up the posterior aperture of the mouth, but also the posterior openings of the nostrils, which is exceedingly rare. In cases of obstructed respiration from enlargement of the tonsils, Desault preferred the introduction of the elastic catheter, from the nose into the larynx, to the operation of bronchotomy. It is not common for a polypus to make this operation necessary. Boerhaave, however, mentions a case, in which the patient was suffocated, as the surgeon was going to extirpate a tumor of this kind: no doubt, this patient might have been saved, if bronchotomy had been previously performed. Polypi, growing in the larynx itself, are very rare; but examples are recorded, and, if such tumors happen to obstruct the glottis, the patients are instantly suffocated. Some instances of this kind are related by Bichat. The only mode of getting at such swellings, so as to extirpate them, is by performing bronchotomy. (See *Œuvres Chir. de Desault, T.* 2, *p.* 254, 255.)

6. Lastly, bronchotomy has been recommended to be done on persons recently suffocated or drowned. Detharding is the first author, who has treated of the necessity of this operation, in the latter case, in a letter addressed to Schroeck, intitled, *De Methodo subveniendi Submersis per Laryngotomiam.* "*Hactenus rectè,* (says Haller,) *si spuma quâ pulmo in submersis offercitur ea administratione repelli quiret.*" This writer maintains, that drowned persons have no water in their chests, or air-vessels of the lungs, and that they perish suffocated, for want of air and respiration, and that, while the person is under water, the epiglottis applies itself so closely over the glottis, that not one drop of water can pass. But, these

assertions are quite contrary to numerous experiments made by Louis, who drowned animals in coloured fluids, and proved that they who are drowned, inspire water, with which the air-vessels and cells are quite filled. Louis also opened men, who had perished under water, but, in them, he never found the epiglottis applied to the glottis, in the manner described by Detharding; indeed, anatomy proves the impossibility of its being so. Detharding's theories were wrong, and, as he did not use any power to distend the lungs with air, his mere practice of bronchotomy must have been useless. When there is a free communication between the cells of the lungs and the atmosphere, the air will not expand these organs, if the inspiratory muscles can no longer act. Hence, after opening the trachea, and letting as much water run out of this tube as possible, the pipe of a pair of bellows should be introduced, and the air forcibly introduced into the lungs.

Detharding was right in his opinion, that drowning is a species of suffocation, and that the privation of oxygen gas is the cause of death. Hence, the propriety of introducing this air into the lungs, as speedily as possible, whenever animation has not been so long suspended, that every hope of restoration is over. Indeed, it is proper to distend the lungs with air, in all cases in which animation has been recently suspended by suffocation, immersion under water, or by noxious vapours and gases. This measure is highly proper, in conjunction with electricity, or galvanism; the communication of warmth to the body; the application of strong volatiles to the nostrils; rubbing the body with warm flannels; and the injection of any fluid, like warm wine and water, into the stomach, through a hollow bougie. However, tobacco clysters, which have had the sanction of the Royal Humane Society, should be reprobated, as the qualities of this plant are peculiarly destructive of the vital principle, and not simply stimulating. I am sorry to find this last means commended by so respectable a surgeon as Baron Larrey, who joins the rest of the French surgeons in condemning electricity and bronchotomy. He speaks in favour of opening the jugular vein, exposing the body to the fire, friction, &c. On dissecting the bodies of some drowned persons, Larrey found, as Louis had done long since, that the air tubes of the lungs were filled with water, instead of air, and that the epiglottis was raised and applied to the os hyoides. (See *Mémoires de Chir. Militaire*, *T.* 1, *p.* 83—85.)

There are many modern practitioners, who consider bronchotomy needless in cases of suspended animation, because, it is contended, that, as the patient is always destitute of sensation, a tube may easily be passed into the trachea from the nose or mouth, for the purpose of inflating the lungs. Either the curved pipe of a pair of bellows may be introduced into the glottis through the mouth, or an elastic gum catheter may be passed into the trachea from the nose. "*On peut mettre ce moyen à exécution* (says Pelletan) *chez les asphixiés, ou les enfans nouveaux nés, qui ne respirent pas; parceque, dans ces differens cas, non seulement il n'y a pas d'inflammation, mais même toute sensibilité est suspendue, et la canule est commode pour souffler de l'air dans les poumons, en même temps qu'elle peut causer une irritation salutaire. M. Baudelocque, mon célèbre confrère, m'a temoigné se servir habituellement, et avec succès de ce moyen pour appeler à la vie les nouveaux nés dont la respiration ne s'établit pas.*" (*Clinique Chir. T.* 1, *p.* 29.) Desault likewise conceived, that the lungs might be easily inflated, without performing bronchotomy. (*Œuvres Chir. T.* 2, *p.* 239.) Mr. A. Burns adopts the same sentiment. (*Surgical Anatomy of the Head and Neck*, *p.* 384.) My own individual opinion upon this subject is, that, if a surgeon knows, that he can inflate the lungs as completely and expeditiously, without performing bronchotomy, as he can by making an incision in the trachea, he is right in dispensing with the latter operation. But, in the generality of cases of suspended animation, (that of new born infants excepted, where bronchotomy would be an objectionable undertaking,) I much doubt, whether in actual practice bronchotomy will not be found the best and most speedy means of enabling the surgeon to distend the lungs with air. If you follow Desault's suggestion, I contend, that you are likely to be some minutes longer in getting the elastic catheter from the right nostril into the larynx, than you would be in cutting into the trachea, and introducing into the incision the muzzle of a pair of bellows. Supposing the elastic catheter introduced, will you now be able to distend the lungs with air, in an adequate degree, an object of the highest moment? A pair of bellows seems to me almost essential to this purpose. I shall say nothing on the probability of many practitioners coming to the patient unprovided with the requisite sort of tube.

If a pair of bellows, with a curved pipe, be employed, many surgeons would be a considerable time in getting the muzzle into the glottis, and, in the meanwhile every spark of life might be extinguished. On the other hand, bronchotomy (performed by a man of ordinary care and skill) is an operation free from danger. It may be executed with a penknife, if no better instrument be at hand; and, when the incision has been made, a pair of common bellows will suffice for the inflation of the lungs. Did I conceive, that bronchotomy were a perilous operation; that the lungs could be effectually distended without the employment of bellows; that the object could generally be accomplished as expeditiously without cutting into the trachea; I should be as ready to join in the condemnation of this last proceeding, as any contemporary writer. Greatly, however, as I respect most of the authors, who differ from me on this point, the reasons I have assigned, prevent me from subscribing to their sentiment. Desault, who may be regarded as the founder of the doctrine, concerning the inutility of bronchotomy, it is also to be observed, spoke only from theory, and not actual practice, in these cases.

With respect to the performance of the operation, no preparation is necessary, as delay only increases the danger. The patient being seated in an arm-chair, or, what is better, laid on a bed with his head hanging backward, an incision is to be made, which is to begin below the cricoid cartilage, and to be continued downward, about two inches, along the space between the sterno-thyroidei muscles. Care should be taken not to cut the lobes of the thyroid gland, lest a troublesome and dangerous bleeding be occasioned, and, as the left subclavian vein lies a little below the upper part of the first bone of the sternum, the incision should never extend so low as this point. The knife must not be carried either to the right or left, in order to avoid all risk of injuring the large blood vessels situated at the sides of the trachea. The incision in the integuments having been made, the sternothyroidei muscles are to be pushed a little towards the sides of the neck, so as to bring the trachea fairly into view. Most authors recommend the point of the knife to be then introduced between the third and fourth cartilage of the trachea, and the opening to be enlarged transversely. It is true, that, in this way, an opening may be safely made, large enough to allow a small cannula to be introduced. It is safer, however, in all cases, to enlarge the opening in the perpendicular direction, by cutting from within outward. There is no advantage in avoiding a wound of the cartilages of the trachea, the only reason assigned for cutting the membrane between them, in a transverse direction; while a sufficiently large opening cannot thus be safely obtained, in cases in which it is necessary to introduce the muzzle of a pair of bellows, in order to inflate the lungs. In short, it is safer and better, in every instance, to make the wound in the trachea in a perpendicular manner.

I have stated, that bronchotomy may be performed by a man of ordinary skill, without hazard. It is far otherwise with a careless practitioner. We read in Desault's work, that, in one instance, the carotid artery was wounded. The following cautions, given by Mr. A. Burns, seem entitled to notice. "The arteria innominata is in risk in some subjects. I have seen it mounting so high on the forepart of the trachea, as to reach the lower border of the thyroid gland. Even the right carotid artery is not always safe. I am in possession of a cast, taken from a boy of twelve years of age, which shows the right carotid artery crossing the trachea in an oblique direction. In this subject, that vessel did not reach the lateral part of the trachea till it had ascended two inches and a quarter above the top of the sternum.

"Where both carotid arteries originate from the arteria innominata, there is considerable danger in performing the operation of tracheotomy, for, in such cases, the left carotid crosses the trachea pretty high in the neck. Professor Scarpa has seen a specimen of this distribution in a male subject, and I have met with five.

"These varieties in the course of the arteries are worthy of being known, and remembered; they will teach the operator to be on his guard, since he can never, *à priori*, ascertain the arrangement of the vessels with any degree of certainty. It will impress on his mind the impropriety of using the knife further, than merely to divide the integuments and fasciæ. If he then clear the trachea with the fingers, he will never injure any of the large arteries. When, with the finger, he has fairly brought the trachea into view, he ought to examine carefully, whether any of the large arteries lie in front of it, and if he find one, he ought to depress it towards the chest, before he penetrates into the windpipe.

"In cutting into the trachea, the preferable plan is to cut the rings from below upward, avoiding injury of the thyroid gland." (See *A. Burns on the Surgical Anatomy of the Head and Neck, p.* 393, 394.)

When bronchotomy is performed for the purpose of inflating the lungs, the cut in the windpipe must be made somewhat larger, than when an opening is required merely to enable the patient to breathe through a small cannula. The larger size of the pipe of the bellows, is the reason of this circumstance.

When a cannula is introduced, care must be taken not to pass it too far into the wound, lest it injure the opposite side of the trachea. This is a caution, on which Fabricius ab Aquapendente dwells very strongly, and with good reason.

Small as the vessels may be, which are divided in bronchotomy, they occasionally bleed so much, as to create apprehension, and even prevent the continuance of the operation. There is a case in Van Swieten's Commentaries, confirming this remark. A Spanish soldier, aged twenty-three, was in the most urgent danger from an inflammation of his throat. It was thought nothing could save him, except bronchotomy. After the longitudinal cut in the skin, and the separation of the muscles, the trachea was opened between two of the cartilages; but the blood insinuated itself into this canal, and excited so violent a cough, that the cannula could not be kept in by any means, though it was replaced several times. Louis remarks, that, in this instance, the patient's head should have been turned downward, in order to keep the blood from flowing backward into the trachea. It is asserted, that the opening of this tube was not always opposite the external wound, in consequence of the convulsive action of the muscles, and that the patient on this account could hardly breathe. Hence, Vigili was induced to slit open the trachea, down to the sixth cartilaginous ring; and it was only then that he inclined the patient's head forward. The bleeding now ceased, the patient breathed with ease, and, on the second day, the inflammation was so much better, that respiration went on without the aid of the opening in the trachea.

The most simple and natural mode of obviating all trouble from the entrance of blood into the trachea, is to tie any bleeding branch of the thyroid artery, or vein, before the windpipe is opened.

Sometimes, though very seldom, the cannula becomes obstructed with mucus, or clots of blood. Such an accident nearly suffocated a patient at Edinburgh. An ingenious person happening to be at hand, suggested the introduction of a second cannula into the first; the second one being taken out, and cleaned, as often as necessary, and then replaced.

The use of the cannula must be continued as long as the causes obstructing respiration, remain. Thus, in one very interesting case of cynanche, detailed in a modern publication, the patient, thirteen months after the operation, had not been able to discontinue the tube. (See *Med. Chir. Journ. Vol.* 5, *p.* 7.) This example was attended in its progress with a singular circumstance, viz. the expulsion through the cannula of several portions of calcareous matter, or bone.

When respiration is suspended by the presence of a foreign body in the trachea, and the extraneous substance does not make its appearance at the opening, a trial may be made to discover its situation by means of a bent probe. When it lies downward, which it hardly ever does, the wound in the trachea may be enlarged in this direction, and the body extracted with a pair of curved forceps. The extraneous substance is mostly forced out by the air, as soon as the incision in the trachea is opened. When it cannot be immediately found, some practitioners (Heister and Raw) have succeeded by keeping the lips of the wound asunder with a leaden cannula, by which means, the force of the air in expiration has, in a few hours, expelled the foreign body.

Richter gave the preference to a curved cannula; and since his time many surgeons have chosen to use such an instrument, though if it be double, the inner tube cannot be so easily introduced as that of a straight cannula, and, no doubt, the chief disadvantage of the latter has often proceeded from its having been made of too great length.

In some instances, like that referred to above, a cannula has been borne quietly in the trachea, while in others, it has produced so much irritation, cough, and sense of choking, as to render its immediate removal necessary. Mr. Lawrence, in speaking of the obstruction of the glottis from the disease already adverted to in this article, observes, that, when the cannula causes inconvenience, he should advise a longitudinal incision, of about half an inch, in the middle of the trachea, and the removal of a thin slip of the tube, which would leave an artificial opening for respiration equal in size to the natural one. (See *Med. Chir. Trans. Vol.* 6, *p.* 249.)

On the Continent, the operation of laryngotomy, which was first advised, by Vicq d'Azyr, and recommended by Desault, is frequently preferred to tracheotomy. The surgeon makes an incision over the anterior part of the thyroid cartilage, punctures the crico-thyroid membrane, and, if it be necessary, introduces a director, and slits the thyroid cartilage upwards. A single opening in the crico-thyroid membrane, would suffice for the introduction of a cannula for the purpose of enabling the patient to breathe; but for the extraction of foreign bodies, it would be necessary also to cut the thyroid cartilage. The fact, that extraneous substances, when they are loose, are almost always lodged at the upper part of the larynx, proves, that laryngotomy, in such cases, must commonly be most advantageous; and, according to Desault, even when the foreign bodies are lower down in the trachea, they may in general be most easily extracted with the aid of a pair of curved forceps. In this country, laryngotomy has been less commonly practised, though commended a few years since, by Mr. Coleman, and more recently by Mr. C. Bell.

"Of the three situations, (says Mr. Lawrence,) in which it has been proposed to make the opening, viz. in the thyroid cartilage, between that and the cricoid, or in the trachea, I consider the first as the least eligible. Besides the objections from the ossification of the cartilage, and the danger of wounding, or otherwise injuring, the chordæ vocales, there is the inconvenience in the case of angina laryngea, arising from the swoln and thickened state of the membrane, which may actually impede the passage of the air. I am not aware of any objection to a transverse opening between the thyroid and cricoid cartilages. The prominence of the former in the neck, serves as a guide to the part, which should be opened. Whether bronchotomy, or laryngotomy, ought to be selected, must of course depend upon the nature of the case: in cases of cynanche, the proximity of the inflamed parts would be an objection to laryngotomy; while, in examples of foreign bodies within the glottis, this operation may generally be most advisable, for reasons already explained. It is absurd to think of confining one mode of operating to different cases." (See *Medico-Chir. Trans. Vol.* 6, *p.* 248.)

Of the operation, performed in the membranous space, Mr. C. Bell entertains a favourable opinion. He directs us to slit up the membrane, and open the incision with the handle of the knife, when the patient will immediately breathe with ease. Here, says he, there is nothing to alarm the most timid operator. No great turgid veins are opened; the cut is made above the thyroid gland; and above the anastomosing branch of the thyroid arteries. The part is strongly marked by the prominence of the thyroid cartilage above, and the ring of the cricoid cartilage below. "If the occasion be temporary, a simple slit of the membrane will be found sufficient. If necessary, a transverse cut will afford any degree of opening. If a round hole be desired, the four corners, left by the incisions, may be snipped off," or the edges of the opening may be kept asunder by means of the doubled wire of a catheter, the middle part of which lies on the wound, while the ends are bent round the neck, and tied by a ligature behind. In Mr. C. Bell's cases, less annoyance was caused by this contrivance, than by a tube.

Hevin sur les Corps Etrangers qui sont arrêtés dans les premières Voies, et qu'il faut tirer par Incision, in Mém de l'Acad. Royale de Chirurgie, T. 3, *p.* 131, *&c. edit.* 12*mo. Louis, Mémoire sur une Question Anatomique relative à la jurisprudence, où l'on établit les principes pour distinguer, à l'inspection d'un corps trouvé pendu, les signes du suicide, d'avee ceux de l'assassinat. Habicot, Question Chirurgicale, par laquelle il est demontré que le Chirurgien doit assurément pratiquer l'Operation de la Bronchotomie, &c.* 12*mo. Paris,* 1620. *Mémoire sur la Bronchotomie, par M. Louis, in Mem. de l'Acad. de Chirurgie, T.* 12, *Edit.* 12*mo. Second Mémoire on this subject, inserted by the same writer in the said volume. De la Rescission des Amygdales, T.* 14, *p.* 283, *&c. Precis d'Observations sur le Gonflement de la Langue, &c. par M. de la Malle, T.* 14, *p.* 408. *Lescure, sur un Portion d'Amande de Noyau d'Abricot, dans la Trachée Artère, T.* 14, *p.* 427. *Suite d'Observations sur les Corps Etrangers dans la Trachée Artère, T.* 14, *p.* 432. *Expériences sur les Cas par M. Favier, T.* 14, *p.* 445. *Bertrandi, Traité des Operations de Chirurgie, p.* 402, *&c. Edit.* 1784. *Sabatier, de la Médecine Opératoire, Tom.* 2. *p.* 283, *Edit.* 1. *Œuvres Chir. de Desault par Bichat, T.* 2, *p.* 236, *&c. Pelletan, Clinique Chirurgicale, T.* 1, *first Memoir. Cheyne, Pathology of the Larynx and Bronchia, Edinb.* 1809. *A. Burns, Surgical Anatomy of the Head and Neck, p.* 377—401. *J. F. Double, Traité du Croup,* 8*vo. Paris,* 1811. *Richter's Aufangsgründe der Wundarzneykunst, B.* 4, *p.* 225, *&c., Göttingen,* 1800. *Lawrence on some affections of the larynx, which require the operation of bronchotomy, in*

Medico-Chirurgical Trans. Vol. 6, *p.* 221, *&c. Baillie, in Trans. of a Society for the Improvement of Med. and Chir. Knowledge, Vol.* 3. *Troussel-Drelincourt, Corps Etrangers, arrêtés dans les Voies aëriennes, Nouveau Journ. de Med. par Beclard, &c. T.* 7. *p.* 101. *Philos. Trans.* 1730, *No.* 416, *Art.* 5. *Journal de Médecine, T.* 38, *p.* 358. *J. A. Albers, Comm. de Trachitide Infantum, vulgo Croup vocata,* 4*to. Lips.* 1816. *Case of Chronic Infl. of the Larynx, in which laryngotomy was performed; see Med. Chir. Journ. Apr.* 1820. *F. J. Baurlant de Bronchotomia Diss. in Coll. Diss. Lovan.* 2, 175. *G. Detharding Epist. Med. de Methodo subveniendi Submersis per Laryngotomiam, Rostochii,* 1714. *Flajani Osservazioni, &c. di Chirurgia, T.* 3, *Roma,* 1802. *R. Collard, Abhandlung über den Croup,* 8*vo. Hannov.* 1814. *T. Chevalier's Case of Croup, in Med. Chir. Trans. Vol.* 6, *p.* 151, *&c. Andree's Case, in Vol.* 3, *same work, p.* 335, *with the Obs. of Dr. Farre on Cynanche in the same part of the work; and those of Dr. Percival on the same subject, in Vol.* 4, *p.* 297. *C. W. Eberhard, De Musculis Bronchialibus in Statu et Morbosa Actione,* 8*vo. Marpurg.* 1817. *R. Sprengel, Geschichte der Chirurgie. Th.* 1. *p.* 177, 8*vo. Halle,* 1805. *Dict. des Sciences Med. Art. Bronchotomie, T.* 3, 1812. *Surgical Observations by C. Bell, Part* 1, *p.* 14, *&c.* 8*vo. Lond.* 1816. *Case of Cynanche Laryngea, requiring Tracheotomy, and the continued use of a Cannula, ever since the Operation, in Med. Chir. Journ. Vol.* 5, *p.* 1, 8*vo. Lond.* 1818. *W. H. Porter, Case of Cynanche Laryngea, in which tracheotomy and mercury were successfully employed: Med. Chir. Trans. Vol.* 11, *p.* 414. *R. Liston, Two Cases in which Tracheotomy was performed with success; one for œdema glottidis, &c. the other, on account of an injury of the larynx: Ed. Med. and Surg. Journ. Vol.* 19. *Burgess, in Dublin Hospital Reports, Vol.* 3. *Dr. Hall in Med. Chir. Trans. Vol.* 12. *W. J. Hunt, Case of Bronchotomy; Med. Chir. Trans. Vol.* 12, *p.* 27, *&c.*

BUBO. (βουβων, the groin.) Modern surgeons mean, by this term, a swelling of the lymphatic glands, particularly of those in the groin, and axilla.

The disease may arise from the mere irritation of a local disorder; from the absorption of some irritating matter, such as the venereal poison; or from constitutional causes.

Of the first kind of bubo, that, which is named the *sympathetic*, is an instance. Of the second, the venereal bubo is a remarkable specimen. (See *Venereal Disease.*)

The *pestilential bubo*, which is a symptom of the plague, and *scrofulous* swellings of the inguinal and axillary glands, may be regarded, as examples of buboes from constitutional causes. (See *Scrofula.*)

The inguinal glands often become affected with simple phlegmonous inflammation, in consequence of irritation in parts, from which the absorbent vessels, passing to such glands, proceed. These swellings ought to be carefully discriminated from others, which arise from the absorption of venereal matter. The first cases are simple inflammations, and only demand the application of leeches, the cold saturnine lotion, and the exhibition of a few saline purges; but the latter diseases render the administration of mercury advisable.

Sympathetic, is the epithet usually given to inflammation of glands from mere irritation; and, we shall adopt it, without entering into the question of its propriety.

The sympathetic bubo is mostly occasioned by the irritation of a virulent gonorrhœa. The pain, which such a swelling gives, is trifling, compared with that of a true venereal bubo, arising from the absorption of matter, and it seldom suppurates. However, it has been contended, that the glands in the groin do sometimes swell and inflame from the actual absorption of venereal matter from the urethra, in cases of gonorrhœa, and which swellings must consequently be venereal. (*Hunter on the Venereal, p.* 57.)

The manner, in which buboes form from mere irritation, will be better understood by referring to the occasional consequences of venesection, in the article *Bleeding.* The distinguishing characters of the venereal bubo are noticed in the article *Venereal Disease.*

BUBONOCELE. (from βουβον, the groin, and κηλη, a tumor.) A species of hernia, in which the bowels protrude at the abdominal ring. The case is often called an *inguinal hernia*, because the tumor takes place in the groin. (See *Hernia.*)

BUNYON. An inflammation of the bursa mucosa, at the inside of the ball of the great toe. (See *Brodie's Pathological and Surgical Obs. on the Joints, p.* 356; *Ed.* 2.)

BURNS are usually divided into three kinds. 1st. Into such as produce an inflammation of the cutaneous texture, but an inflammation, which, if it be not improperly treated, almost always manifests a tendency to resolution. 2dly. Into burns, which injure the vital powers of the cutis, occasion the separation of the cuticle, and produce suppuration on the surface of the cutaneous texture. 3dly. Into burns, in which the vitality and organization of a greater or less portion of the cutis are either immediately or subsequently destroyed, and a soft slough or hard eschar produced. (See *Thomson's Lectures on Inflammation, p.* 585, 586.)

Suppuration is not always an unavoidable consequence of the vesications in burns; but it is a common and a troublesome one. "In severe cases, it may take place by the second, or third day; often not till a later period. It often occurs without any appearance of ulceration; continues for a longer, or shorter time; and is at last stopped by the formation of a new cuticle. In other instances, small ulcerations appear on the surface or edges of the burn. These spreading, form extensive sores, which are in general long in healing, even where the granulations, which form upon them, have a healthy appearnace." (*Op. cit. p.* 595.)

Burns present different appearances, according to the degree of violence, with which the causes producing them have operated, and according to the kind of cause, of which they are the effect. Burns, which only irritate the surface of the skin, are essentially different from those, which destroy it; and these latter have a very different aspect from what others present, which have attacked parts more deeply situated, such as the muscles, tendons, ligaments, &c. Scalds, which are the effect of heated fluids, do not exactly resemble burns, occasioned by the direct contact of very hot metallic bodies, or some combustible substance on fire. As fluids are not capable of acquiring so high a temperature, as many solid things, scalds are generally less violent than burns, in the injury which they produce; but, in consequence of liquids often flowing about with great rapidity, and being suddenly thrown in large quantities over the patient, scalds are frequently dangerous on account of their extent. It is well worthy of remark, that the danger of the effects of fire is not less proportioned to the size, than the degree and depth of the injury. A burn, that is so violent, as to kill parts at once, may not be in the least dangerous, if not extensive; while, a scald, which perhaps only raises the cuticle, may prove fatal, if very large. The degree of danger, however, is to be rated from a consideration both of the size and violence of the injury. The worst burns, which occur in practice, arise from explosions of gunpowder, or inflammable gases, from ladies' dresses catching fire, and from the boiling over of hot fluids, in laboratories, manufactories, &c.

Burns, which only destroy the cuticle, and irritate the skin, are very similar to the effects, produced by cantharides and rubefacients. The irritation, which such injuries excite, increases the action of the arteries of the part affected, and they effuse a fluid under the cuticle, which becomes elevated and detached. Hence, the skin becomes covered with vesicles, or bladders, which are more or less numerous, and large, according to the manner in which the cause has operated. But, when the skin, or subjacent parts, are destroyed, no vesicles make their appearance. In this circumstance, a black eschar is seen; and when the dead parts are detached, there remains a sore, more or less deep, according to the depth to which the destructive effects of the fire have extended.

The parts may either be killed, at the moment of the injury, by the immediate effect of the fire, or they may first inflame, and then mortify.

In all cases of burns, the quantity of injury depends on the degree of heat in the burning substance; on the duration, and extent of its application; and on the sensibility of the burnt part.

When a large surface is burnt, mortification sometimes makes its appearance with great violence, and very quickly after the accident; but, in general, the symptom the most to be dreaded, in such cases, is inflammation. The pain and irritation often run to such a pitch that, notwithstanding every means, there is frequently immense trouble in keeping down the inflammation. When the burnt surface is very large, the effects of the inflammation are not confined to the part, which was first injured; but, even cause a great deal of fever; and, in certain cases, a comatose state, which may end in death.

It has been observed, that persons, who die of severe burns, seem to experience a remarkable difficulty of breathing, and oppression of the lungs. These organs, and the skin, are both concerned in separating a large quantity of water from the circulation, and their participating in this function may, perhaps, afford a reason for respiration being often much affected, when a large surface of skin is burnt. However, the kidneys perform the same office, and they are not particularly affected in burnt patients; so that the asthmatic symptoms, frequently noticed in cases of burns, are probably owing to a sympathy between the lungs and skin, or else to causes not at present understood.

According to Dupuytren, extensive and deep burns always induce inflammation of the mucous membrane of the alimentary canal; a circumstance said to explain those curious instances of death, which so often occur when the ulcers are on the point of healing. (See *Médecine Opératoire par Sabatier, edit. de MM. Sanson et Begin.*)

Two general methods of treating burns have at all times been followed. One consists in the application of substances, which produce a cooling, or refrigerant effect; the other in the employment of calefacient, or stimulating substances. Dr. Thomson is satisfied, that each of these different modes may have its advantages in particular cases. *(Lect. on Inflammation, p. 588.)*

The practice mostly resorted to in this country some years since, is explained by Mr. B. Bell. When the skin is not destroyed, but seems to suffer merely from irritation, relief may be obtained by dipping the part affected in very cold water, and keeping it for some time immersed. This author states, that plunging the injured part suddenly into boiling water would also procure ease; an assertion, however, much to be doubted, and a practice not likely to be followed. In some cases, emollients afford immediate relief; but, in general, astringent applications are best. Strong brandy, or alcohol, is particularly praised. At first the pain is increased by this remedy; but an agreeable soothing sensation soon follows. The parts should be immersed in the spirit, and, when this cannot be done, soft old linen, soaked in the application, should be kept constantly on the burn. The liquor plumbi superacetatis dilutus is recommended. It is said to prove useful, however, only by being astringent, as equal benefit may be derived from a strong solution of alum, &c. Such applications were frequently made with the view of preventing the formation of vesicles; but, Mr. B. Bell always remarked, that there was less pain, when the blisters had already appeared, than when prevented from rising, by remedies applied immediately after the occurrence of the injury.

The applications should be continued, as long as the pain remains; and in extensive burns, creating great irritation, opium should be prescribed. The stupor, with which patients, so situated, are often attacked, receives more relief from opium, than any thing else.

Some recommend opening the vesications immediately; others assert, that they should not be meddled with. Mr. B. Bell thinks that they should not be opened till the pain arising from the burn, is entirely gone. At this period, he says, they should always be punctured; for, when the serum is allowed to rest long upon the skin beneath, it has a bad effect, and even induces some degree of ulceration. Small punctures, not large incisions, should be made. All the fluid having been discharged, a liniment of wax and oil, with a small proportion of the superacetate of lead, is to be applied.

On the subject of opening the vesications in burns, Dr. Thomson believes, that the diversity of opinion arises from the different effects resulting from the particular manner, in which the opening is made. "If a portion of the cuticle be removed, so as to permit the air to come into contact with the inflamed surface of the cutis, pain and a considerable degree of general irritation will necessarily be induced; but if the vesications be opened cautiously with the point of a needle, so as to allow the serum to drain off slowly, without at the same time allowing the air to enter between the cuticle and cutis, the early opening of the vesications will not only not occasion pain, but will give considerable relief, by diminishing the state of tension, with which the vesications are almost always, in a greater or less degree, accompanied. When opened in this manner, the vesications often fill again with serum; but, the punctures may be repeated as often as is necessary, without any hazard of aggravating the inflammation. Great care should be taken, in every instance, to preserve the raised portion of cuticle as entire as possible," &c. (See *Lectures on Inflammation*, *p.* 595.)

When there is much irritation and fever, blood-letting, and such remedies, as the particular symptoms demand, must be advised. On account of the pulse being frequently small, quick, and vibratory, bleeding is at present not often employed. As Dr. Thomson remarks, however, it may become necessary in patients of a strong robust constitution, in whom the symptomatic fever assumes an inflammatory type. He has often seen a single bleeding procure great relief in these cases; and he does not remember a case where bleeding was followed by injurious effects. (*P.* 594.) When the skin ulcerates, the treatment does not differ from what will be described, in speaking of *Ulcers.*

When burns are produced by gunpowder, and the skin more or less destroyed, cooling emollient applications were formerly thought most effectual, and a liniment, composed of equal proportions of lime-water and linseed oil, gained the greatest celebrity. Even at this day, the application is very often employed. Mr. B. Bell advises it to be put on the parts, by means of a soft hair pencil, as the application and removal of the softest covering, are often productive of much pain. The same author admits, however, that there are some cases, in which Goulard's cerate, and a weak solution of the superacetate of lead, more quickly procure ease, than the above liniment.

The sloughs having come away, the sores are to be dressed according to common principles. (See *Ulcers.*)

When burns are produced by gunpowder, some of the grains may be forced into the skin: these should be picked out with the point of a needle, and an emollient poultice applied, which will dissolve and bring away any particles of gunpowder yet remaining.

Burnt parts, which are contiguous, frequently grow together in the progress of the cure. The fingers, toes, sides of the nostrils, and the eyelids are particularly liable to this occurrence; which is to be prevented by keeping dressings always interposed between the parts likely to become adherent, until they are perfectly healed.

The sores, resulting from burns, are perhaps more disposed than any other ulcers, to form large granulations, which rise considerably above the level of the surrounding skin. No poultices should now be used. The sores should be dressed with any moderately stimulating, astringent ointment: the ceratum calaminæ or the unguentum resinæ with the pulv. hydrarg. nitrat. rub. is now generally preferred: and, if the part will allow of the application of a roller, the pressure of it will be of immense service in keeping down the granulations, and rendering them more healthy. When these methods fail, the sores should be gently rubbed with the argentum nitratum.

In the dry and hot state of the skin, Dr. Thomson is an advocate for diaphoretics. "Laxatives (says he) are often necessary; but, it is in general best to employ only the gentler sort, on account of the trouble and pain, which moving always gives the patient. Anodynes are often required, not only to procure sleep, but even a temporary alleviation of the pungency of the pain, which the burn occasions. A mild vegetable and farinaceous diet should be used during the period of the symptomatic fever. Animal food, wine, and other cordials, may be required in the progress of a suppurating burn; but, they are not necessary at first, and when given in this stage, are almost always injurious." (See *Lectures on Inflammation*, *p.* 594.)

With respect to the topical applications recommended by this gentleman, he generally prefers in cases of superficial burns, cooling and refrigerant remedies. When there are vesications, and suppuration takes place without ulceration, he advises us, after refrigerants have ceased to produce beneficial effects, to use the linimentum aquæ calcis. However, where the progress of cicatrization is slow, he recommends, instead of this liniment, ointments containing lead, or zinc, particularly, the ceratum calaminæ.

In the ulcerating state of suppurating burns, he prefers emollient cataplasms. But, when the discharge continues, or becomes more profuse, under the use of poultices, they are to be left off, and astringent washes employed, such as lime-water, the compound decoction of oak bark; a weak solution of sulphate of copper, &c.

Where the parts are destroyed and converted into sloughs, Dr. Thomson does not think it matters much whether vinegar, oily liniments, turpentine, spirits of wine, or emollient poultices, be at first employed. He acknowledges, however, that the poultice is the remedy under the application of which, the separation of the dead parts is most easily and agreeably accomplished. "The question (says he) at present most deserving the attention of medical practitioners, with regard to the use of the warm emollient poultice in burns, is, whether we should apply it immediately after the burn has been received, or interpose for some hours, as has been so strongly recommended, dressings with vinegar, spirits of wine, or oil of turpentine. My own experience has not been sufficient to enable me to determine this point to my entire satisfaction. Yet, I think it right to state to you, that, in a number of trials made at different times, I have had occasion to see burns, to which common emollient poultices had been from the first applied, slough and granulate faster, and in a more kindly manner, than similar burns in the same persons, to which in some instances the Carron oil (lin. aq. calcis), and, in others again oil of turpentine, were applied at the same time with the poultices." (See *Lectures on Inflammation, p.* 609.)

MR. CLEGHORN'S PLAN.

This gentleman, who was a brewer at Edinburgh, was induced to pay great attention to the effects of various modes of treating burns, on account of the frequency of these accidents amongst his own workmen. His observations led him to prefer the immediate application of vinegar, which was to be continued for some hours, by any of the most convenient means, until the pain abated; and when this returned, the vinegar was repeated. If the burn had been so severe as to have produced a destruction of parts, these, as soon as the pain had ceased, were covered with a poultice, the application of which was continued about six, or, at most, eight hours, and, after its removal, the parts were entirely covered with very finely powdered chalk, so as to take away every appearance of moisture on the surface of the sore. This being done, the whole burnt surface was again covered with the poultice. The same mode was pursued every night and morning, until the cure was complete. If the use of poultices relaxed the ulcers too much, a plaster, or ointment, containing the acetate of lead, was applied; but the chalk was still sprinkled upon the sore.

With respect to general remedies, Mr. Cleghorn allowed his patients to eat boiled, or roasted fowl, or, in short, any plainly dressed meat which they liked. He did not object to their taking moderate quantities of wine, spirits and water, ale, or porter. He never had occasion to order bark, or any internal medicines whatever, and he only once thought it necessary to let blood. When the patient was costive, Mr. Cleghorn ordered boiled pot-barley and prunes, or some other laxative nourishing food, and sometimes an injection, *but never any purgative*, as he remarked that the disturbance of frequently going to stool was distressing to a patient with bad sores. Besides, he thought, that a hurtful weakness and languor were always (more or less) brought on by purgatives. From the effects, too, which he felt them have upon himself, and observed them to have upon others, they did not seem to have so much tendency to remove heat and feverish symptoms as is generally supposed, and he believed, that they more frequently carried off *useful* humours, than *hurtful* ones.

Diluted sulphuric acid was not found to answer so well as vinegar, and the latter produced most benefit, when it was fresh and lively to the taste.

In cold weather, Mr. Cleghorn sometimes warmed the vinegar a little, placed the patients near the fire, gave them something warm internally, and kept them, in every respect, in a comfortable situation. His object, in so doing, was to prevent the occurrence of tremblings, and chilliness, which, in two instances, after employing cold vinegar, took place in an alarming degree.

The account of Mr. Cleghorn's plan was published by Mr. Hunter. (See *Med. Facts and Observations, Vol.* 2.)

SIR JAMES EARLE'S PLAN.

This gentleman was an advocate for the use of cold water, or rather ice; and published several cases of extensive burns, in which this method was employed with the best effect. Cold water was enumerated by Mr. B. Bell, amongst the applications to burns, and it was not uncommonly used long before Sir James Earle communicated the result of his experience to the public. The method, indeed, is very ancient. "Cold is a remedy (says Dr. J. Thomson) which has long been employed to diminish the inflammation of superficial burns. Rhazes directs, that, in recent burns, cloths dipt in cold water, or in rose-water cooled with snow, be applied as soon as possible to the parts which have been injured, and that these cloths be renewed from time to time; and Avicenna says, that this practice often prevents the formation of blisters." (*Lectures on Inflammation, p.* 589.) Sir James Earle's publication, however, had the good effect of drawing considerable attention to the subject, and of leading surgeons to try the method in a great number of instances, in which other more hurtful modes of treatment might otherwise have been employed. The burnt parts may either be plunged in cold water, or they may be covered with linen dipped in the same, and renewed as often as it acquires warmth from the part. The application should be continued as long as the heat and pain remain, which they will often do, for a great many hours. (See *Essay on the Means of lessening the Effects of Fire on the Human Body. 8vo. Lond.* 1803.)

Some caution, however, in the application of cold becomes necessary, when a scald is of very large size, or situated upon the trunk of the body. In extensive burns, superficial as they may be, the patient is liable to be affected with cold shiverings; and these shiverings may be greatly aggravated by exposure, and by the application of cold. Perhaps, therefore, in these examples, warm applications ought to be preferred. (*Dr. J. Thomson's Lectures on Inflammation, p.* 591.)

BARON LARREY'S PLAN.

It seems to me, that on the subject of burns, there is, even at the present day, as much contrariety of sentiment, as in any part of surgery whatsoever. After all the praises, which of late years have been heard of vinegar, cold applications, oil of turpentine, &c. a French surgeon, whose talents, and opportunities of observation, entitle his opinion to the highest attention, has recently censured the employment of all such remedies. Larrey, though a military surgeon, has had occasion to see numerous burns, in consequence of explosions. He declares, that he has been long struck with the bad effects of repellents, such as fresh water with the muriate of ammonia, oxycrate, the liquor plumbi subacetatis, and the solution of opium in ice-water. He recommends dressing all deep burns, with fine old linen, spread with saffron ointment, which, he says, has the quality of diminishing the pain, and preventing irritation by keeping the nervous papillæ from coming into contact with the air, or being pressed by the linen and clothes. This ointment, is to be continued till suppuration takes place, after which, Larrey employs the ointment of styrax, for promoting the detachment of the eschars, and checking the extension of the sloughing. As soon as the dead parts have separated, he again has recourse to the saffron ointment, for which he gradually substitutes dry lint, with strips of linen spread with cerate. When the vessels exceed the level of the edge of the sore, he touches them with the argentum nitratum, and he occasionally applies a weak solution of the oxymuriate of mercury, or of the sulphate of copper.

Larrey prescribes emollient and antispasmodic beverages, which are to be taken warm, such as milk of almonds, containing nitre, and properly sweetened; hydromel; rice ptisan, &c. His patients are never deprived of light nourishment, such as broths, jellies, eggs, soups, &c. He has found this simple treatment, which he calls soothing and gently tonic, almost always successful. (See *Mémoires de Chirurgie Militaire, T.* 1, *p.* 93.)

DR. KENTISH'S PLAN.

From what has been stated, it appears, that in cases of burns, cold and hot, irritating and soothing, astringent and emollient applications, have all been outwardly employed without much discrimination. But, the internal treatment has always been of one kind, and both the ancients and moderns agree in advising blood-letting, cooling purges, and, in short, the whole of the antiphlogistic plan. If we except Mr. Cleghorn, who condemned purges, and allowed stimulants internally, Dr. Kentish has been almost the only advocate for the latter means.

The fanciful theories, advanced by Dr. Kentish, lead him to believe, that as burns are injuries, attended with increased action, there are two indications, for restoring what he terms *the unity of action;* viz. the excitement, or action, of the part, is first to be gradually diminished; secondly, the action of the system is to be increased to meet the increased action of the part, holding this law as the system in view: *That any part of the system, having its action increased to a very high degree, must continue to be excited, though in a less degree, either by the stimulus, which caused the increased action, or some other having the nearest similarity to it, until by degrees the extraordinary action subsides into the healthy action of the part.*

With this view, holding the part to the fire seems, to Dr. Kentish, the best mode of relief; but, as parts of the body are injured, to which this cannot be done, the most stimulant applications must be used; for, in this class, there is little fear of any of them being greater, than that which originally caused the accident. The strongest rectified spirits, made still stronger by essential oils, are proper, and may also be heated as much as the sound parts can bear. These, and many other applications of the same class, says Dr. Kentish, will give the most speedy relief. They are to be continued only for a certain time, lest they cause the very ill which they are given to cure. They are then to be succeeded by less stimulant applications, until the parts act by common natural stimuli.

The internal mode of relief is, to give those substances which soonest excite the system to great action, such as æther, ardent spirits, opium, wine, &c. by which means, the solution of continuity of action is allowed to last the shortest time possible, and the unity of action is restored, which constitutes the cure.

Suppose, for instance, as a local application, we at first apply the strongest alcohol, heated to the degree, which the sound part would bear without injury: it should afterwards be gradually diluted until it becomes proof spirit, and the heat should be diminished, although gradually, as cold is always pernicious, bringing on that tendency to shiver, which should ever be continually guarded against, as being a most hurtful symptom, and the forerunner of a violent sympathetic fever. To prevent this, the external heat should be kept at a high temperature, and the action of the whole system raised in as great a degree, as may be safe. By this means, the action of the whole is made to meet the increased action of the part, by which, the lessening of the increased action of the part to join the action of the whole, is rendered more easy. Thus, there is, says Dr. Kentish, an unity of intention by both the external and internal means, leading to the restoration of the unity of action, and the cure is performed.

It may be said, these circumstances can only take place when there is an increased action; and, when the parts are destroyed, other means should be used, emollients, &c. In replying to this remark, Dr. Kentish distinguishes burns into two kinds; one, in which the action of the part is only increased; and, another, in which some parts have increased action, while other parts are destroyed. It is of little consequence, says Dr. Kentish, what is applied to the dead part, as the detachment of an eschar depends upon the action of parts, which remain alive, and not upon what is applied to those, which are dead. Dr. Kentish remarks, however, that he never saw an instance of a burn, in which, though some parts were totally destroyed, there were not always other parts, in which there was only increased action. Now as our duty is always to save living parts, our mode of cure in the first instance, will always be the same, viz. to cure the parts, which have only an increased action, in the doing of which the dead parts will not be the worse, as their separation is a process of the system, which requires time, and, if the injury is to any extent, draws forth the joint efforts of the system, and, even, says Dr. Kentish, calls up all the energy of its powers, to violent fever. This state should be supported by every artificial aid, in order to bring the parts to suppuration, otherwise the subject falls in the contest; for, if the living parts have not the power to throw off the dead, the dead will assimilate the living to themselves, and a mortification ensue.

When the living parts have been preserved, (continues Dr. Kentish,) which according to this treatment, will be in the course of two or three days, the dead parts will be more plainly observed, and the beginning of the process to throw them off will be commencing. This process must be assisted by keeping up the powers of the system, by stimulant medicines and a generous diet. The separation of the eschars will be greatly promoted by the application of the stimulus of heat, by means of cataplasms frequently renewed. These may be made of milk and bread, and some camphorated spirit, or any essential oils, sprinkled upon the surface. Such means need only be continued, until the suppuration is established.

After Dr. Kentish had supported this system to a suppuration, he then found, that gradually desisting from his stimulant plan, diminished the secretion of pus, and wonderfully quickened the healing process.

Thus we see, observes Dr. Kentish, the whole of the former treatment inverted. The most gentle soothing means were used externally and internally; these were continued until suppuration took place; and then the system was excited under an idea of supporting it, which not unfrequently so fatigued the constitution, as to induce a hectic fever. The present mode is the reverse of this. When a part of the frame has been much excited, this part is not allowed to cease to act for want of stimulus, but, is kept in action by an adequate stimulus, which is gradually diminished, until the ordinary action returns. With the same view, the internal means are highly stimulant to the whole system, which must be supposed to be in a natural state at the time of the accident.

Thus increasing the action of the whole by strong stimuli, and decreasing the action of the part, by lessening the stimuli, the desired end will be more readily obtained: that is, an equilibrium of action will be restored.

When some parts are destroyed, there must be others with increased action; and, in this case, according to Dr. Kentish, the foregoing mode will be the best for restoring the living parts, and promoting the separation of the dead ones. Suppuration having taken place, the exciting of the system by any thing stimulant, either by food, or medicine, should be cautiously avoided. Should the secretion of pus continue too great, gentle laxatives, and a spare diet, are indicated. If any part, as the eyes, for instance, remain weak, with a tendency to inflammation, topical bleedings, or small quantities of blood taken from the arm, are useful. For the purpose of defending the new skin, camphorated oil, or camphorated oil and lime water in equal parts, are good applications. Wounds of this kind heal very fast, when the diminution of pus is prevented, by attention to diet: if the patient's strength require support, small doses of bark, taken two or three times a day, in some milk, will answer that purpose, without quickening the circulation, as wine, ale, or spirits, are apt to do. By attention to these principles, (continues Dr. Kentish,) I can truly assert, that I have cured very many extensive and dangerous burns and scalds, in one, two, three, and four weeks, which in the former method would have taken as many months; and some, which I believe to have been incurable by the former method.

After explaining his principles, Dr. Kentish takes notice of the various substances, which have commonly been employed. Of these he would chiefly rely on alcohol, liquor ammoniæ subcarbonatis, æther, (so applied as to avoid the cooling process of evaporation,) and spirit of turpentine.

In applying these, we are directed to proceed as follows: the injured parts are to be bathed, two, or three times over, with spirits of wine, spirits of wine with camphor, or spirit of turpentine, heated by standing in hot water. After this a liniment, composed of the ceratum resinæ softened with spirit of turpentine, is to be spread on soft cloth, and applied. This liniment is to be renewed only once in twenty-four hours, and, at the second dressing, the parts are to be washed with proof spirit, or laudanum, made warm. When the secretion of pus takes place, milder applications must be made, till the cure is effected.

The yellow ointment stops the pores of the cloth, impedes evaporation, and thus confines the effect of the alcohol to the burnt surface. The first dressings are to remain on four-and-twenty hours. Dr. Kentish thinks it of importance, that the injured surface should be left uncovered, as little as possible. It is, therefore, recommended, to let the plasters be quite ready, before the old ones are removed, and then only to take off one piece at a time.

It will seldom be necessary to repeat the application of alcohol, or that of oleum terebinthinæ. The inflammatory action will be found diminished, and according to Dr. Kentish's principles, the exciting means should therefore be diminished. Warm proof-spirits, or laudanum, may be substituted for the alcohol, and the unguentum resinæ flavæ is to be mixed with oleum camph. instead of turpentine. If this should be found too irritating, Dr. Kentish recommends ceratum plumbi acetatis, or cer. lap. calaminaris. Powdered chalk is to be used to repress the growth of exuberant granulations, and to absorb the pus. In the cavities of separated eschars, and in the furrows, between sloughs, and living parts, he introduces powdered chalk. Then a plaster is applied, and, in tedious cases, a poultice over the plaster.

With respect to the internal treatment, the author observes, that great derangement of the system arises in certain persons, from causes, which, in others, produce no effect; and that this depends on a difference in the degree of strength. Hence, he concludes, that as strength resists the sympathetic irritative actions of parts, and weakness induces them, we should, in all cases, make the system as strong as we can, immediately upon the receipt of the injury. In considerable burns, he supposes a disproportion of action to take place, between the injured parts, and the system at large, or what, he styles, a solution of the continuity of action; and, that by a law of the system, a considerable commotion arises, for the purpose of restoring the equilibrium, or enabling the constitution to take on the action of the part. Hence, Dr. Kentish is of opinion, that the indication is *to restore the unity of action of the whole system, as soon as possible*, by throwing it into such a state as to *absorb the diseased action*, and then gradually bring down the whole to the natural standard of action by nicely diminishing the exciting powers. Æther and alcohol, or other stimulants, are to be immediately given in proportion to the degree of injury; and repeated, once or twice, within the first twelve hours, and, afterwards, wine or ale is to be ordered, till suppuration takes place, when it will be no longer necessary to excite the system.

In a second essay, Dr. Kentish remarks, that, in the first species of burns, *in which the action of the part is only increased*, he has not found any thing better for the first application, than the heated oleum terebinthinæ and ceratum resinæ, thinned with the same. In superficial burns, when the pain has ceased, he considers it advisable to desist from this application in about four and twenty hours, and use at the second dressing, a digestive, sufficiently thinned with common oil, beginning on the third day, with the ceratum lap. calaminaris. This author has frequently seen secondary inflammation excited by the remedy. The most certain remedy, for this unpleasant symptom, is a digestive ointment, thinned with oil, or a plaster of cerate, and over that a large warm poultice. The cerate will finish the cure. Should there be much uneasiness of the system, an anodyne, proportioned to the age of the patient, should be given.

The growth of fungus, and the profuse discharge of matter, are to be repressed, as already mentioned, by sprinkling powdered chalk on the surface, and by the use of purgatives, in the latter stages. The chalk must be very finely levigated.

Dr. Kentish's theories are, as far as I can judge, visionary: they may amuse the fancy, but can never improve the judgment. They are nearly unintelligible; they are unsupported by any sort of rational evidence; and, as being only the dreams of a credulous, sportive imagination, they must soon decline into neglect, if not oblivion. However, in making these remarks, it is far from my intention to extend the same animadversion to the mode of treatment, insisted upon by Dr. Kentish, which forms a question, which cannot be determined by reason, but by experience. He is a man, who has had superior opportunities of observing this part of practice, and the alleged success of his plan of treatment has acquired extensive approbation, although there are still many practitioners, who prefer common methods, and the antiphlogistic principles. In America, it is asserted, that, in superficial burns, the best application is *raw cotton*, thinly spread out, or carded, and put directly on the injured parts. (See *Dallam on the Use of Cotton in Burns, in Potter's Medical Lyceum, p.* 22; *and Professor Gibson's Institutes and Practice of Surgery, p.* 62, *vol.* 1, 8*vo. Philadelphia*, 1824.)

The cicatrix of a burn is often of great extent, and, on this account, the subsequent absorption of the granulations on which the new skin is formed, (a process by which the magnitude of the scar is afterwards lessened,) is so considerable, as to draw the neighbouring parts out of their natural position, and occasion the most unpleasant kinds of deformity. Thus, burns on the neck are apt to cause a distortion of the head, or even draw down the chin to the breast bone; and in the limbs, such contractions as fix the joints in one immoveable position. Simply dividing these contractions again mostly fails altogether, or only produces very partial and temporary relief, as after the cicatrization is completed, the newly formed parts are absorbed, and the contraction recurs. A few years ago, a proposal was made, by my friend Mr. Earle, to cut away the whole of the cicatrix, and then bring the edges of the skin as much towards each other as possible, in the transverse direction, with strips of adhesive plaster. In one case, in which "from the fore-part of the upper arm, to within about two inches of the wrist, a firm tense cicatrix, of an almost horny consistence, extended, which kept the elbow immoveably bent to a right angle," this gentleman performed such an operation. After removing the cicatrix, the flexor muscles at first made some resistance to the extension of the limb; but by degrees they yielded, and the arm was brought nearly to a right line. The whole limb was kept in this position by means of a splint and bandage. In the end, the contraction was cured, and the use of the limb restored. (See *Med. Chir. Trans. Vol.* 5, *p.* 96, *&c.*)

Probably, as this patient was a young growing subject, only six years of age, the operation would have proved equally successful, if a simple division of the contracted skin had been made, and the arm kept extended for a length of time by the use of a splint. It is hardly necessary to observe, that, cutting a large cicatrix entirely away, must always be a severe, and sometimes a dangerous operation: therefore, the avoidance of it, if possible, cannot but be desirable. (See *B. Bell's System of Surgery; Medical Facts and Observations, Vol.* 2; *J. Sedillot, de Ambustione Theses*, 4*to. Parisiis*, 1781. *Richter's Anfangsgründe der Wundarzneykunst, B.* 1. *Earle's Essay on the Means of lessening the Effects of Fire on the Human Body*, 8*vo. Lond.* 1799. *Kentish's Two Essays on Burns, the first of which was published in* 1798. *Robert Lyall, in Edinb. Med. and Surg. Journ. Vol.* 7, *p.* 313. *Hedin, Diss. sistens Observationes circa vulnera ex combustione, &c.* 4*to. Upsaliæ*, 1804. *Larrey, Mémoires de Chirurgie Militaire, T.* 1, *p.* 93—96. *Boyer, Traité des Maladies Chir. T.* 1, *p.* 160. *Nodes Dickinson, Remarks on Burns and Scalds, chiefly in reference to the principle of treatment at the time of their infliction, suggested by a perusal of the last edition of an Essay on Burns, by E. Kentish, M. D.* 8*vo. Lond.* 1818. *Lectures on Inflammation, by John Thomson, p.* 585, *&c. Edin.* 1813. *Lassus, Pathologie Chir. T.* 2, *p.* 391. *Léveillé, Nouvelle Doctrine Chir. T.* 4, *p.* 355. *Pearson's Principles of Surgery, p.* 171. *Edit.* 1808.)

BURSÆ MUCOSÆ.—These are small membranous sacs, situated about the joints, particularly the large ones of the upper and lower extremities. For the most part, they lie under tendons. Mr. Brodie comprehends, also, under the same head, the membranes forming the sheaths of tendons, as they have the same structure and perform a similar office. The celebrated Dr. A. Monro, of Edinburgh, published a very full account of the bursæ mucosæ, and their diseases. These parts are naturally filled with an oily kind of fluid, the use of which is to lubricate surfaces, upon which the tendons play, in their passage over joints. In the healthy state, this fluid is so small in quantity, that it cannot be seen without opening the membrane containing it; but, occasionally, such an accumulation takes place, that very considerable swellings are the consequence. Tumors of this sort are often produced by bruises and sprains, and, now and then, by rheumatic affections. They are not often attended with much pain, though, in some cases, it is very acute, when pressure is made with the fingers. The tumors yield, in a certain degree, to pressure; but, they rise again, with an appearance of elasticity, not remarked in other sorts of swellings. At first, they appear to be circumscribed, and confined to a small extent of the joint; but, sometimes, the fluid, forming them, is so abundant, that they extend over a great part of the circumference of the limb. The skin, when not inflamed, retains its usual colour.

In this morbid state of the bursæ mucosæ, they contain different kinds of fluids, according to the cause of the disease. When the tumor depends on a rheumatic affection, the contents are ordinarily very fluid. They are thicker, when the cause is of a scrofulous nature. When the disease is the consequence of a bruise, or sprain, the effused fluid often contains hard concretions, and, as it were, cartilaginous ones, which are sometimes quite loose, and, more or less, numerous. Mr. Brodie states, that they have the appearance of small melon seeds, and are not unusual when the inflammation is of long standing. Such substances may frequently be felt with the fingers.

In the greater number of instances, as Mr. Brodie remarks, inflammation of the bursæ mucosæ occasions an increased secretion of synovia. In other cases, the bursa is distended with a somewhat turbid serum, containing floating portions of coagulable lymph. The inflammation sometimes leads to the formation of an abscess; and, occasionally the membrane of the bursa becomes thickened, and converted into a gristly substance. Mr. Brodie has seen it at least half an inch in thickness, with a small cellular cavity in the centre containing synovia. In other instances, however, though the inflammation has lasted a considerable time, the membrane of the bursa retains nearly its original structure. (*Pathological and Surgical Obs. on the Joints, p.* 351, *Ed.* 2.)

According to the same authority, the disease may be the consequence of pressure, or other local injury; the abuse of mercury; rheumatism, or other constitutional affection; and, in such cases, the complaint is frequently joined with inflammation of the synovial membrane of the joints. (See *Joints.*) Sometimes, it has the form of an acute, but, more commonly, that of a chronic inflammation.

While the swellings are not very painful, an attempt may be made to disperse them, by warm applications, friction, (particularly, with camphorated mercurial ointment,) or blisters, kept open with the savin cerate. But, if these tumors should become very painful, and not yield to the above methods, Dr. Monro recommends opening them. This author was continually alarmed at the idea of the bad effects of air admitted into cavities of the body, and, hence, in the operation, even of opening the bursæ mucosæ, he is very particular in directing the incision in the skin, not to be made immediately opposite that made in the sac.

In the beginning, Mr. Brodie recommends the use of leeches and cold lotions, and, afterwards, that of blisters, or stimulating liniments. In particular cases, he says, these means should be combined with such constitutional remedies as circumstances indicate. When the disease is of long standing, the preternatural secretion of fluid will often continue after the inflammation has entirely subsided. If blisters now fail in procuring its absorption, Mr. Brodie recommends friction; and, if this be unavailing, he considers it advisable to discharge the fluid by a puncture. The presence of loose substances in the bursa, he thinks may of themselves keep up a collection of fluid.

Dr. Monro met with cases, in which amputation became indispensable, in consequence of the terrible symptoms following the opening of bursæ mucosæ.

On account of such evil consequences, which are imputed to the air, though they would as often arise, were the same practice pursued in a situation in which no air could have access at all, it has been recommended to pass a seton through the swelling, and to remove the silk, after it has remained just long enough to excite inflammation of the cyst, when an attempt is to be made to unite the opposite sides of the cavity by pressure.

This practice is sometimes approved of by Mr. Brodie on other grounds: he has noticed, that after the whole cavity of the bursa has been converted into an abscess, and this has been cured, no fluid generally collects there again. Hence, he has sometimes been induced to pass into the puncture a seton, or tent, or (what he deems better) the blunt end of a probe for the irritation of the inner surface of the bursa. At the same time, he cautions surgeons against the indiscriminate adoption of this practice. Inflammation and suppuration of a large bursa (he says) sometimes disturb the constitution so much, that it might be prudent merely to make a puncture, and keep the patient afterwards perfectly quiet. He mentions a diseased bursa mucosa, which he had seen between the lower angle of the scapula and the latissimus dorsi, and which was not much less than a man's head. In this case, death followed the constitutional disturbance excited by a puncture and the seton. In another example, seen by this judicious surgeon, where the patient was in bad health, and the due observance of quietude was neglected, puncturing a diseased bursa mucosa was soon followed by death. (*Op. cit. p.* 360.)

When the coats of a bursa mucosa are much thickened, and cannot be restored to their natural condition. Mr. Brodie says, that the bursa, if superficially situated, may be removed with as much facility as an encysted tumor. This practice, however, he has only as yet applied to the bursa between the patella and the skin, though he entertains no doubt of there being other superficial bursæ which would also safely admit of removal.

Consult *Monro's Description of all the Bursæ Mucosæ, &c. with remarks on their accidents and diseases, &c. fol. Edin.* 1788. *C. M. Koch, de Morbis Bursarum tendinum mucosarum. And, particularly B. C. Brodie's Pathological and Surgical Observations on the Joints, Chap.* 9, *Ed.* 2, *8vo. Lond.* 1822.

C.

CÆSAREAN OPERATION. Called also *Hysterotomia*, from υστερα, *uterus*, and τομη, *sectio*. Pliny, book 7, chap. 9, of his Natural History, gives us the etymology of this operation. "*Auspicatiùs* (says he) *enectâ parente gignuntur, sicut Scipio Africanus prior natus, primusque Cæsar à cæso matris utero dictus; quâ de causâ cæsones appellati. Simili modo natus est Manlius qui Carthaginem cum exercitu intravit.*"

From this passage, we are to infer, that the Cæsarean operation is extremely ancient, though no description of it is to be found in the works of Hippocrates, Celsus, Paulus Ægineta, or Albucasis. The earliest account of it in any medical work, is that in the Chirurgia Guidonis de Cauliaco, published about the middle of the fourteenth century. Here, however, the practice is only spoken of, as proper after the death of the mother, and is alleged to have been adopted only at such a conjuncture in the case of Julius Cæsar. (See *Cap. de Extractione Fœtus.*) Vigo, who was born towards the close of the fifteenth century, takes no notice of the Cæsarean Operation; and Paré, who greatly improved the practice of midwifery, thinks this measure only allowable on women, who die undelivered. (*De Hominis Generatione, cap.* 31.) Rousset, who was contemporary with Paré, collected the histories of several cases, in which the operation is said to have been successfully performed, and, after the publication of these, the subject excited more general interest.

By the *Cæsarean Operation*, is commonly understood that, in which the fœtus is taken out of the uterus, by an incision made through the parietes of the abdomen and womb. The term, however, in its most comprehensive sense, is applied to three different proceedings. It is sometimes employed to denote the incision, which is occasionally practised in the cervix uteri, in order to facilitate delivery; but, this particular method is named the *Vaginal Cæsarean Operation*, for the purpose of distinguishing it from the former, which is frequently called, by way of contrast, the *Abdominal Cæsarean Operation*. With these cases, we have also to class the incision, which is made in the parietes of the abdomen, for the extraction of the fœtus, when, instead of being situated in the uterus, it lies in the cavity of the peritoneum, in consequence of the rupture of the womb, or in the ovary, or Fallopian tube, in consequence of an extra-uterine conception.

VAGINAL CÆSAREAN OPERATION.

Disease, malformation, or a preternatural position of the cervix uteri, may render this practice indispensable. A scirrhous hardness of the neck of the uterus is the most frequent. When the induration is such, that the cervix cannot be dilated, and the patient is exhausting herself with unavailing efforts, the parts should be divided in several directions. This has been successfully done under various circumstances. Cases have been met with, in which the cervix uteri presented no opening at all, and yet the preceding operation proved quite effectual. Such is the example, which Dr. Simson has inserted in the third volume of the Edinburgh Essays. A woman, forty years of age, became pregnant, after recovering from a difficult labour, in which the child had remained several days in the passage. She had been in labour sixty hours; but the neck of the womb had no tendency to dilate. Dr. Simson, perceiving that its edges were adherent, and left no opening betwixt them, determined to practise an incision, with the aid of a speculum uteri. The bistoury penetrated to the depth of half an inch, before it got quite through the substance, which it had to divide, and which seemed as hard as cartilage. As the opening did not dilate, in the efforts which the woman made, it became necessary to introduce a narrow bistoury on the finger, in order to cut this kind of ring in various directions. There was no hemorrhage; and the only additional suffering, which the patient encountered, arose from the distention of the vagina. As the child was dead, Dr. Simson perforated the head, in order to render the delivery more easy.

Strong convulsions, at the moment of parturition, may create a necessity for the vaginal Cæsarean Operation. These sometimes subside, as soon as the membranes are ruptured, and the waters discharged, so as to lessen the distention of the womb. However, if the convulsions were to continue, and the cervix uteri were sufficiently dilated, the child should be extracted with the forceps, or by the feet, according to the kind of presentation. On this subject, Baudeloque has recorded a fact, which was communicated to the Academy of Surgery, by Dubocq, professor of surgery at Toulouse. The woman was forty years of age, and had been in convulsions two days. She was so alarmingly pale, that she could scarcely be known. Her pulse was feeble, and almost extinct, and her extremities were cold, and covered with a clammy perspiration. The edges of the opening, which was about as large as a crown piece, felt, as it were, callous, and hardly had this aperture been dilated, when delivery took place spontaneously. The child was dead. The symptoms were appeased, and the woman experienced a perfect recovery. Another case, in which the indurated cervix uteri was successfully divided, is recorded by Lambron, a surgeon at Orleans. (See *Dict. des Sciences Med. T.* 23, *p.* 297.)

A considerable obliquity of the neck of the womb, combined with a pelvis of small dimensions, may also be a reason for the performance of the vaginal Cæsarean Operation. Not that such obliquity always occasions that of the rest of the uterus; nor is the neck of this viscus invariably directed towards that side of the pelvis, which is opposite to its fundus, although this is sometimes the case. In the latter circumstance, as the contractions of the uterus do not produce a dilatation of its cervix, which rests upon the bones of the pelvis, the adjacent part of that organ is dilated and pushed from above downwards, so as to present itself in the form of a round smooth tumor, without any appearance of an aperture. Such a case may have fatal consequences. Baudeloque furnishes us with an instance. A woman, in her first pregnancy, not being able to have the attendance of the accoucheur, whom she wished, put herself under the care of a midwife, who let her continue in labour-pains during three days. When the accoucheur came, on being sent for again, the child's head presented itself in the vagina, covered with the womb. The portion of the uterus, which included the fœtus, was in a state of inflammation. The os tincæ was situated backward, toward the sacrum, hardly dilated to the breadth of a penny-piece, and the waters had been discharged a long time. The patient was bled, and emollient clysters were administered. All sorts of fomentations were employed. She was laid upon her back, with her pelvis considerably raised. The accoucheur had much difficulty in supporting the head of the child, and keeping it from protruding at the vulva, enveloped, as it was, in the uterus. Notwithstanding such assistance, the patient died.

So fatal an event, says Sabatier, might have been prevented, by making the woman lie upon the side, opposite the deviation of the uterus, and employing pressure from above. If these proceedings had failed in bringing the os tincæ toward the centre of the pelvis, this opening might have been brought into such position, by means of the finger, in the interval of the pains, and kept so, until it were sufficiently dilated for the membranes to protrude.

This is what was done by Baudeloque in one case, where the womb inclined forward and to the right. The os tincæ was situated backward. The waters escaped, and the head advanced towards the bottom of the pelvis, included in a portion of the uterus. The whole of the spherical tumor, which presented itself, could be felt with the finger; but, no opening was distinguishable; and the swelling might also be seen, on separating the labia from each other, and opening the entrance of the vagina. It became necessary to keep the patient continually in bed, and to have the finger incessantly introduced; but, she was not sufficiently docile to submit to such treatment. Fortunately, the unexpected appearance of two officers of justice, forty-eight hours after the commencement of the labour, had the effect of making her more manageable. It was time for her to become so; for, the uterus had now become tense, red, and painful. The abdomen was also so tender, that it could scarcely bear the contact of the clothes. Febrile symptoms had begun, and the ideas were beginning to be confused. Baudeloque made her lie down; and he pressed, with one hand, on the abdomen, for the purpose of raising the uterus, while, with the other, he pushed the head a little way back, in order that he might reach the os tincæ, which he now brought with his finger toward the centre of the pelvis, and kept there for some time. The efforts of the patient being thus encouraged, she was delivered in about a quarter of an hour. The infant was of a thriving description, and the case had a most favourable termination.

When the obliquity of the uterus is such, that the os tincæ cannot be found, and the mother and fœtus are both in danger of perishing, it is the duty of the practitioner to open the portion of the womb, that projects towards the vulva. Lauverjat met with a case of this description in his practice. A woman, pregnant with her first child, suffered such extreme pain in her labour, that Lauverjat was solicitous to ascertain the real state of things. He was surprised to find the vulva completely occupied by a body, which even protruded externally, and yielded to the pressure of the fingers, except during the labour pains. In examining this tumor, he could only find at its circumference a cul-de-sac, half an inch deep, without any aperture, through which the child could pass. Other practitioners, who were consulted about this extraordinary case, were also anxious to learn what had happened. They found in the tumor a laceration, which only affected a part of the thickness of its parietes. This laceration was deemed the proper place for making an incision. The operation having been done, the finger was passed into the cavity, in which the child was contained. A large quantity of turbid fluid was discharged. The child presented, and passed through the opening, with a trivial laceration on the right side. Lauverjat, having passed his hand into the uterus, was unable to find either the os tincæ, or the cervix. No particular indisposition ensued, and the lochia were discharged through the wound, which gradually closed. In the course of two months the os tincæ and neck of the uterus, were in their natural position again. (*Lauverjat, Nouvelle Méthode de pratiquer l'Operation Cesarienne, Paris*, 1788.)

When the case is a scirrhous induration of the cervix uteri, or a laceration of the parietes of this viscus, at the place, where it projects into the vagina, the vaginal Cæsarean Operation is attended with no difficulty. It is performed with a blunt-pointed bistoury, the blade of which is wrapped round with lint, to within an inch of the point. The instrument is to be introduced, under the guidance of the index finger, into the opening presented by the uterus, and the aperture is to be properly enlarged, from within outwards, in various directions. But, when the scirrhous hardness of the cervix presents no opening at all, or when the part of the uterus projecting in the vagina is entire, the incision should be made from without inwards, with the same kind of knife. Too much caution cannot be used in introducing the instrument, in order that no injury may be done to the child, which lies directly beyond the substance, which is to be divided. No general direction can here be offered, except that of proceeding slowly, and of keeping the index finger extended along the back of the knife, so that it may be immediately known, when the substance of the womb is cut through, into the cavity of which the finger ought to pass as soon as the knife. If it should be necessary to extend, or multiply the incisions, the cutting instrument should be regulated in a similar manner, with the same finger. The cervix uteri having been divided, the expulsion of the child is either to be left to nature, or to be promoted by the ordinary means. The operation that has been described, requires no dressings. If the bleeding should prove troublesome, we are recommended to apply to the incision a dossil of lint, wet with vinegar, or spirit of wine. (See

Sabatier, Médecine Opératoire, T. 1.) The chief object would here be to prevent adhesions between the cervix of the uterus and the upper part of the vagina. (*Dict. des Sciences Med. T.* 23, *p.* 298.)

ABDOMINAL CÆSAREAN OPERATION.

This is a far more serious operation, than that which has just now been treated of, and is the proceeding, to which the term Cæsarean Operation is more particularly applied.

There are three cases, in which this operation may be necessary. 1. When the fœtus is alive, and the mother dead, either in labour, or the last two months of pregnancy. 2. When the fœtus is dead, but cannot be delivered in the usual way on account of the deformity of the mother, or the disproportionate size of the child. 3. When both the mother and child are living, but delivery cannot take place from the same causes, as in the second example.

In many instances, both mother and child have lived after the Cæsarean Operation, and the mother even borne children afterwards. (See *Heister's Institutes of Surgery, chap.* 118. *Mem. de l'Acad. de Chirurgie, T.* 1, *p.* 623, *T.* 2, *p.* 308, *in* 4to. *Edinb. Med. Essays, Vol.* 5, *art.* 37, 38. *Edinb. Med. and Surgical Journal, Vol.* 4, *p.* 179. *Med. Chir. Trans. Vol.* 9, *and* 11, *&c.*) And, in a valuable periodical work, one example is reported from Hufeland's Journal, where the mother and twins were all saved by the operation. (See *Quarterly Journ. of Foreign Medicine, &c. Vol.* 4, *p.* 625.)

In England, the operation has been attended with remarkably ill success; and perhaps there is not one unequivocal example, in which the mother has here survived the true Cæsarean Operation. In the third edition of this work, indeed, I referred to the case, recorded by Mr. James Barlow, of Chorley, Lancashire, who made an incision into the abdomen, extracted a dead child, and saved the mother's life. (See *Medical Records and Researches, p.* 154, 1798; *also J. Barlow's Essays on Surgery and Midwifery.*) My friend Dr. Gooch, however, having obligingly communicated to me his doubts, and those of Dr. Hull, respecting the reality of an incision having been made in this instance into the uterus, I am glad to have the opportunity of expressing my perfect conviction of the more correct view of the case, taken by these physicians. "I suspected, from the first, (says Dr. Hull) that Mr. Barlow was deceived in this case, from the account he gave of the *remarkable thinness of the uterus.* And I had formed an opinion, that the *child had escaped through a laceration of the uterus into the abdomen,* enveloped in the secundines, and that he had merely divided the membranes, when he fancied he had divided the uterus. Dr. Hull then proceeds to explain the confirmation of his own sentiments by those of Mr. Howarden, a very intelligent practitioner at Blackrod, who assisted at the operation. In fact, the particulars stated by this gentleman, leave no doubt, that the fœtus had escaped through a laceration of the uterus into the cavity of the abdomen. (See *Hull's Defence of the Cæsarean Operation, &c. p.* 72.) The case also referred to by Mr. D. Stewart, (see *Edin. Med. Essays, Vol.* 5,) where the labour had endured twelve days, and the life of the mother was saved, after the dead fœtus had been extracted by a midwife, was also probably of the same nature: at all events, the want of authentic particulars, and the circumstance of the operation having been done by a woman, leave the true nature of the case questionable.

If therefore, when we speak of the Cæsarean Operation, we mean that, in which the parietes of the abdomen and those of the uterus are divided by the surgeon, and the fœtus extracted, I believe, that, as far as the history of the practice extends in this country, it cannot be said, that the mother has ever recovered after such a proceeding; though, some years ago, a calculation was made, that the operation had been done not less than eighteen times in Great Britain; and since then it has been repeated in several instances with the same ill success. (See *Henderson's Case in Ed. Med. and Surg. Journ. Vol.* 17.) Ten of the children, however, are stated to have been saved. On the Continent, the practice has proved infinitely more successful; for, of 231 cases of this operation, to be found in the records of medicine, 139 are said to have terminated successfully. (*Kellie, in Edin. Med. and Surgical Journ. Vol.* 8, *p.* 17.) No doubt, the ill success of the Cæsarean Operation in England was correctly explained by Dr. Hull: "In France, and some other nations upon the European Continent, the Cæsarean Operation has been, and continues to be performed, where British practitioners do not think it indicated; it is also had recourse to early, before the strength of the mother has been exhausted by the long continuance and frequent repetition of tormenting, though unavailing pains, and before her life is endangered by the accession of inflammation of the abdominal cavity. From this view of the matter, we may reasonably expect, that recoveries will be more frequent in France, than in England and Scotland, where the reverse practice obtains. And, it is from such cases as these, in which it is employed in France, that the value of the operation ought to be appreciated. Who would be sanguine in his expectation of a recovery under such circumstances, as it has generally been resorted to in this country, namely, where the female has laboured for years under *malacosteon* (*mollities ossium*) a disease hitherto in itself incurable; where she has been brought into imminent danger by previous inflammation of the intestines; or other contents of the abdominal cavity; or been exhausted by a labour of a week's continuance, or even longer?" Dr. Hull thus refutes the opinion of Mr. W. Simmons, that our ill success was owing to climate, or some peculiarity in the constitutions of the females of this island. (*See Hull's Defence of the Cæsarean Operation, p.* 10.)

When the fœtus is contained in the womb, and cannot be expelled, by reason of the invincible obstacles, to which I have already referred, the Cæsarean Operation should be practised, before the mother, and fœtus, both perish from the violence of the pains, hemorrhage, convulsions, &c.

For this purpose, it is necessary to make an extensive incision in the integuments of the abdomen, and in the uterus. Some have thought, that cutting the parietes of the belly would be mortal, while others have believed a wound of the uterus equally dangerous. Hence, such persons have condemned the operation on the principle, that religious reasons do not authorize taking one life to save another. All the opponents of the Cæsarean Operation fear the hemorrhage, which, they say, must follow. Indeed, if the uterus were not to contract sufficiently, when the fœtus and afterbirth had come away, the bleeding would really be perilous. But when, by means of the Cæsarean Operation, the fœtus is extracted, together with the placenta and membranes, the uterus contracts, just as it does after a natural labour. Besides, even when the mother is alive, the operation is not commonly done, till the uterus evinces a propensity to deliver itself, and begins to contract. The womb being delivered of its contents, the incision becomes closed, the vessels obliterated, and there is no fear of hemorrhage. The wound must also make so irritable an organ more disposed to contract; but, whatever arguments may be adduced, it is enough to say in this case: *Artem experientia fecit, exemplo monstrante viam.* Rousset, in 1581, published a work, in French, entitled, *Hystérotomie, ou l'Accouchement Césarien.* This book, in 1601, was translated into Latin, and enlarged with an appendix by the celebrated Bauhin. Even then, the practice of the Cæsarean Operation on the living mother had its defenders. Bauhin relates that, in the year 1500, a sow-gelder performed the Cæsarean Operation on his wife, *tam feliciter, ut ea posteà gemellos et quatuor adhuc infantes enixa fuerit.* This is said to be the first instance, in which the operation was ever done on the living mother with success. Many other cases were afterwards collected, and published.

The possibility of operating successfully on the living mother, was proved with great perspicuity and accuracy, by Simon, in the *Mémoires de l'Acad. de Chirurgie, T.* 1, *4to.* Here we are presented with a collection of sixty-four Cæsarean Operations more than a half of which had been done on thirteen women. Some of these had undergone the operation once, or twice; others five or six times. There was one woman in particular, who had undergone it seven times, and always with success. This seems to prove, notwithstanding all assertions to the contrary, that the operation for the most part succeeds. But, if the life of the mother should not invariably be preserved, the Cæsarean Operation ought not to be rejected on this account; it ought always to be done, when relief cannot be obtained by other means; just as amputation and lithotomy are practised, though they are not constantly followed by success. Would any thing be more cruel, than to abandon a mother and her child, and leave them to perish, while there is any hope of saving them both? It is true, that when a pregnant woman dies of any inward disorder, and not from the pains, and efforts of labour, the fœtus is sometimes still alive in the uterus; but, in cases of death, after difficult labours, and the great efforts, made by the uterus to overcome the obstacles to parturition, the fœtus is generally dead; and the operation therefore is less likely to be availing. (See *Bertrandi Traité des Opérations de Chirurgie, chap.* 5.)

It is the opinion of the best writers upon this subject, that whenever a woman dies, at all advanced in pregnancy, the performance of the Cæsarean Operation is highly proper. The propriety of this practice, in such circumstances, was known to the ancient Romans; for, by a decree of Numa Pompilius, no woman, who died pregnant, was suffered to be buried, ere her body had been opened, with the view of preserving the infant for the use of the state. (*Sprengel, Geschichte, der Chir. Th.* 1, *p.* 371.) Experience has proved, that when the fœtus has not attained the period, at which parturition commonly happens, it will sometimes survive the operation a considerable time, and that, when it is full grown, its life may be most happily preserved. Although instances are cited, in which the fœtus in utero has been found alive upwards of four-and-twenty hours after the death of the mother, little stress should be laid on such prodigies. The operation ought to be done without any delay. Even then, we are not certain of saving the infant's life. In the greater number of instances, the fœtus perishes, at the same time with the mother, and from the same causes. The cases, which are recorded, of the fœtus being extracted alive, after the death of the mother, are numerous: I shall here only refer to three, two of which rest on the unimpeachable authority of Flajani, who was himself the operator. (*Collezione di Osservazioni, &c. di Chirurgia, T.* 3, *p.* 144—146.) In one of these instances, the operation was done on a woman, killed by violence, in the ninth month of pregnancy; the child lived six hours; in the other, a fœtus was extracted from a woman who had died of typhus fever, in the seventh month, and though the operation was not done till she had been dead about an hour, the child was taken out alive, and continued to live full ten minutes. A living child was also taken out of its mother by Vesling, after her death from typhus. (*Welsch. Obs. Med. Episagm. No.* 74, *p.* 47 : *Sprengel, Geschichte der Chir. Th.* 1, *p.* 374.) On the 15th of April 1820, Mr. Green, of St. Thomas's Hospital, extracted by the Cæsarean Operation from a women suddenly killed in the ninth month of pregnancy by the passage of a stage coach over her, a fœtus that livid 34 hours after its removal from the uterus. (See *Med. Chir. Trans. Vol.* 12, *p.* 46.) With respect to the statements of Cangiamila, a Sicilian practitioner, I join Sprengel in considering them as incredible exaggerations; five instances are given, in which the fœtus was taken out of the mother from fifteen to twenty-four hours after her death, and yet it continued to live. Cangiamila says, that at Syracuse, in the course of eighteen years, the operation had been practised twenty times under the same circumstances; that at Girgenti, thirteen children were saved out of twenty-two women, who had died pregnant; and that, in twenty-four years, at Montereali, twenty-one children were preserved in the same manner. (*Embryologia Sacro. Venet.* 1763, *fol.*) As Sprengel remarks, one might almost suppose, from this account, that in Sicily pregnancy was generally fatal. If the mother should happen to die in labour, and the neck of the uterus were sufficiently dilated, or disposed to be so, an attempt should be made to accomplish delivery in the ordinary way; for, examples have occurred, in which, women, supposed to be dead in this circumstance, were in reality alive. Hence, we find, that the senate of Venice in 1608 enacted a law, by which practitioners were liable to punishment, in case they neglected to operate with as much caution on a pregnant woman, supposed to be dead, as on the living subject; and rules to be observed were again issued by the same government, in 1720. (*Seb. Melli, La Commare levatrice, p.* 108, *4to. Venez.* 1721; *Personè Diss. sopra l'Operaz. Cesar. p.* 15, *8vo. Venez.* 1778.) A law to the same effect was likewise made in 1749, by the king of Sicily, who decreed the punishment of death to those medical men, who omitted to perform the Cæsarean Operation on such women as died in the advanced stages of pregnancy. In the Journal des Sçavans de Janvier, 1749, the following case, confirming the propriety of such caution, was inserted by Rigaudeaux, surgeon to the Military Hospital at Douay. This practitioner, having been sent for to a woman, to whose residence he was unable to proceed, till two hours after her apparent death, he had the sheet, with which she was covered, removed, and perceiving that the body retained its suppleness and warmth, he tried whether the fœtus could not be extracted in the ordinary way, which was easily effected as soon as the feet were got hold of. The first endeavours to save the child, were very unpromising; but, after a few hours, they had the desired effect. As the woman continued in the same state, five hours afterwards, Rigaudeaux recommended that she might not be buried, before her limbs were quite cold and stiff. He afterwards had the satisfaction to learn, that she was also restored to life. This remarkable case happened on the 8th of June, 1745, and both the mother and child were living at the period when Rigaudeaux published the observation.

Supposing, however, delivery in the ordinary manner to be impracticable, at all events, the Cæsarean Operation ought to be performed, with the same cautions, as if the mother were alive, only one incision being made for the purpose of opening the uterus.

Almost all the insurmountable obstacles to delivery originate from the bad conformation of the pelvis, depending upon rachitis; though they are not an invariable consequence of it, since there are women, extremely deformed, in whom no imperfection of the pelvis exists, while it prevails in others, whose shape is but trivially disfigured. An examination of the dimensions of the pelvis is the right mode of ascertaining, whether there is really such an impediment to parturition. In order that the dimensions may not be an obstacle to delivery, the distance, between the upper edge of the sacrum and the os pubis, ought to be three inches and a half; and the distances, between the tuberosities of the ischium, and between each of these protuberances and the point of the os coccygis, three inches. Women have indeed been known to be delivered, without assistance, although the first of the above distances, was only two inches and a half; but, then the heads of the children were so elongated, that the great diameter was nearly eight inches, while that which extends from one parietal protuberance to the other, was reduced to two inches five or six lines, and the infants were lifeless. If they are to be born alive, they must be taken out of the womb by the Cæsarean Operation; but, the latter proceeding should never be adopted, without a certainty, that they are actually living; for when dead, they may be extracted in a way, that is attended with much less risk to the mother.

It is not always an easy matter to ascertain with certainty, whether a fœtus in utero, be living, or dead. If it has entirely ceased to move, after being affected with a violent motion, the probability is, that it is no longer alive. But, to be certain, manual examination is necessary, which may be practised in two ways. One consists in pressing upon the uterus, through the parietes of the abdomen. If the child lives, such pressure makes it move, and the motion can be plainly felt, and distinguished. In the other method, one hand is employed in pressing upon the uterus externally, while, with the fingers of the other hand, passed up the vagina, corresponding pressure is also to be made. The uterus is likewise to be allowed to descend as far as possible, in order to induce the fœtus to move. When no decisive indications can be thus obtained, it becomes necessary to rupture the membranes, if they have not already given way, introduce the hand into the uterus, and put a finger into the child's mouth, for the purpose of making it move its tongue. The finger may also be applied to the region of the heart, so as to examine, whether this organ is beating; and the umbilical cord may be touched, in order to ascertain, whether there is still a pulsation in it. When none of these proceedings furnish unequivocal information, the conclusion is, that the child is dead, and its extraction is indicated, unless the narrowness of the parts be such, that the hand cannot be passed into the uterus, in which case, the Cæsarean Operation is indispensable.

But, how are we to form a judgment respecting the dimensions of the pelvis? And how can we know, whether that diameter, which extends from the upper edge of the sacrum to the os pubis, is long enough to allow the passage of the child? The proper conformation of this part is known, by the roundness and equality of the hips, both in the transverse and perpendicular direction; by the projection of the pubes; by the moderate depression of the sacrum; by an extent of four or five inches from the middle of this depression to the bottom of the os coccygis; by an extent of seven or eight inches from the spinous process of the last lumbar vertebra to the highest part of the mons veneris, in a woman moderately fat; and by there being an interspace of eight or nine inches, between the two anterior superior spinous processes of the ossa ilium.

These general calculations, however, are insufficient. In order to acquire more correct opinions, double compasses have been employed. The branches of the first being applied to the top of the sacrum, and middle of the mons veneris, three inches are to be deducted from the dimensions, indicated by the instrument; viz. two inches and a half for the thickness of the upper part of the sacrum, (which is said to be constant in subjects of every size,) and half an inch for that of the os pubis. In women, who are exceedingly fat, some lines must also be deducted on this account. Hence, when the total thickness of the pelvis, measured in this direction, is seven inches, there will remain four for the distance from the upper part of the sacrum to the os pubis, or for the extent of the lesser diameter of the upper aperture of the pelvis.

For taking the measurement internally, a kind of sector was invented by Coutouly. It bears a considerable resemblance to the instruments, employed by shoemakers for measuring the feet. It is passed into the vagina, with its two branches approximated, until one arrives opposite the anterior and upper part of the sacrum, when the other is to be drawn outward, so as to be applied to the pubes. The distance, between the branches, is judged of by the graduations on the instrument. This was named by its inventor a pelvimeter. According to Sabatier, it is not always easy to place it with accuracy; its employment is attended with some pain; and there are particular cases, in which it cannot be used.

Instead of this contrivance, the celebrated Baudeloque recommended a means, which seems to be very safe and simple. The index finger of one hand is to be introduced into the vagina to the upper part of the projection of the sacrum. The finger, having the radial edge turned forwards, is then to be inclined anteriorly till it touches the arch of the pubes. The point of contact being then marked with the opposite hand, the length from the point in question to the end of the finger is to be measured. This length, which indicates the distance between the sacrum and the bottom of the symphysis pubis, usually exceeds that of the lesser diameter of the pelvis by about six lines. Baudeloque acknowledges, that this measurement is not exactly accurate; but, he believes, it will do very well, because, unless the narrowness of the pelvis be extreme, two, or three lines hardly make any difference in the facility of parturition.

The following is the description of the pelvis of the woman, twice operated upon by Dr. Locher: the ossa pubis, which should be on the same level with the promontory of the sacrum, were found perpendicularly under it; so that the child necessarily extended the abdominal integuments by its own weight, into a pendulous bag overhanging the thighs. For the same reason, nothing could be felt of the child by examination per vaginam. The sacrum, instead of closing the pelvis behind, by a semicircular curve, which forms a kind of conductor for the child in parturition, stretched nearly horizontally backwards. A representation of this pelvis, with a few other particulars, may be seen in a modern publication. (*Med. Chir. Trans. Vol.* 11, *p.* 199.)

The pelvis may be everywhere well formed, and yet present an insurmountable obstacle to delivery, in case an exostosis, lessening its dimensions, should exist on one of the bones, which compose this part of the skeleton. Pineau met with a case of this description in a woman, who died undelivered. The tumor originated, from one of the ossa pubis. A steatomatous swelling, situated with the head of the child in the upper aperture of the pelvis, might produce the same effect, unless it were detected, and could be pushed out of the way, so as to make room for the fœtus to pass. Baudeloque mentions a swelling of this kind. It was six or seven inches long, and an inch and a half in width. The extremity of it, which was as large as half a hen's egg, had a bony feel, and contained nine well-formed teeth, the rest of the mass being steatomatous. It had descended into the lesser pelvis, below the projection of the sacrum, and a little to one side. It might have been taken for an exostosis of this last bone. The labour pains continued sixty hours, and the propriety of performing the Cæsarean Operation was under consideration. Baudeloque was averse to this proceeding. He recommended turning the child, and extracting it by the feet, because he thought, that the pelvis was sufficiently capacious to admit of delivery. The event proved, that it was three inches nine lines, from before backward, and four inches nine lines transversely. The fœtus was soon easily extracted. The assistance of the forceps was necessary to get out the head. The child was still-born. The mother, exhausted with numerous unavailing efforts, only survived between fifty and sixty hours. Baudeloque was of opinion, that a defective regimen also tended to occasion her death.

Among the insurmountable obstacles to delivery may be reckoned such a displacement of the uterus, that this viscus protrudes from the abdomen, and forms a hernia. The records of surgery have preserved some examples of this extraordinary occurrence. Twice has the Cæsarean Operation been performed, and, in one of the cases, the woman survived so long, that hopes were entertained of her recovery. Indeed, as Sabatier observes, why should not the operation succeed in such a case, where the uterus is only covered by the integuments, and there is no occasion to cut into the abdomen, just as well as other instances, in which it is indispensable to divide the muscles, and open the cavity of the belly? In the other case on record, delivery was effected in the ordinary way, either by raising the abdomen, and keeping it in this position with towels skilfully placed, or by making pressure on the uterus, which had the beneficial effect of making this organ resume its proper situation.

Having shown the absolute necessity for the Cæsarean Operation, under certain circumstances, it remains to consider the proper time for performing it, the requisite preparatory means, and the method of operating.

With regard to the time of operating, practitioners do not agree upon this point: some advising the operation to be done, before the membranes have burst, and the waters been discharged; others, not till afterwards. The arguments, in favour of the first plan, are, the facility with which the uterus may be opened without any risk of injuring the fœtus, and the hope that the viscus will contract with sufficient force to prevent hemorrhage. The advocates for the second mode believe, that, in operating after the discharge of the waters, there is less danger of the uterus falling into a state of relaxation, in consequence of becoming suddenly empty after being fully distended, and that this method does not demand so extensive an incision. Hence, they recommend, as a preliminary step, to open the membranes. Whatever conduct be adopted, it is essential, that the labour should be urgent and unequivocal, that the cervix uteri should be effaced, and that the os tincæ should be sufficiently dilated to allow the lochia to be discharged; but, at the same time, says Sabatier, if the operation is not to be done till after the escape of the waters, there ought not to be too much delay, lest the patient's strength should be exhausted, and the violent efforts of labour should bring on an inflammatory state of the parietes of the uterus.

The propriety of emptying the rectum and bladder is so evident, that it is unnecessary to insist upon it. This precaution is more particularly requisite in regard to the latter of these viscera, which has been known to rise so much over the uterus, as to conceal the greater part of it. Baudeloque had occasion to remark this circumstance, in a woman, upon whom he was operating. The bladder ascended above the navel, and presented itself through the whole extent of the opening made in the parietes of the abdomen.

The instruments, dressings, &c. which may be wanted, are two bistouries, one with a convex edge, the other with a probe-point; sponges, basins of cold water acidulated with a little vinegar; long strips of adhesive plaster; needles and ligatures; lint; long and square compresses; a bandage to be applied round the body, with a scapulary, &c.

For the purpose of undergoing the operation, the patient should be placed at the edge of her bed, well supported; her chest and head should be moderately raised; her knees should be somewhat bent, and held by assistants, one of whom ought to be expressly appointed to fix the uterus by making pressure laterally, and from above downward, so as to circumscribe, in some degree, the swelling of the uterus, and prevent the protrusion of the bowels. These things being attended to, the integuments are to be divided with the convex-edged bistoury to the extent of at least six inches. The place and direction of this incision, differ with different operators.

In the most ancient method, it was customary to make the incision between the outer edge of the rectus muscle, and a line, drawn from the anterior superior spinous process of the ilium, to the junction of the bone of the first rib with its cartilage. This cut was begun a little below the umbilicus, and was continued downward as far as an inch above the pubes. After the integuments had been divided, the muscles, aponeuroses, and peritoneum were cut, and the uterus cautiously opened. The left index finger was then introduced into this viscus, the wound of which was dilated by means of the probe-pointed bistoury.

This manner of operating is subject to great inconveniences. The place, where the incision is made, is the situation of muscles, the fibres of which have a different direction, and, on contracting, separate the edges of the wound, and make it gape. The considerable blood-vessels, which ramify there, may be the source of perilous bleeding. The bowels can protrude in that situation more readily, than any where else. When the position of the uterus is oblique, and when, consequently, the edges of this viscus are turned forward and backward, and its surfaces to the right and left, the incision will be made in one of the lateral portions of the uterus, where the trunks of its blood-vessels are known to be situated, and sometimes even the Fallopian tube and ovary may be cut. The fibres of the uterus are cut transversely, so that the edges of the incision are apt to gape, instead of being in contact. This last circumstance may the more readily permit the lochia to escape into the abdomen, inasmuch as the uterus is cut nearly through its whole length, and there is no cavity, in which they can accumulate, in order to be discharged through the cervix of that organ.

The linea alba has been frequently considered the most eligible place for making the incision. As Sabatier informs us, it was the method adopted by Soleyrès and Deleurye, and it has the recommendation of Baudeloque, because there are fewer parts to be cut, and, when the uterus is exposed, an incision, parallel to its principal fibres, may be made in its middle part. Soleyrès thought that this plan of operating originated with Platner and Guérin, a surgeon at Crepì en Valois. Platner says; *Incidantur juxta lineam albam, plagâ majore quæ ab umbilico ad ossa pubis ferè descendit, tùm abdominis musculi, tum peritonæum, ubi tandem vitandum ne violetur arteria epigastrica.* Guérin, in his case, made an incision, six inches long, which began a little above the umbilicus, and extended to within an inch and a half of the pubes. He afterwards divided the fat, muscles, and peritoneum, in order to get at the uterus, the anterior part of which was opened, the wound being made rather in the body, than the fundus of that viscus. Deleurye will not admit, that these writers actually divided the linea alba, because they speak of having cut muscles, which in reality do not exist in that situation; and he attributes the honour of the invention to Varoquier, a surgeon of Lisle, in Flanders; but, the method was known to Mauriceau, as we may be convinced of by the following passage, extracted from the chapter in which he treats of the Cæsarean Operation, "*La plupart veulent qu'on incise au côté gauche du ventre; mais l'ouverture sera mieux au milieu entre les muscles droits, car il n'y a en ce lieu, que les tégumens et les muscles à couper.*" Lauverjat, who has made this remark, and cited the Latin edition of Mauriceau, page 247, also observes, that the incision in the linea alba was practised by a contemporary of La Motte, a circumstance which Sabatier has not been able to ascertain. *(Médecine Opératoire, Tom.* 1.*)* The following would be the proper manner of operating in the linea alba. The operator should first divide the integuments perpendicularly, so as to expose the linea alba, making the wound about six inches long. An opening should then be carefully made through the aponeurosis, into the abdomen, either at the upper, or lower part, of the linea alba in view. A curved bistoury is then to be introduced into the opening, and the tendon and peritoneum cut from within outward, as far as the extent of the wound in the integuments. The latter cut should be cautiously made, with the crooked bistoury, guided by the forefinger of the left hand, lest any of the intestines be accidentally injured. The uterus must next be carefully opened, making an incision in it, of the same length, as the preceding wound. The fœtus is to be taken out through the wound, and then the placenta and membranes. In this way, M. Artiste lately operated, so as to save both mother and child. (See *Edinb. Med. & Surg. Journ. Vol.* 4, *p.* 178.)

This mode of operating, as Sabatier observes, gives more hopes of success, than the plan first described; but he argues, that such hopes have not been realized by experience. Though the operation may have been more easy, he contends, that the edges of the wound in the skin, and those of the incision in the uterus, have had no tendency to remain in a state of proximity to each other, because the linea alba is the point, on which all the large muscles of the abdomen principally act, and because the contraction of the uterus invariably takes place from above downwards. Sabatier alleges, that the wound in this viscus has been found to incline to one of its sides, for the same reasons, as occur, in operating at one of the sides of the abdomen. He also states, that the incision has been concealed under the integuments of the upper part of the pubes, and that the presence of the bladder hinders the wound from being carried sufficiently far down. Perhaps, says he, a part of these inconveniences, which depend upon the contraction of the uterus, and the return of this organ to its natural state, might be avoided, by extending the incision to its highest part. Baudeloque has advised this plan, with the view of preventing the fatal extravasations in the abdomen, which frequently follow this operation. Sabatier, however, has doubts, whether, in operating in the linea alba, the wound can be carried high enough. Besides, he maintains, that this precaution would not prevent the wound from gaping, nor the greater tendency of the lochia to be extravasated in the abdomen, than to accumulate in the uterus, and be discharged through the os tincæ. (*Médecine Opératoire, Tom.* 1, *p.* 274-275.)

In this country, (where, indeed, the Cæsarean Operation has proved most unsuccessful) the linea alba is preferred, I believe, by the majority of practitioners. That the method is not always attended with the formidable objections, urged against it by Sabatier, is quite certain: the case, lately published by Dr. Chisholm, is a decisive proof of this assertion. (See *Edinb. Med. and Surgical Journ. Vol.* 4, *p.* 178, 179.)

There is a third method of performing the abdominal Cæsarean Operation. It consists in making a transverse incision, five inches in length, through the parietes of the abdomen, between the rectus muscle and the spine, and in a situation more or less high, according to the more or less elevated position of the uterus. This plan was recommended by Lauverjat, in a publication, entitled, "*Nouvelle Méthode de pratiquer l'Operation Césarienne, Paris,* 8*vo.* 1788." Lauverjat acknowledges, that the method had been successfully practised by different persons before himself, and, especially, in one instance, which was particularly remarkable, as, in consequence of the first incision having been made too high up, it became necessary to make a second one, which extended obliquely from the other. However, according to Sabatier, Lauverjat has as much merit, as if he had invented the plan, since he has given a better explanation of its advantages, than any of his predecessors.

The side, on which the operation is to be done, is in itself a matter of indifference. But, if the liver or spleen were to project, one ought to avoid it. Also, if the uterus were to incline more towards one side, than the other, it would be proper to operate on the side, where this viscus could be most conveniently exposed. The patient being put in a proper position, and held by assistants, and her abdomen kept steady by an attendant, who must apply the palms of his hands to the sides of the uterus, the integuments, muscles, and peritoneum are to be divided, with the usual precautions. The uterus is then to be opened, and the wound in it enlarged in the requisite degree, by means of a probe-pointed bistoury. Should the placenta present itself, care must be taken not injure it, for fear of opening one of the arteries of this mass, which communicate with the umbilical arteries of the child, or of leaving a portion of it in the uterus; but, it should be separated, in order to facilitate breaking the membranes at its circumference. The child is next to be extracted. This part of the operation is subject to no general rule. Delivery being accomplished, we are recommended to introduce through the vagina anodyne injections, in order to lessen spasm, and wash out the coagula. This method is preferable to that of clearing out the uterus with the hand. Sabatier most properly condemns the plan, formerly advised by Rousset and Ruleau, of passing up the neck of this viscus a catheter for the purpose of washing out the lochia, as well as the absurd proposal of employing a seton to promote their escape. Should the lochia not pass readily outward, we are recommended to introduce the finger occasionally into the cervix uteri, so as to free it from the coagula, which may obstruct it.

Sabatier observes, that nearly all authors, who have spoken of the Cæsarean Operation, whether performed at the sides of the abdomen, or in the linea alba, have advised keeping the edges of the wound in the skin, muscles, and peritoneum together, by means of the interrupted, or twisted suture, care being taken to place at the lower part of the incision a tent, in order to prevent adhesion, and leave a free issue for whatever discharge may take place from the abdomen. Others have been content with recommending the use of adhesive plasters and the uniting bandage.

Sabatier condemns sutures as painful and irritating, and he states, that the other means only act upon the skin, without fulfilling the object in view, because the integuments have no fixed point, and the divided muscles tend to contract. He assures us, that, in the last mode of operating, the edges of the wound may be brought into contact by merely laying the patient upon her side. Besides, he remarks, that there are not many muscular fibres cut, those of the transversalis being only separated from each other. He affirms, that this manner of operating also favours the approximation of the edges of the wound in the uterus, in consequence of this organ contracting most extensively in the perpendicular direction. It is likewise asserted, that, as the uterus has only been opened at its upper part, it affords in its middle and lower portions a large cavity, which does not communicate with the abdomen, and in which the lochia may easily accumulate, and afterwards be discharged by the natural way. The only dressings, advised by Sabatier, are a large pledget, compresses, and a moderately tight bandage round the body. These are to be changed, when soiled with the matter or discharge. In this country, practitioners would not neglect to bring the edges of the wound, as much as possible, together, by means of strips of adhesive plaster; for, though they may not act with so much effect in this situation as many others, they undoubtedly assist in promoting the main aim of the surgeon, which is to heal at least all the upper part of the incision, if possible, by the first intention. I have no doubt, there are many, who would be advocates for sutures. In this country, the last method of operating has also been tried.

Mr. Wood, of Manchester, performed the Cæsarean Operation, in a case, in which parturition was prevented by deformity of the pelvis. The incision was made nearly in a transverse direction, on the left side of the abdomen, about five inches in length, beginning at the umbilicus. This part was fixed upon, because the nates of the child could be felt there, and it was evident, that no intestine was interposed betwixt the abdominal parietes and the uterus. There was scarcely any effusion of blood, either from the external wound, or from that of the uterus, though the latter was made directly upon the placenta. Instead of dividing the placenta, Mr. Wood introduced his hand betwixt it and the uterus, and, laying hold of one of the child's knees, extracted the fœtus with ease. His hand readily passed betwixt the placenta and uterus; this produced an hemorrhage, but, not in any considerable degree; for, the whole quantity of blood lost did not exceed seven, or eight ounces. After the uterus was emptied, the intestines and omentum protruded at the wound. These having been reduced, the integuments were brought into contact with sutures and adhesive plaster. This operation, however, did not save the woman's life; she died on the fourth day after its performance. (See *Med. and Physical Journ. Vol.* 6.) As I have already explained, the ill success of the Cæsarean Operation in England has been such, that not a single case has yet happened, in which the life of the mother has been preserved after the child was truly extracted from the womb by incision. The probable reason of this circumstance I have also noticed. Abroad, however, the success of the practice forms quite a contrast to what has occurred in this country, the operation having been often done so as to save the lives both of the mother and child, of which an interesting example was recently published by Dr. Locher, of Zurich. (See *Med. Chir. Trans. Vol.* 9. *p.* 11.) And, in Vol 11 of the same work, may be read a case, in which Dr. Meyer, of Minden, lately saved a woman by the operation, but the fœtus was dead. Likewise an example, in which Dr. Spitzbarth, in 1819, preserved the lives both of the infant and mother; and another interesting relation of two Cæsarean Operations performed by Lorinser, on a woman still living at Nimes, in Bohemia. (See *also Siebold's Journ. für Geburtshulfe, &c. Vol.* 3. *Part* 1, *Frankf.* 1819.) In 1801, Dr. Schlegel, of Merseburg, likewise operated on a woman, who recovered, notwithstanding the bowels became strangulated, and she is still living, with a hernia in the situation of the wound. (*Schweighäuser Archiv. des Accouchemens, p.* 135, 8*vo. Paris,* 1797.)

OF OPERATING WHEN THE FŒTUS IS EXTRA-UTERINE.

Delivery cannot possibly happen in the ordinary way, when the fœtus is situated in the ovaries, or Fallopian tube, or in the cavity of the peritoneum. However, there are many instances recorded of ventral pregnancies, which the mothers survived, the dead putrefied fœtus having been discharged, either out of an abscess, or through the rectum.

Practitioners are occasionally called upon to do a very similar operation to the Cæsarean, when the child has passed into the cavity of the peritoneum, in consequence of the rupture of the uterus. Unfortunately, such an accident is not uncommon, and though the causes of it may not be obvious, nothing is more certain, than that the fœtus itself is entirely passive, and has no share in producing the misfortune. The symptoms, by which the event can be known, are not always easy of comprehension. When, however, the pains have been violent; when the last, after being excessively severe, has been followed by a kind of calm; when the countenance loses its colour, the pulse grows weak, and the extremities become cold and covered with a cold sweat; when the abdomen is generally flat and only partially affected with a swelling, occasioned by the fœtus, which either continues to move, or is dead and motionless; when the patient complains of a moderate degree of heat about the belly; and, lastly, when the child shrinks from the touch of the accoucheur; it is manifest that the uterus is lacerated. If the child has passed completely into the abdomen, gastrotomy is the only resource. Should a part of it, however, yet remain in the uterus, it may be extracted, with the aid of the forceps, if the head presents, or by the feet, provided only the upper part of the body be in the abdomen.

Baudelocque quotes three instances of gastrotomy, performed on account of the rupture of the uterus. The first is that inserted by Thibaud Dubois, in the Journal de Médecine, for May, 1760. Every preparation was made for a natural labour, when, after excessively violent pains about the upper and left part of the uterus, the child disappeared. Thibaud opened the abdomen, though not till some hours after the accident. The infant was dead; but, the mother experienced no ill effects after the operation, except such as are usual after ordinary labours.

The second and third cases were communicated to the French Academy of Surgery in 1775, by Lambron, a surgeon of Orleans. He practised the operation twice, on the same woman, with success. In the first instance, he operated eighteen hours after the rupture of the uterus. The child was dead. An ill conditioned abscess formed near the wound; but the patient got quite well in the course of six weeks. She was pregnant again the following year, and the uterus was once more ruptured. Lambron now had recourse to the operation without delay. The child betrayed some signs of life; but, soon died. The mother not only survived; but, afterwards became pregnant again, and had a favourable delivery.

In a foregoing column, I have adverted to the case, in which Dr. Locher, of Zurich, saved both the mother and child by the Cæsarean Operation, performed in the linea alba. After her recovery, a small point of the wound, not exceeding two or three lines in length and breadth, required a long time to be quite healed, though no particular inconvenience was experienced from it. Some time afterwards the cicatrix gave way again, and a portion of omentum protruded, which was reduced, when a piece of bowel came out, and was also returned. The edges of the wound were then brought together; but a small superficial ulcer continued open, in spite of every effort to close it. In 1818, the year following that, in which the Cæsarean Operation had been performed upon her, she became pregnant again, and the chief particularity, which happened during gestation, was an increase in the size of the preceding ulcer, which became three inches in width. The sore, however, was covered with charpie, and the integuments well supported with adhesive plaster. On the 23d of May, she was seized with labour pains; and about seven in the evening, she complained all at once of a very acute pain, and at the same moment voided a considerable quantity of blood from the vagina. On examining by this passage, nothing was discovered; but, when the hand was applied below the navel, in the line of the old wound, and under the ulcer, a circumscribed firm swelling was felt, caused by the child's head, of which the sutures were plainly discernible. Dr. Locher naturally concluded, that the uterus had burst, so as to allow the child to escape, and the hemorrhage was thus easily explained. A repetition of the Cæsarean Operation was deemed indispensable. The place of the incision was determined by the round swelling, caused by the child's head. An incision six inches in length, was made into the abdomen, where a quantity of coagulated blood was found. When this had been removed, the membranes presented themselves, exhibiting a bluish hue, and, after they had been opened, the head of the child immediately appeared. The navel-string passed round the neck, which was also compressed in the opening of the uterus. The child evinced no signs of life. The placenta came away during the attempts to reanimate the child. The uterus contracted, and there was little bleeding. This patient, after a good deal of indisposition, and occasional approaches to a perfect recovery, was at length attacked with inflammation of the stomach and bowels, and died on the 9th of July. The uterus was found contracted to a small size, with an opening, of about the size of an almond on its anterior surface, with a rounded callous edge. This aperture, Dr. Locher thinks, had remained ever since the first operation, and had allowed the escape of the child in the second labour; a circumstance, which may be doubted, as the hemorrhage indicated the period, when the uterus had been lacerated, as this gentleman indeed has in one place particularly noticed himself. (See *Med. Chir. Trans. Vol.* 11, *p.* 182, *&c.*) An almost incredible case is related of, what may be called, a Cæsarean birth, effected solely by the powers of nature, and, as would appear, by a sudden rupture of the uterus and parietes of the abdomen, after the patient had been in labour three days. (See *Essays and Obs. Physical and Literary, Vol.* 2.)

A laceration in the uterus, or the wound made in this viscus in the Cæsarean Operation, may give rise to dangerous and even fatal symptoms of strangulation, if any of the intestines insinuate themselves into the preternatural opening. When such an occurrence happens in the performance of the preceding operation, the intestine must be directly withdrawn and replaced. If the accident were to happen, when the child is extracted in the natural way, the bowel is to be pushed back into the abdomen from the uterus. Were the occurrence to take place several days after the operation, Sabatier inquires, what ought to be done? A surgeon is said to have pushed back the intestine from the uterus as late as the third day. Sabatier thinks, that later it could not be done. In this circumstance, Baudeloque advises the operation, suggested by Pigrai, namely, that of opening the abdomen and withdrawing the bowel from the place, in which it is incarcerated. But, there are serious objections to this proceeding. There is no certainty that the intestine is strangulated, and, if it were so, the adhesions, which are soon formed, would frustrate the design of the operator.

Gastrotomy has not only been recommended for cases, where the child has passed into the abdomen through a rupture of the uterus; it has likewise been advised for instances, in which the fœtus has grown in the Fallopian tube, ovary, or cavity of the abdomen. Here, indeed, the operation deserves to be called Cæsarean; for, in addition to the incision in the skin and muscles of the abdomen, it is necessary to open the pouch, in which the child is contained. The instances of conceptions in the Fallopian tube are not uncommon. Those in the ovary, and cavity of the peritoneum, are more rare. Sabatier conjectures, that most of the cases, reported to be of the latter kind, if attentively examined, would have been found to be in reality conceptions in the Fallopian tube.

Extra-uterine conceptions hardly ever arrive at maturity. However, the fœtus, formed in the Fallopian tube, has sometimes been known to attain the term of nine months, and then die, either from the impossibility of its expulsion, or from the insufficiency of the nourishment afforded it. The pouch, in which it was contained, and the neighbouring parts, have then inflamed, and, after becoming connected together by numerous adhesions, have suppurated. The abscess has burst, partly at some point of the circumference of the belly, and, partly, into the rectum; and the dead fœtus has been discharged piecemeal with the matter.

In other examples, the fœtus, instead of giving rise to abscesses, has become ossified, with the enveloping membranes, and continued in this state many years, without any other inconvenience to the patient, than what depended on the size and weight of the tumor within the abdomen.

Most frequently, however, the pouch, containing the fœtus, bursts, about the middle of the ordinary period of gestation, and the child passes into the cavity of the peritoneum. At the same moment, the blood-vessels, ramifying on the parietes of the containing parts, usually pour forth into the abdomen so much blood, that the patients generally die in the space of a few hours. *(See a case by Dr. Clarke in Trans. of a Society for the Improvement of Medical and Chirurgical Knowledge. Also another adverted to by Mr. C. Bell, in Medico-Chirurg. Trans. Vol.* 4, *p.* 340.*)*

Two facts of this kind fell under Sabatier's observation. The women were in the end of the fourth month of pregnancy. Excepting a swelling, which affected only one side of the abdomen, and frequent dragging pains in this cavity, there was no indication of any thing extraordinary. In other respects, the patients were well. They were both, all on a sudden, attacked with extremely acute pains, which lasted two or three hours. A more violent suffering, than the rest, was followed by entire ease. The abdomen subsided, and became as it were flat. An equal moderate warmth diffused itself over this part of the body. The skin lost its colour. Almost continual syncopes occurred. The pulse was feeble and concentrated. The whole body was covered with a cold sweat, and the women died. The rapid course of these symptoms rendered it impossible for Sabatier to be of any service. The patients were actually dying, when he was called to them. The examination of their bodies evinced, that the abdomen contained a large quantity of blood; that the fœtuses lay on the intestines, connected with the lacerated Fallopian tube by means of the umbilical cord; and that the tube itself, which was strongly contracted, presented no other tumor, except that which depended on the after-birth.

There is nothing, that announces an extra-uterine pregnancy, with sufficient certainty, to justify any positive conclusion, respecting the nature of the case, before the ordinary time of parturition. In many women, the gravid uterus inclines to one side, and numerous pregnant females have dragging pains, which may depend upon other causes. Things, however, are different when the fœtus has lived to the ordinary period of parturition, and the woman is attacked with labour-pains; because, besides the unequivocal signs of the presence of a child in the abdomen, the womb is empty, and is little changed from its common state. Should we now, asks Sabatier, have recourse to the Cæsarean Operation, just as if the fœtus were in the womb? Can we be sure, that the pouch, which contains the child, will contract itself, like the uterus, and that the incision, which is in contemplation, will not give rise to a fatal hemorrhage? Would it be easy to separate, and remove the whole of the placenta? How could the discharge, analogous to the lochia, find an outlet, and would not its extravasation in the abdomen, be likely to prove fatal? Sabatier thinks, that the risk, which is to be encountered, is much less, when things are left to nature. The child, indeed, must inevitably perish. It will either give rise to abscesses, with which it will be discharged in fragments, or it will remain for a length of time in the abdomen, without any urgent symptoms. Sabatier also calls our attention to the great precariousness of an infant's life, and expresses his opinion, that, there can be no difficulty in deciding what conduct ought to be adopted. Happily, practitioners are not often placed in circumstances so delicate, and extra-uterine conceptions mostly perish, before the end of the common period of gestation. We have then only to second the efforts of nature; either by promoting suppuration, if it should seem likely to occur; by making a suitable opening, or enlarging one that may have formed spontaneously; by extracting such fragments of the fœtus as present themselves; by breaking the bones, when their large size confines them in the abscess, as Littre did in an instance, where the abscess burst into the rectum; and, lastly, by employing suitable injections. (See *Sabatier's Médecine Opératoire, T.* 1.)

An extremely uncommon case of extra-uterine conception, was related a few years ago by Josephi: the fœtus having at length passed into the bladder by ulceration, and caused such affliction, as rendered an incision into that receptacle indispensable, with the view of extracting the parts of the fœtus lodged in it. The operation was done above the pubes; but, the internal mischief already existing was so great, that the patient did not recover. (*Ueber die Schwangerschaft ausserhalb der Gebärmutter; Rostock,* 1803, 8*vo.*)

Govei, p. 401, relates a case of ventral conception, in which instance the Cæsarean Operation was done, and the child preserved. A lady, aged 21, had a tumor in the groin, which, was at first supposed to be an epiplocele, but an arterial pulsation was perceptible in it. In about ten weeks, the swelling had become as large as a pound of bread. Govei, solicited by the lady, opened the tumor. He first discovered a sort of membranous sac, whence issued a gallon of a limpid fluid. The sac was dilated, and a male fœtus found, about half a foot long, and large in proportion. It was perfectly alive, and was baptized. After tying the umbilical cord, the placenta was found to be attached to the parts just behind, and near, the abdominal ring; but it was easily separated. Govei does not mention whether the mother survived; but the thing would not be very astonishing, considering the situation of the fœtus. Bertrandi says, he was unacquainted with any other example of the Cæsarean Operation being done, in cases of extra-uterine fœtuses, so as to save both the mother and infant. This eminent man condemned operating, in ventral cases, on the ground that the placenta could not be separated from the viscera, to which it might adhere, or, if left behind, it could not be detached, without such inflammation and suppuration, as would be mortal. But if, in addition to such objections, says Bertrandi, the operation has been proposed by many, and practised by none, we may conclude, that this depends on the difficulty of judging of such pregnancies, and of the time when the operation should be attempted. He puts out of the question the dilatations, which have been indicated for extracting dead portions of the fœtus, and also Govei's case, who operated without expecting to meet with a fœtus at all. (*Bertrandi Traité des Opérations de Chirurgie, Chap.* 5.)

Whenever the Cæsarean Operation, or gastrotomy, has been performed, the practitioner is not merely to endeavour to prevent inflammation, heal the wound, and appease any untoward symptoms, which may arise; he should also prevail upon the mother to suckle the child, in order that the lochia may not be too copious, and, after the wound is healed, she should be advised to wear a bandage, for the purpose of hindering the formation of a ventral hernia, of which, according to surgical writers, there is a considerable risk.

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CALCULUS. Calculi form in the ducts of the salivary glands; in the kidneys, bladder, urethra, gall-bladder, &c. A paper on calculi formed in the lachrymal sac, has lately been published in Graefe's new Journal. (*Journ. für die Chir. No.* 1, *Berlin,* 1820.) For an account of, what are commonly called, stones in the bladder, refer to *Urinary Calculi.*

CALCULUS IN THE INTERIOR OF THE EYE. See *Eye, &c.*

CALLUS, *New bone,* or the substance, which serves to join together the ends of a fracture, and for the restoration of destroyed portions of bone.

1. The old surgeons believed callus to be a mere inorganic concrete, a fluid poured out from the extremities of the ruptured vessels, which was soon hardened into bone. They always described it, as an "exudation of the bony juice," and imagined that it oozed from the ends of broken bones, as gum from trees, sometimes too profusely, sometimes too sparingly. The reunion of broken bones, and the hardening of callus, they compared with the glueing together of two pieces of wood, or the soldering of a broken pot. (*A. Paré.*) The old surgeons also conceived, that callus sometimes flowed into the joints, so as to form a clumsy, prominent protuberance. They imagined, that callus was a juice, which congealed at a determinate period of time, and they therefore had fixed days for undoing the bandages of each particular fracture. They supposed, that its exuberance might be suppressed by a firm and well rolled bandage, and its knobby deformities corrected by pillows and compresses; that it might be softened by frictions and oils, so as to allow the bone to be set anew. All their notions were mechanical; and their absurd doctrines have been the apology for all the contrivers of machines, from Hildanus down to Dr. Aitken and Mr. Gooch.

2. By Galen and Duhamel, however,, a second doctrine was entertained, which imputed the formation of callus altogether to the periosteum and medullary texture, which were supposed to produce two solid rings round the fracture, the interspace between them being afterwards effaced.

3. A third opinion, maintained by Bordenave, and the best modern observers, is that the process of nature, in the production of callus, bears a great resemblance to the changes, which take place in the reunion of the soft parts.

A bone is a well organized part of the living body; that matter, which keeps its earthy parts together, is of a gelatinous nature. The phosphate of lime, to which a bone owes its firmness, is deposited in the interstices of the gluten, undergoing a continual change and renovation. It is incessantly taken up by the absorbents, and secreted again by the arteries. It is this continual absorption and deposition of earthy matter, which forms the bone at first, and enables it to grow with the growth of the body. It is this unceasing activity of the vessels of a bone, which enables it to renew itself, when it is broken or diseased. In short, it is by various forms of one secreting process, that bone is formed at first, is supported during health, and is renewed on all necessary occasions. Bone is a secretion, originally deposited by the arteries of the bone, which arteries are continually employed in renewing it. Callus is not a concrete juice, deposited merely for filling up the interstices betwixt fractured bones, but it is a regeneration of new and perfect bone, furnished with arteries, veins, and absorbents, by which its earthy matter is continually changed, like that of the contiguous bone. Indeed, there could be no connexion, between the original bone and callus, were the latter only the inorganic concrete, which it was formerly supposed to be.

Notwithstanding the more accurate opinions now entertained, concerning callus, the supposition is still very common, that the slightest motion will destroy callus, while it is being formed. But, says Mr. John Bell, it is an ignorant fear, proceeding merely from the state of the parts not having been observed; for, when callus forms, the perfect constitution of the bone is restored; the arteries pour out from each end of a broken bone a gelatinous matter; the vessels, by which that gluten is secreted, expand and multiply in it, till they form, betwixt the broken ends, a well organized, and animated mass, ready to begin anew the secretion of bone. Thus, the ends of the bone, when the bony secretion commences, are nearly in the same condition, as soft parts which have recently adhered; and it is only when there is a want of continuity in the vessels, or when a want of energetic action incapacitates them from renewing their secretion, that callus is imperfectly formed. This is the reason, why in scorbutic constitutions, in patients infected with syphilis, in pregnancy, in fever, or in any great disorder of the system, or while the wound of a compound fracture is open, no callus is generated. (*John Bell's Principles of Surgery, Vol.* 1, *p.* 500, 501.) How far some of the latter statement is correct, or not, will be seen in the article *Fractures.*

For some time, the secretion of earthy matter is imperfect; the young bone is soft, flexible, and of an organization suited for all the purposes of bone; but, hitherto delicate and unconfirmed; not a mere concrete, like the crystallization of a salt, which, if interrupted in the moment of forming, will never form; not liable to be discomposed by a slight accident, nor to be entirely destroyed by being even roughly moved, or shaken. Incipient callus is soft, fleshy, and yielding; it is ligamentous in its consistence, so that it is not very easily injured; and, in its organization, it is so perfect, that when it is hurt, or the bony secretion interrupted, the breach soon heals, just as soft parts adhere, and thus the callus becomes again entire, and the process is immediately renewed.

In consequence of the above circumstances, if a limb be broken a second time, when the first fracture is nearly cured, the bone unites more easily than after the first accident; and Mr. J. Bell even asserts, that when it is broken a third, and a fourth time, the union is still quicker. In these cases, the limb yields, it bends under the weight of the body, which it cannot support; but, without any snapping or splintering of the bone, and, generally, without any over-shooting of the ends of the part, and without any crepitation. Callus is found to be more vascular, than old bone. Mr. J. Bell mentions an instance of a bone, which had been broken twelve years, before he injected it, yet the callus was rendered singularly red. When a recently formed callus is broken, many of its vessels are ruptured, but some are only elongated, and it rarely happens, that its whole substance is torn. It is easy to conceive, how readily the continuity of the vessels will be renewed in a broken callus, when we reflect on its great vascularity; and the vigorous circulation, excited by the accident in vessels already accustomed to the secretion of bone. These reasons show, why a broken, or bent callus, is more speedily united, than a fractured bone.

When bones granulate, says Mr. Wilson, the granulations at first appear exactly similar to those of the soft parts, and, as in the soft parts, take place to restore any loss, which the bones may have suffered. This process is very similar to that of the first formation of bone. In the skull, membrane was first formed; and here also, in the process of restoration, the granulations change into membrane, and then into bone. In cylindrical bones, the granulations first produce a species of cartilage, and this is afterwards converted into bone. Thus, in the restoration of bone, nature is guided by the same laws, which prevail in its first formation. If the granulations, thrown out on the surface of a bone, be viewed in a microscope, they appear to form a number of small points, like villi, the bases of which first become similar to cartilage, and then to bone. "The preparations from the surface of granulating stumps, show the extreme delicacy of the first bony threads, and also their mode of uniting laterally with each other." (*Lectures on the Structure, Physiology, and Diseases of the Bones, &c. p.* 197, *8vo. Lond.* 1820.)

And, in another place, he repeats, "I have examined several skulls on the death of the persons, at different periods, from days to years after pieces of bone had been removed, and before the vacancies had been completely filled up; but, I never could in any of them discover the least appearance of cartilage." A membrane here always precedes the formation of bone. (*p.* 210.) For additional observations on Callus, see *Fracture. N. M. Muller, De Callo Ossium*; *4to. Norimb.* 1707; *Duhamel in Mém. de l'Acad. Royale des Sciences, an.* 1741, *p.* 92, *et* 222; *Boehmer, De Callo Ossium è rubia tinctorum radicis pastu infectorum,* 4*to. Lips.* 1752; *Dethleef, Diss. exhibens Ossium Calli generationem et naturam per fracta in animalibus rubiæ radice pastis ossa demonstratam.* 4*to, Goett*. 1753; *A. Marrigues, sur la Formation du Cal. Paris*, 1783. *A. M'Donald, De Necrosi, &c. Edin.* 1799. *The works of Trojà, David, Blumenbach, and Koehler, as specified at the conclusion of the article Necrosis. J. Wilson, Lectures on the Structure, Physiology, and Diseases of the Bones, p.* 208, *8vo. &c. Lond.* 1820.

CALOMEL. (Submuriate of mercury; hydrargyri submurias, L. P.) Its extensive utility, in numerous surgical diseases, will be conspicuous in a large proportion of the articles in this work. When prescribed, as an alterative, the common dose is a grain once or twice a day;

when ordered as a purgative, from three to eight grains may be given; and when directed, with the view of exciting salivation, one or two grains, conjoined with opium, are usually administered night and morning. This medicine, combined with opium, is frequently given, for the relief of what is usually termed *spasmodic* stricture, which is an attendant on severe cases of gonorrhœa.

CALX CUM POTASSA. This is a strong kind of caustic, chiefly used for making the eschars, when issues are formed in cases of diseased vertebræ, white swellings, morbid hip-joints, &c. (See *Vertebræ.*) This caustic is also sometimes used, though not so often as it was formerly, for opening buboes and other abscesses. Some are in the habit of making it into a paste with soft soap; they cover the part affected with adhesive plaster, in which there is a hole of the size of the eschar intended to be made; and into this aperture they press the paste till it touches the skin. A bandage is then applied to secure the caustic substance in its situation, till the intended effect is produced.

The action of calx cum potassa, in this way, however, is more inert and tedious, and, perhaps, on this account, more painful. Hence, many of the best modern surgeons never adopt this method; but, after covering the surrounding parts with sticking plaster, rub the caustic on the situation, where it is desired to produce an eschar, till the skin turns brown. The end of the caustic must first be a little moistened.

The calx cum potassa, is sometimes employed also for destroying fungous excrescences.

Before the port wine injection was found to answer best for the radical cure of hydrocele, this caustic was often used as a means of cure. (See *Hydrocele.*) Mr. Else, a chief advocate for the latter method, used to mix the caustic, with powdered opium, by which contrivance, it is said, though not with much appearance of truth, that the sloughs were made with little, or no pain to the patient.

Some assert that the potassa alone acts more quickly, than when mixed with quicklime. I have not found this to be the fact, and, after trying both, give the preference to the calx cum potassa.

CAMPHOR, is used externally, chiefly as a means of exciting the action of the absorbents, and thus dispersing many kinds of swellings, extravasations, indurations, &c. Hence, it is a common ingredient in liniments. It has also the property of rousing the action of the nerves, and quickening the circulation in parts, on which it is rubbed. For this reason, in paralytic affections, it is sometimes employed. Perhaps, there is no composition, that has greater power in exciting the absorption of any tumor, or hardness, than camphorated mercurial ointment.

In cases of delirium, depending on the irritation of local surgical diseases, and in some descriptions of mortification, camphor is occasionally prescribed. It has also been recommended, as singularly useful for the relief of stranguries, even those depending on the operation of cantharides. But, although it may occasionally have succeeded, when given with this view, it not only does not always do so, but, it has been known to cause an opposite effect, sometimes producing great scalding in voiding the urine, and sometimes pains like those of labour. (*Medical Trans. Vol.* 1, *p.* 475.) In chordee, its utility is generally acknowledged.

CANCER. (derived from *cancer*, a crab, to which, a part, affected with cancer, and surrounded with varicose veins, was anciently thought to have some resemblance.) *Carcinoma.*

The disease has two principal forms; one named *scirrhus*, or *occult cancer*; the other, *ulcerated*, or *open cancer*. According to the usual definition, as Mr. Pearson observes, an indolent scirrhus is a hard and almost insensible tumor, commonly situated in a glandular part, and accompanied with little, or no discolouration of the surface of the skin. But, when the disease has proceeded from the indolent to the *malignant* state, the tumor is unequal in its figure, it becomes painful, the skin acquires a purple, or livid hue, and the cutaneous veins are often varicose. (*Principles of Surgery*, § 331, 343.) The pain is remarked to be acute and lancinating, and its attacks recur with more or less frequency. At length, the tumor breaks, and is converted into cancer, strictly so called, or the disease in the state of ulceration.

The female breast, and the uterus, are particularly subject to the disease. The breasts of men are but rarely affected. The testes, lips, (especially the lower one of male subjects), the penis, the lachrymal gland and eye, the tongue, the skin, (particularly that of the face), the tonsils, the pylorus, the bladder, rectum, prostate, and a variety of other parts, are recorded by surgical writers as having frequently been the seat of scirrhus and cancer. They seem, however, to have comprehended an immense number of different malignant diseases under one common name, and, in many of the cases called cancerous, there are no vestiges of the true scirrhous structure.

OF SCIRRHUS, OR CANCER, NOT IN THE ULCERATED STATE.

Mr. Abernethy has given a matchless history of this affection, as it appears in the female breast where it most frequently occurs, and can be best investigated. Sometimes, as he has remarked, it condenses the surrounding substance, so as to acquire a capsule; and then it appears, like many sarcomatous tumors, to be a part of new formation. In other cases, the mammary gland seems to be the nidus for the diseased action. In the latter case, the boundaries of the disease cannot be accurately ascertained, as the carcinomatous structure, having no distinguishable investment, is confused with the rest of the gland. Sir Everard Home also remarks, that when the disease originates by a small portion of the glandular structure of the breast becoming hard, which is very commonly the case, it is readily distinguished by the hard part never having been perfectly circumscribed, and giving more the feel of a knot in the gland itself, than of a substance distinct from it. In each of these instances, carcinoma begins at a small spot, and extends from it in all directions, like rays from a centre. This is one feature distinguishing this disease from many others, which, at their first attack, involve a considerable portion, if not the whole, of the part, in which they occur. The progress of carcinoma is more or less quick in different instances. When slow, it is in general unremitting. Mr. Abernethy thinks, that though the disease may be checked, it cannot be made to recede by the treatment, which lessens other swellings. On this point, however, he is not positive; for, surgeons have informed him, that diseases, which eventually proved to be carcinomatous, have been considerably diminished by local treatment. With great deference to Mr. Abernethy, I may be allowed to remark in this place, that every tumor, which ends in cancer, is not from the first of this nature, though it has in the end become so; consequently, it may at first yield to local applications, but will not do so, after the cancerous action has commenced. Hence, Mr. Abernethy's opinion, that a true carcinomatous tumor cannot be partially dispersed, at least remains unweakened by the fact, that some tumors have at first been lessened by remedies, though they at last ended in cancer. Sir E. Home's observations tend to prove, that any sort of tumor may ultimately become cancerous.

Without risk of inaccuracy, we may set down the backwardness of a scirrhous swelling to be dispersed, or diminished, as one of its most confirmed features. This obdurate and destructive disease excites the contiguous parts, whatever their nature may be, to enter into the same diseased action. The skin, the cellular substance, the muscles, and the periosteum, all become affected, if they are in the vicinity of cancer. This very striking circumstance distinguishes carcinoma, says Mr. Abernethy, from several other diseases. In what this author calls *medullary sarcoma*, the disease is propagated along the absorbing system; but the parts immediately in contact with the enlarged glands do not assume the same diseased action. Neither in the *tuberculated* species does the ulceration spread along the skin, but destroys that part only which covers the diseased glands. According to Mr. Abernethy, a disposition to cancer existing in the surrounding parts, before the actual occurrence of the diseased action, was a circumstance noticed by Mr. Hunter. Hence arose the following rule in practice: *That a surgeon ought not to be contented with removing merely the indurated, or actually diseased part, but that he should also take away some portion of the surrounding substance, in which a diseased disposition may probably have been excited.* In consequence of this communication of disease to the contiguous parts, the skin soon becomes indurated, and attached to a carcinomatous tumor, which, in like manner, is fixed to the muscles, or other part, over which it is formed.

As a carcinomatous tumor increases, it generally, though not constantly, becomes unequal upon its surface, so that this inequality has been considered as characteristic of the disease. A lancinating pain is common; but it is not experienced in every case, without exception. It is also a symptom, attending other tumors, which are unlike carcinoma in structure, and it cannot, therefore, be deemed an infallible criterion of the nature of the disease. (*Abernethy's Surgical Works, Vol. 2, p. 69, &c.*)

A hard and painful glandular swelling, having a disposition to become cancer, says Richter, is the common, but, inadequate and erroneous definition of scirrhus. The disease is not regularly attended with swelling; sometimes scirrhous parts diminish in size, and shrink. Hardness is not a characteristic property; for, many tumors, which are not scirrhous, are exceedingly indurated. The disease is not always situated in a gland: it frequently attacks structures, which cannot be called glandular; and hard glandular swellings are often seen, which do not partake of scirrhus. The disposition to cancer cannot be enumerated among the marks of scirrhus, since it is not discoverable, till carcinoma has actually commenced. Its termination in open cancer, is not an invariable occurrence; and other tumors become cancerous, to which no one would apply the term scirrhus. (*Anfangsgr. der Wundarzn. B. 1.*)

With regard to the observation, that *tumor* is not an essential character of carcinoma, Mr. C. Bell admits its correctness only in a certain sense: "It is true (says he) that there is not always an increase of the dimensions of the whole breast; on the contrary, true carcinoma is often accompanied with a contraction and diminution of the general bulk. But, what is true of the breast, or mamma, is not true of the tumor; for, the proper structure of the gland either shrinks, or is compressed; and sometimes the surrounding fat is diminished by absorption, so that the whole mass is less, than the natural breast, or than what the breast was before the commencement of the disease. But, still the diseased part is properly a tumor: there we see an increased mass, a preternatural growth, or new matter, corresponding to the old definition, *morbosum augmentum.* But further, and in respect to the adipose membrane, the fat is not always diminished in carcinoma mammæ, but sometimes quite the contrary; and this difference in it will sometimes produce a variety in the external character, when there is none in the disease actually, or in the internal structure. Sometimes, from the diminution of fat, the irregular tuberculated structure of this disease will be apparent to the eye and to the touch; while, in another patient the breast will be large, full, and smooth, only marked more than naturally with large blue veins, and having an ulcer like a hole dug in the centre of the breast." (*C. Bell, in Med. Chir. Trans. Vol. 12, p. 220.*) These observations fully agree with those, which some attention to the appearances of cancer have enabled me to make.

Scientific surgeons ought undoubtedly to have a definite meaning, when they employ the term scirrhus; the word is generally used most vaguely; and, perhaps, influenced by its etymology, surgeons call an immense number of various morbid indurations scirrhi, which are not at all of a malignant, or dangerous character.

I have always considered scirrhus, as a diseased hardness, in which there is a propensity to cancerous ulceration, and a greater backwardness to recede, than exists in any other kind of diseased hardness, although the skin may occasionally not break during life, and a few scirrhous indurations may have been lessened.

Though Richter states, that this disposition cannot be discovered, till carcinoma has actually taken place; though Mr. J. Burns and Sir E. Home affirm, that other indurations and tumors may terminate in cancer; though Mr. Abernethy shows, that sarcomatous, and encysted tumors may end in most malignant diseases, and such as equal cancer in severity, (*Chir. Works, p.* 83,) yet, it is now well ascertained, that, in all these instances, the changes, which precede cancerous ulceration, bear no resemblance to those of a true malignant scirrhus.

The puckering of the skin, the dull leaden colour of the integuments, the knotted and uneven feel of the disease, the occasional darting pains in the part, its fixed attachment to the skin above, and muscles beneath, and in the breast, the retraction of the nipple, form so striking an assemblage of symptoms, that, when they are all present, there cannot be the smallest doubt, that the tumor is a scirrhus, and that the disease is about to acquire, if it have not already acquired, the power of contaminating the surrounding parts, and the lymphatic glands, to which the absorbents of the diseased part tend.

As Sir Everard Home has observed, the truly scirrhous tumor, which is known to be capable of changing into the true open cancer, when allowed to increase in size, is known to be hard, heavy, and connected with the gland of the breast; and, when moved, the whole gland moves along with it. The structure of a scirrhous tumor in the breast, is different in the various stages of the disease; and a description of the appearances, exhibited in the three principal ones, may give a tolerable idea of what the changes are, which it goes through, previous to its breaking, or becoming, what is termed, an open cancer.

When a section is made of such a tumor, in an early stage, provided the structure can be seen to advantage, it puts on the following appearance: the centre is more compact, harder to the feel, and has a more uniform texture, than the rest of the tumor; and is nearly of the consistence of cartilage. This middle part does not exceed the size of a silver penny; and, from this, in every direction, like rays, are seen ligamentous bands, of a white colour, and very narrow, looking, in the section, like so many extremely irregular lines, passing to the circumference of the tumor, which is blended with the substance of the surrounding gland. In the interstices, between these bands, the substance is different, and becomes less compact towards the outer edge. On a more minute examination, transverse ligamentous bands, of a fainter appearance, form a kind of net-work, in the meshes of which the new-formed substance is inclosed. This structure accords with what Dr. Baillie describes as presenting itself in cancerous diseases of the stomach and uterus.

In a more advanced stage of the tumor, the whole of the diseased part has a more uniform structure; no central point can be distinguished; the external edge is more defined, and distinct from the surrounding gland; and the ligamentous bands, in different directions, are very apparent, but do not follow any course, that can be traced.

According to Mr. C. Bell, it is the ligamentous bands which produce the retraction of the nipple by extending betwixt its ducts, and destroying its spongy texture. (*Med. Chir. Trans. Vol.* 12, *p.* 233.)

On dissection, Sir Astley Cooper observes, that the breast is one solid mass like cartilage, with very little vascularity except at its edges, and internally fibrous. When the breast has acquired any magnitude, he says, there is generally an opening in it, in which case, it has the appearance internally of being worm-eaten, and spongy. In the situation of the ulceration, it is very vascular, and bloody serum is met with. The absorbent glands put on the same character as the scirrhous breast. The cellular membrane, skin, and muscles are also affected. Sometimes, the diseased glands above the clavicle press upon the thoracic duct, and thus interrupt the transmission of chyle into the blood. Hence, the appetite is sometimes voracious, though the patient is rapidly wasting. In the chest, on the same side as the disease, hydrothorax prevails, and the absorbents on the pleura are in a morbid state, and small white spots like pins' heads, are visible. Traces of scirrhous disorder, Sir Astley Cooper likewise represents as occasionally existing in the liver, uterus, &c. (See *Lancet, Vol.* 2, *p.* 373.)

When the tumor has advanced to what may be called cancerous suppuration, (which, however, does not always happen in the centre, before it has approached the skin, and formed an external sore,) it exhibits an appearance totally different from what has been described. In the centre is a small irregular cavity, filled with a bloody fluid, the edges of which are ulcerated, jagged, and spongy. Beyond these, there is a radiated appearance of ligamentous bands, diverging towards the circumference; but, the tumor, near the circumference, is more compact, and is made up of distinct portions, each of which has a centre, surrounded by ligamentous bands, in concentric circles.

It is remarked by Sir Everard Home, that, in some instances, scirrhus has no appearance of suppuration, or ulceration, in the centre, but consists of a cyst, filled with a transparent fluid, and a fungous excrescence projecting into this cavity, the lining of which is smooth and polished. When a large hydatid of this kind occurs, a number of very small ones have been found, in different parts of the same tumor; and, in other cases, there are many very small ones, of the size of pins' heads, without a large one. These hydatids are, by no means, sufficiently frequent in their occurrence to admit of their forming any part of the character of a cancerous tumor. (*Obs. on Cancer, p.* 156, *&c. 8vo. Lond.* 1805.)

In the fourth chapter of this work, the author relates two cases of hydatids found in the breast. In the first, the contents of the cyst were bloody serum; in the second, a clear fluid. These two cases of simple hydatids in the breast, unconnected with any other diseased alteration of structure, led Sir E. Home to consider more particularly the nature of such hydatids, as are sometimes found in cancerous breasts; he believes, that they form no real part of the disease, but are accidental complaints superadded to it; and, that, as they occur in the natural state of the gland, they are much more likely to do so in disease. (*Op. cit. p.* 108, 159.) These *hydatid*, or *encysted* swellings, of the breast are not always regarded as true scirrhi, and, in particular, Sir Astley Cooper, and Mr. C. Bell describe them, according to my judgment very correctly, as a different form of disease.

Sir E. Home defines what he means by cancer, as follows:—" As cancer is a term, too indiscriminately applied to many local diseases for which we have no remedy, though they differ very much among themselves, it becomes necessary to state what the complaints are, which I include under this denomination. The present observations, respecting cancer, apply only to those diseased appearances, which are capable of contaminating other parts, either by direct communication, or through the medium of the absorbents; and when they approach the skin, produce in it small tumors of their own nature, by a mode of contamination, with which we are at present unacquainted.

"There is a disease, by which parts of a glandular structure are very frequently attacked, particularly the os tincæ, the alæ of the nose, the lips, and the glans penis. This has been called cancer, but differs from the species, of which we are now treating, in not contaminating the neighbouring parts, with which it is in contact; and neither affecting the absorbent glands, nor the skin at a distance from it. It is, properly speaking, an eating sore, which is uniformly progressive; whereas, in cancer, after the sore has made some progress, a ridge is formed upon the margin, and the ulceration no longer takes that direction. It also differs from a cancer, in admitting of a cure in many instances, and under different modes of treatment.

"From the facts which have been stated, (*see the cases detailed in this gentleman's work*,) it appears, that *cancer is a disease, which is local in its origin.* In this respect, the cases (alluded to) only confirm an opinion very generally received amongst medical practitioners; but, in favour of which, no series of facts had been laid before the public, of sufficient force entirely to establish the opinion." (*P.* 145, *&c.*)

Sir E. Home endeavours to establish a second point, that *cancer is not a disease, which immediately takes place in a healthy part of the body; but one, for the production of which it is necessary, that the part should have undergone some previous change, connected with the disease.* In proof of this, the two first cases in his work are brought forward, and the innumerable instances, in which a pimple, small tumor, or wart upon the nose, cheek, or prepuce, may remain for ten, fifteen, or thirty years, without producing the smallest inconvenience; but, at the age of sixty or seventy, upon being cut in shaving, bruised by any accidental violence, or otherwise injured, assumes a cancerous disposition.

All the cases of induration of the gland of the breast, or of indolent tumors in it, which have continued for years, without producing any symptom, and, after being irritated by accidental violence, have assumed a new disposition, and become cancerous, admit of the same explanation; and are adduced as so many proofs of the truth of this latter position. (*P.* 147, *&c.*)

With regard to the common opinion, that the production of scirrhus of the breast is connected with the cessation of the menses, Sir Astley Cooper also expresses his belief, that if a person has a tumor not originally of a malignant nature in the breast, an undue action may afterwards be excited in it when the change of life takes place; and the disease then assumes the character of scirrhus. (*Lancet, Vol* 2, *p.* 376.)

However, the doctrine, that certain tumors may change their nature, and alter into cancer, is one, which is sometimes looked upon with suspicion. "Improper treatment may without doubt exasperate diseases, and render a complaint, which appeared to be mild and tractable, dangerous, or destructive; but, to aggravate the symptoms, and to change the form of the disease, are things, that ought not to be confounded. I do not affirm (says Mr. Pearson) that a breast, which has been the seat of a mammary abscess, or a gland that has been affected by scrofula, may not become cancerous; for they might have suffered from this disease, had no previous complaint existed: but, these morbid alterations generate no greater propensity to cancer, than if the parts had always retained their natural condition. There is no necessary connexion between cancer and any other disease; nor has it ever been clearly proved, that one is convertible into the other." (*Pract. Obs. on Cancerous Complaints, p.* 8.) To the latter way of thinking, Mr. Abernethy also inclines; for, in speaking of the occurrence of cancer in parts previously diseased in another manner, he confesses, that his own observations have not led him to believe, that this change is common. "Cases of tumors, which have remained indolent for twenty or more years, becoming cancerous at an advanced period of life, are not unfrequently met with;" but, (says Mr. Abernethy,) the patients "might have been liable to the formation of a cancerous disease, even if no diseased structure had previously existed." A degree of indecision, however, appears to be thrown upon this statement by the admission, that cancer is more likely to begin in parts previously diseased. (*Surg. Works, Vol.* 2, *on Tumors, p.* 87.)

The following are some of the most distinguishing characters of scirrhus. A scirrhous induration seldom acquires the magnitude, to which almost all other tumors are liable to grow, when no steps are taken to retard their growth. Many scirrhi are attended even with a diminution, or shrunk state, of the part affected.

Scirrhi are generally more fixed, and less moveable, than other sorts of tumors; especially, when the latter have never been in a state of inflammation.

With the exception of fungus hæmatodes, other diseases do not involve in their ravages indiscriminately every kind of structure, skin, muscle, cellular substance, &c. and the integuments seldom become affected, before the distention, produced by the size of such swellings, becomes very considerable. In scirrhous cases, the skin soon becomes contaminated, discoloured, and puckered.

Some few tumors may be harder, and heavier, than a few scirrhi; but, the reverse, is commonly the case.

As other indurations, and tumors, may assume the cancerous action, and even end in cancerous ulceration; and, as some true scirrhi, when not irritated by improper treatment, may continue stationary for years; the occurrence of actual carcinoma cannot prove, that the preceding state was that of scirrhus. The only criterion of the latter disease is deduced from the assemblage of characters already specified; for, except the peculiar puckering, and speedy leaden discolouration of the skin, no other appearances, considered separately, form any line of discrimination.

The white ligamentous bands, around a scirrhus, form a very characteristic mark of the complaint, at least as it presents itself in the female breast; but, these cannot be detected, till the disease has been removed. Hence, how manifestly prudent it must be to take away a considerable portion of the substance surrounding a scirrhous tumor! Were any of these white bands left, the disease would inevitably recur.

Mr. Pearson has never yet met with an unequivocal proof of a primary scirrhus in an absorbent gland, and, (says he) "if a larger experience shall confirm this observation, and establish it, as a general rule, it will afford material assistance in forming the diagnosis of this disease. (*Pract. Obs. on Cancerous Complaints, p.* 5.) Sir E. Home, however, has given the particulars of one case, which seemed to him to have commenced in one of the lymphatic glands, situated between the nipple and the axilla. (*Obs. on Cancer, p.* 161.) The position laid down by Mr. Pearson, that when the disease originates in those glands, it will rarely be found to be of a cancerous nature, may yet be very generally correct.

OF CANCER IN THE STATE OF ULCERATION.

According to the observations of Mr. Abernethy, the diseased skin, covering a carcinomatous tumor of the breast, generally ulcerates, before the swelling has attained any great magnitude; a large chasm is then produced in its substance, partly by a sloughing, and partly by an ulcerating process. Sometimes, when cells, contained in the tumor, are by this means laid open, their contents, which are a pulpy matter of different degrees of consistence, and various colours, fall out, and an excoriating ichor issues from their sides. This discharge takes place with a celerity, which would almost induce belief, that it can hardly result from the process of secretion. When the diseased actions have, as it were, exhausted themselves, an attempt at reparation appears to take place, similar to that which occurs in healthy parts. New flesh is formed, constituting a fungus of peculiar hardness, as it partakes of the diseased actions, by which it was produced. This diseased fungus occasionally even cicatrizes. But, though the actions of the disease are thus mitigated; though they may be for some time indolent and stationary; they never cease, nor does the part ever become healthy.

In the mean while, the disease extends through the medium of the absorbing vessels. Their glands become affected, at a considerable distance from the original tumor. The progress of carcinoma, in an absorbent gland, is the same as that, which has been already described. The disease is communicated from one gland to another, so that after all the axillary glands are affected, those which lie under the collar bone, at the lower part of the neck, and upper part of the chest, become disordered. Occasionally, a gland, or two, become diseased higher up in the neck, and apparently out of the course which the absorbed fluids would take. As the disease continues, the absorbent glands, in the course of the internal mammary vessels, become affected. In the advanced stage of carcinoma, a number of small tumors, similar in structure to the original disease, form at some distance, so as to make a kind of irregular circle round it.

The strongest constitutions now sink under the pain and irritation, which the disease creates, aggravated by the obstruction, which it occasions to the function of absorption, in those parts, to which the vessels leading to the diseased glands belong. Towards the conclusion of the disease, the patient is generally affected with difficulty of breathing, and a cough. (See *Abernethy's Surgical Works, Vol.* 2, *p.* 72, *&c.*)

The general condition of the patient is excellently described by Mr. C. Bell: After noticing the hectic fever, which preys upon her, he observes, "the countenance is pale and anxious, with a slight leaden hue; the features have become pinched, the lips and nostrils slightly livid; the pulse is frequent; the pains are severe. In the hard tumors, the pain is stinging, or sharp; in the exposed surface, it is burning and sore. Pains, like those of rheumatism, extend over the body, especially to the back and lower part of the spine; the hips and shoulders, &c. Successively the glands of the axilla, and those above the clavicle, become diseased. Severe pains shoot down the arm of the affected side: it swells in an alarming degree, and lies immoveable. At length, there is nausea and weakness of digestion. A tickling cough distresses her. Severe stitches strike through the side; the pulse becomes rapid and faltering; the surface cadaverous; the breathing anxious; and so she sinks." (*Med. Chir. Trans. Vol.* 12, *p.* 223.)

One of the most deplorable effects, occasionally resulting from cancer, is so great a fragility of the bones, that those of the limbs are broken by the most trifling causes, as merely turning in bed, &c. Sir Astley Cooper mentions several examples of this fact, which were noticed by himself. (*Lancet, Vol.* 2, *p.* 374;) and others are recorded by surgical writers. See *Fragilitas Ossium.*

In the above species of carcinoma, described by Mr. Abernethy, the part is peculiarly hard, and rarely attains considerable magnitude. He admits, however, that there are varieties, and speaks of another case, in which the integuments sometimes remain pale and pliant; "and a surgeon, who first sees the breast in this state, may doubt, whether the disease be actual cancer, or common sarcoma. The substance of the tumor is also much less hard, than in the specimen first described; yet, it is more compact and weighty, than most other diseases of the same bulk, which are not carcinomatous. If the history of the disease accords with that of carcinoma; that is to say, if it began in a small district, and regularly and unabatingly attained its present magnitude; if the surface of the tumor be unequal, having produced in various parts roundish projecting knobs, the disease will almost invariably be found to be carcinoma. The skin will soon adhere to one, or more of these prominences; it will ulcerate and expose the subjacent parts; and the future progress of the disease will accord to that of the harder and smaller specimen," except that the absorbents are much less liable to be affected. (*Vol. cit.* 85.)

The edges of a cancerous ulcer are hard, ragged, and unequal, very painful, and reversed in different ways, being sometimes turned upwards and backwards, and, on other occasions, inwards. The whole surface of the sore is commonly unequal: in some parts, there are considerable risings, whilst, in others, there are deep excavations. The discharge, for the most part, is a thin, dark-coloured, fetid ichor; and is often possessed of such a degree of acrimony, as to excoriate, and even destroy, the neighbouring parts. In the more advanced stages of the disease, a good deal of blood is often lost from the ulcerated vessels. A burning heat is universally felt over the ulcerated surface; and, this is the most tormenting symptom, that attends the disorder. Those shooting, lancinating pains, which are generally very distressing in the occult state of the complaint, become now a great deal more so. Notwithstanding cancerous diseases are not always situated in glandular parts, the situation of such sores affords some assistance in the diagnosis: for, six times as many cancerous affections occur in the lips, and female breasts, as in all the rest of the body together. (*B. Bell.*)

According to Mr. C. Bell, true carcinoma of the breast, belongs to that period of life, when the uterine functions cease. Menstruation becomes irregular, both in respect to time and quantity. Long intervals occur, after which the discharge is profuse, with unusual disturbance of the general system. The mamma, in particular, sympathizes with the condition of the uterus; pains shoot through it, and it swells; and when the general fulness and tension subside, a partial hardness, an indurated lump, is left, with irregular margins, which mix with the substance of the breast. The hardness extends, until the whole gland is unusually firm, the disease becoming at the same time tuberculated, or knobby and irregular. The veins enlarge, and assume a deep blue colour. In the meantime, the strength declines, and the patient becomes emaciated. The nipple is now not only drawn in and incapable of erection, but retracted in comparison with the irregular convexity of the mamma. In a later stage, the skin is puckered and tucked in. These parts now firmly adhere to the subjacent mass, and sometimes there is bleeding from the nipple, in which case, the axillary glands are affected early.

A true carcinoma, continues Mr. C. Bell, may begin very differently. A small hard tumor is felt deeply seated in the mamma. It is difficult to distinguish whether, or not, it is a part of the proper gland. It becomes painful, approaches the surface, becomes attached to the mamma and to the skin, and is gradually incorporated with them. The skin becomes discoloured, the surface moist, and the patient is apprehensive of the occurrence of a sore. At length, the part does ulcerate, and begins to discharge. The bottom of the sore is foul and sloughy; the smell is offensive; and the constitution sympathizes with the state of the sore. The whole gland is now hard and adherent to the pectoral muscle. The edges of the sore are particularly hard, and present a dark red, glazed appearance. They are not everted, and curling; but rather depressed under the general convexity of the tumor. This will certainly be the appearance in a fat woman. The chasm is deep, with solid, abrupt, sharp edges. In proportion as its depth increases, the surrounding hardness extends and the whole breast feels of a stony hardness.

Cancer of the breast sometimes assumes another form, which is also well described by Mr. C. Bell: although the disease commences in the mamma, it rather propagates itself by extending its peculiar structure to the cutaneous glandular texture. Around the nipple, tubercles are felt in the skin, which extend to the skin of the breast, neck, and shoulders, and soon become painful. At first, they assume a high red colour; then, a yellowish transparency in the centre. They do not suppurate and break; but change into corroding ulceration.

It is a form of the same disease, says Mr. C. Bell, when the breast presents a tumor, elevated, tuberculated, and remarkably firm, without any elasticity, but, on the contrary, fixed to the side and presenting one consolidated mass. The surface is granular, and of a deep, or rather dark red colour, with a bluish cast, somewhat like the colour of a peach. This tumor ulcerates, and sloughs, and bleeds profusely. The disease is propagated by tubercles under the skin, towards the sternum and clavicles; and it is a case soon accompanied with effusion in the chest. (*C. Bell, in Med. Chir. Trans. Vol.* 12, *p.* 216—220.)

By some of the old writers, the causes of cancer were referred to the presence of worms, which destroyed the parts, and produced all the local mischief. Strange as this doctrine may appear, one very analogous to it was adopted by the late Dr. Adams. (*Obs. on Morbid Poisons.*) When hydatids found their way into a solid substance, he supposed, that the effect would be cancer; and he conjectured, that the success of an operation would depend, in a great measure, upon these animals being confined in a common cyst, for then they could be entirely removed; whereas, if they were unconnected, some of the smaller ones would be likely to remain. The absurdity of this doctrine, however, and the eccentric reasoning, by which it is supported, make it quite unnecessary here to fatigue the reader with a particular explanation of it. Though hydatids are occasionally found in tumors, which have been called cancerous, they are not found often enough to make any part of the character of the disease; and they are met with in cases, in which there is not the least vestige of such disorder.

After cancer had continued some time, it was formerly believed, that the matter was absorbed into the blood, and all the humours contaminated. Hence, was explained the fatal and rapid relapses, after an apparent cure. However, the effects of absorption are supposed by more modern writers to be confined to the lymphatic glands, which intervene betwixt the sore and the heart; for, beyond these, it is said, that the absorbed matter is changed in its properties. (*J. Burns on Inflammation, Vol.* 2.)

With respect to the causes of cancer, the disease is very frequently imputed to blows, pressure, and other accidental injuries; but, there are almost always other circumstances concerned, which have more influence, than the accidental violence. "Although, (as Sir Astley Cooper remarks) the disease operates on some particular part of the body, it is always preceded by a state of constitution which has excited it. He who looks at this disease in the light merely of a local affection, takes but a narrow view of it. A blow, or a bruise, inflicted on a healthy person, would be followed by common inflammation only, which would lead to the removal of the matter effused.

But, if a blow were received on the breast, when the constitution were disposed to the formation of scirrhous tubercle, it would be the cause of a particular action being excited in the part injured, and might lay the foundation of this complaint.—Yet, the formation of scirrhous tubercle does not entirely depend on constitutional derangement; there must be also a peculiar action excited in the part." In order to prove, that the disease must depend on constitutional derangement and an altered action in the part unitedly, Sir Astley observes, that, if a scirrhus be cut into, all the horrors of cancer will be the result of the injury; but, if the cut be made in the healthy parts, around the disease, no cancerous ulceration follows, and the wound heals. In short, he argues, that the disease is the effect of a specific action in the part, preceded by a disposition in the constitution to its production. (See *Lancet*, *Vol.* 2, *p.* 378.)

In the breast, cancer frequently commences, without any previous accidental injury of the part; a fact tending to establish the correctness of such writers as represent the disease to be of a constitutional nature. In these cases, there is always an irregularity, or disappearance of the menses; and the affection of the mamma may be supposed to depend on sympathy between it and the uterus. Certain it is, that cancer is very frequent about the time of life, when the menstrual discharge ceases.

It is a commonly received opinion, that cancer is an hereditary disease, or observed to prevail a good deal in particular families. Sir Astley Cooper has known it occur in three sisters. (*Lancet*, *Vol.* 2, *p.* 377.) Sir Everard Home has endeavoured to reconcile this to the doctrine of the disease being at first entirely of a local nature; circumstances, which seem incompatible: "It is now universally admitted (says he) that children take after their parents in the general structure of their bodies, and therefore will be more or less liable to have the different solids, of which they are composed, disturbed by the same causes; and when a violence of any kind is committed upon them, it may be productive of the same diseases.—In some families, the venereal disease shall always appear in the form of gonorrhœa [?]; in others again, rarely or never in that form, but, in that of chancre [?]. Strictures in the urethra are common in some families: they have taken place in a father, and all his sons from very slight causes; such indeed as would not have produced the disease in others. Yet, stricture cannot be called hereditary, because it is a local complaint, arising from a local inflammation differing in different people, according to the natural irritability of the parts, which are affected. In this way, and this only, can cancer run in families, and be an hereditary disease," &c. (*Obs. on Cancer*, *p.* 150.) The observations, which this gentleman has published respecting cancer, are unquestionably some of the most valuable, which have yet been collected; but, I am doubtful about the correctness of one term, which is frequently met with in his work, viz. *cancerous poison.* At all events, I am not at present acquainted with any facts, which satisfactorily demonstrate the existence of such virus; and, from some circumstances briefly mentioned in vol. 1 of the 4th edition of the *First Lines of the Practice of Surgery*, the reality of a poison of this nature would seem at least questionable. In support of the belief in the existence of a cancerous virus, it has been observed, however, "that we scarcely ever see glands diseased out of the course, which the absorbed matter would naturally take, though they are affected in this manner in diseases, which can be propagated by irritation." (*Abernethy's Surg. Works*, *Vol.* 2, *on Tumors*, *p.* 75.)

Undoubtedly, cancer is most common in elderly persons; but according to the generality of writers, no age is exempt from the disease. Mr. J. Burns has seen it distinctly marked, and attended with a fatal event, in children of five years old: he mentions two instances of the eye being affected in such subjects; though from the late observations of Mr. Wardrop, we may now reasonably suspect, that these examples were really cases of fungus hæmatodes. An instance, in which a cancerous disease of the breast began at the age of fifteen, is related by Sir E. Home. (*Obs. on Cancer*, *&c. p.* 50.)

The youngest person in whom Sir Astley Cooper has ever seen this disease, was 27; and he has seen another case in a person of 29; but, with these two exceptions, he has never seen the complaint in any patient under 30. From the age of 30 to that of 50, he sets down as the period of life, in which scirrhus of the breast is most frequent. The most advanced age, in which he has seen the disease, was 86. He disbelieves in the correctness of the reports of examples of the disorder in young subjects. (See *Lancet*, *Vol.* 2, *p.* 376.)

Age makes a great difference in the whole class of carcinomatous tumors; and, as Mr. C. Bell has remarked, the same disease, distinguishable by obvious signs, will run its course rapidly, and with every symptom aggravated, in a woman of forty-five, while it will remain stationary for years in a woman of sixty, or seventy. (*Med. Chir. Trans. Vol.* 12, *p.* 216.) Sir Astley Cooper also states, that, when it occurs in advanced age, it is slow in its progress. (See *Lancet*, *Vol.* 2, *p.* 376.)

According to Sir Astley Cooper, married women, who bear no children, and single women, are more subject to this complaint, than such as have large families. He thinks it very probable, that the natural change, which the breast undergoes in the secretion of milk, has some power in preventing this disease. But he admits, that the circumstance of a woman having borne children is not a perfect security against the complaint; and he knew one individual with this disease, who had been pregnant seventeen times. (*Lancet*, *Vol.* 2, *p.* 375.)

This gentleman's experience confirms a remark, made by other writers, that grief and mental anxiety seem frequently to have a great share in the production of scirrhus of the breast. (*Vol. cit. p.* 379.)

TREATMENT OF CANCER.

Cancers have sometimes been supposed to be a general disorder of the system; sometimes merely local affections. This is a point of much importance in practice; for, if cancers are originally only local affections, no objection can be made to extirpating them. They who think, that cancer is a constitutional disease, will have much less confidence in the operation, which they may even regard as useless, perhaps hurtful, inasmuch as it may convert a scirrhus into an open cancer, or bring on the affection in some other part.

Some practitioners, however, reject the doctrine of cancer depending on constitutional causes; and, Sir E. Home's sentiments, in opposition to the opinion, have been laid before the reader. When cancer breaks out again, in the same part, after the performance of an operation, it is often owing to some portion of the disease having been blameably left behind, or to the operation having been put off too long. How likely it is, that some of the cancerous disease may be left unremoved by the operator, is obvious on considering the manner, in which the white bands, resembling ligament, shoot into the surrounding fat; and that, even the fibres of the muscles, beneath a cancerous disease, are frequently affected. At the same time, it must be allowed, that the disease is sometimes, to all appearances, so freely and completely removed, that its recurrence may be imputed, perhaps with equal probability, to the continued operation of the same unknown cause, which originally produced the first cancerous mischief. Sir Astley Cooper, and many other very experienced men, both of the past and present time, consider cancer as decidedly a complaint connected with a peculiar state of the constitution. But, if this be true, it may be asked, how can any cure be expected from the removal of the part, as the continued operation of the same constitutional causes must occasion a relapse? And so they sometimes do, no doubt, independently of the accident of any portion of the disease not being completely removed with the knife. However, experience proves, that the operation frequently effects a radical cure, and no other organ is afterwards attacked; which is analogous to what is seen after the amputation of a scrofulous limb, a case, in which frequently no other part is afterwards attacked, though the constitution is unsound.

Until late years, the accounts given of the results of operations for cancers were so unpromising, that they deterred many patients from undergoing a timely operation; which, for cancerous complaints, is the only remedy, with which we are as yet acquainted, entitled to much confidence. As Mr. B. Bell remarks, the great authority of Dr. Alexander Monro must have had no inconsiderable influence even with practitioners, in making them much more backward in undertaking the extirpation of cancers, than they otherwise would have been. "Of near sixty cancers," says he, "which I have been present at the extirpation of, only four patients remained free of the disease, at the end of two years: three of these lucky people had occult cancers in the breast, and the fourth had an ulcerated cancer on the lip." (*Edinb. Med. Essays*, *Vol.* 5.) Dr. Monro also observes, that, in those, in whom he saw the disease relapse, it was always more violent, and made a quicker progress, than it commonly did in others, on whom no operation had been performed. Hence, he questions, "whether ought cancerous tumors to be extirpated, or ought the palliative method only to be followed?" and, upon the whole, he concludes against their extirpation, except in such as are of the occult kind, in young healthy people, and have been occasioned by bruises, or other external causes.

More modern experience, however, has afforded a very different result, and given ample encouragement to the early performance of an operation, and even to making an attempt to cut away the disease, in every instance, both of the occult, and ulcerated kind, when such a measure can be so executed, as not to leave a particle of the cancerous mischief behind.

Mr. Hill, in 1772, published some valuable remarks on the present subject. At this period, he had extirpated from different parts of the body eighty-eight genuine cancers, which were all ulcerated, except four; and all the patients, except two, recovered of the operation. Of the first forty-five cases, only one proved unsuccessful; in three more, the cancer broke out again in different parts; and, in a fifth, there were threatenings of some tumors, at a distance from the original disease. These tumors, however, did not appear, till three years after the operation; and the woman was carried off by a fever, before they had made any progress. All the rest of the forty-five continued well, as long as they lived: or are so, says Mr. Hill, at this day. One of them survived the operation above thirty years; and, fifteen were then alive, although the last of them was cured in March, 1761.

Of the next thirty-three, one lived only four months; and, in five more, the disease broke out afresh, after having been once healed. The reason, why, out of forty-five cases, only four or five proved unsuccessful, and six, out of thirty-three, was as follows: "The extraordinary success I met with, (says Mr. Hill,) made cancerous patients resort to me from all corners of the country, several of whom, after delaying till there was little probability of a cure by extirpation, or any other means, forced me to perform the operation, contrary both to my judgment and inclination."

Upon a survey in April, 1764, made with a view to publication, the numbers stood thus: Total cured, of different ages from eighty downwards, sixty-three; of whom there were then living thirty-nine. In twenty-eight of that number, the operation had been performed more than two years before; and, in eleven, it had been done in the course of the last two years. So that, upon the whole, after thirty years' practice, thirty-nine, of sixty-three patients, were alive and sound; which gives Mr. Hill occasion to observe, that the different patients lived as long after the extirpation of the cancers, as according to the bills of mortality, they would have done, had they never had any cancers, or undergone any operation.

The remaining twenty-five, which complete the eighty-eight, were cured since the year 1764. Twenty-two of these had been cured, at least, two years; and some of them, it may be remarked, were seventy, and one ninety years old.

In the year 1770, the sum of the whole stood thus: Of eighty-eight cancers, extirpated at least two years before; not cured, two; broke out afresh, nine; threatened with a relapse, one; in all, twelve, which is less than a seventh part of the whole number. At that time, there were about forty patients alive and sound, whose cancers had been extirpated above two years before.

Mr. B. Bell, who was present at many of these cases, bears witness to Mr. Hill's accuracy; and, the former very judiciously states, that, "from these and many other authenticated facts, which, if necessary, might be adduced of the success attending the extirpation of cancers, there is, it is presumed, very great reason, for considering the disease, in general, as a local complaint, not originally connected with any disorder of the system." With respect to Mr. Bell's opinion, that a general cancerous taint seldom, or perhaps never, occurs, but, in consequence of the cancerous virus being absorbed into the constitution from some local affection, much doubt attends even this supposition, though the practical inference from it is what cannot be found fault with: viz. in every case of real cancer, or rather in such scirrhosities, as, from their nature, are known generally to terminate in cancer, we should have recourse to extirpation as early as possible; "and, if this were done soon after the appearance of such affections, or before the formation of matter takes place, their return would probably be a very rare occurrence." (*System of Surgery, Vol.* 7.)

Sir Astley Cooper admits, that the operation is followed by a return of the disease in many cases, the average number of which, however, he does not state, though he says that they do not amount to one fourth. (*Lancet, Vol.* 2, *p.* 383.)

How often is the operation determined upon, because the nipple is retracted, and true cancer thereby announced! Yet, says Mr. Charles Bell, with reference to the cause of this change, as previously explained, "it is quite clear, that if the nipple be fully retracted, and if this has been evident for any considerable time, the operation has been too long deferred." (*Med. Chir. Trans. Vol.* 12, *p.* 233.)

Sir Astley Cooper is very rightly adverse to the performance of the operation when dyspnœa is present; for, he has known patients die in two or three days, who had been operated upon, while labouring under that symptom. On examination after death, water was found in their chests, and tubercles in the pleura. (*Lancet, Vol.* 2, *p.* 373.)

The same experienced surgeon gives it as his opinion, that a breast should never be removed, unless the patient has undergone a course of alterative medicines, as Plummer's pills and the compound decoction of sarsaparilla, or (what he prefers) the infusion of gentian with soda and rhubarb. Thus the constitution may be improved, and the danger of a relapse diminished. (*Vol. cit. p.* 379.)

After comparing the different accounts of success given by Monro and Hill, well might Richter say: "*Jure sane dixeris, de uno eodemque morbo hos viros loqui, dubitari fere potest.*" (*Obs. Chir. Fasc.* 3.)

MEDICINES AND PLANS, WHICH HAVE BEEN TRIED, FOR THE CURE OF SCIRRHUS AND CANCER.

It is a contested point, whether a truly cancerous disease is susceptible of any process, by which a spontaneous cure can be effected. It appears certain, however, that a violent inflammation, ending in sloughing, may sometimes accomplish an entire separation of a cancerous affection, and that the sore, left behind, may then heal. Facts, confirming this observation, are occasionally exemplified in cases, where caustic is used, and accidental inflammations have led to the same fortunate result, as we may be convinced of by examples recorded by Sir Everard Home, Richerand, &c. The latter writer, adverting to the effort, which nature sometimes makes to rid herself of the disease by the inflammation and bursting of the tumor, takes the opportunity to relate the following case. A woman, aged forty-eight, of a strong constitution, was admitted into the hospital of St. Louis, with a cancerous tumor of the right breast. The swelling, after becoming softer, and affected with lancinating pains, was attacked with an inflammation, which extended to the skin of the part, and all the adjacent cellular membrane. The whole of the swelling mortified, and was detached. A large sore, of healthy appearance, remained after this loss of substance, and healed in two months. (*Nosographie Chir. T.* 1, *p.* 381, *Edit.* 2.)

In general, however, it must be confessed that inflammation renders things worse instead of better, and by converting occult cancers into ulcerated ones, hastens the patient's death, or, at all events, renders the cure more difficult, and forbids any attempts, which, on such a principle, might be made for his relief.

Of the general remedies, narcotics, as conium, opium, belladonna, &c. have been employed with most hope.

Cicuta, or conium maculatum, owed its reputation to the experimenting talent of Storck, who has written several libelli on it. According to him, cicuta possesses very evident powers over cancer, and has cured a great many cases; but, in less prejudiced hands, it has not been found successful; and even in many of the instances, adduced by Baron Storck, of its utility, it is by no means proved, that the disease was really cancer. The public have now little or no reliance on this medicine, as a means of relieving cancer. Mr. J. Burns declares, that, in cancerous ulceration, he never knew hemlock produce even temporary melioration. (See *Conium.*)

Belladonna was highly recommended by Lambergen. During its use, he kept the bowels open with clysters, administered every second day. The dose should be, at first, a grain of the dried leaves, made into a pill. The quantity may be gradually increased to that of 10, or 12 grains. The extract is now frequently exhibited, the dose being at first one grain, and afterwards increased by degrees to five. The reputation of belladonna has not been supported by any decided success in cases of true cancer.

Hyosciamus has often been tried in cancerous cases, and was held in great estimation by the ancients. Mr. J. Burns says, he has employed it occasionally, but with little effect. The common dose, at first, is three grains of the extract.

Aconitum has also been given; and, as it is a very powerful and dangerous narcotic, a patient usually begins with only half of a grain of the extract night and morning. Solanum dulcamara, Paris quadrifolia, phytolacca, &c. have also been recommended; but, they are now hardly ever employed, which is a sufficient proof of their inefficacy. Mr. J. Burns tried the hydro-sulphuret of ammonia, without any benefit. Richter prescribed the laurus cerasus, but without any decided success.

Digitalis lessens vascular action, and may act on scirrhi, like abstinence, bleeding, &c. It has, however, no specific virtue in curing cancerous diseases.

Opium is seldom employed, with the intention of curing cancer, although probably it has just as much power of this kind, as other narcotics, which have been more frequently used. For the purpose of lessening the pain of cancerous diseases, it is very freely prescribed.

Tonics sometimes improve the general health; but, they never produce any specific effect on the local disease.

Justamond thought arsenic a specific for cancers. Further experience has not, however, confirmed the truth of this opinion, though there are many practitioners, who continue to think highly of the efficacy of this mineral in certain forms of disease, which have sometimes been classed with cancer, and in many cases of lupus, and malignant ulcers of the tongue, and other parts, it may really possess greater claims to further trial, than perhaps any other medicine, yet suggested. It unquestionably cures numerous ill-looking sores, on the face, lips, and tongue, and is one of the best remedies for lupus. Mr. Hill observes: "Experience has furnished me with some substantial reasons for considering arsenic as a medicine of considerable merit, both with regard to actual cancer and scirrhus, which may one day terminate in that horrible species of ulcer; and although I cannot as yet say it will remove the one, or cure the other, as certainly and safely as mercury commonly does a syphilitic swelling, or open sore, yet, it will, in a great majority of cases, retard the progress of the true scirrhous tumor, and often prevent its becoming cancer. In some, it has appeared to dissipate such swellings completely." (See *Edinb. Med. and Surgical Journ. Vol.* 6, *p.* 58.)

Mercury, in conjunction with decoctions of guaiacum, sarsaparilla, &c. has been recommended; but, as Mr. J. Burns remarks, no fact is more certainly ascertained, than that mercury always exasperates the disease, especially, when in the ulcerated state. Plummer's pills and the other alteratives, approved of by Sir Astley Cooper, as medicines to be given previously to an operation, with the design of lessening the chances of a return of the disease, have been already noticed.

Sulphate of copper has been tried; but, at present, it retains no character, as a remedy for cancer. The same may be said of muriated barytes.

The carbonate (rust) of iron was particularly recommended by Mr. Carmichael. Besides the carbonate of iron, he sometimes prescribed the tartrate of iron and potass, and the phosphate, oxyphosphate, and suboxyphosphate of the metal. Some constitutions can bear these preparations only in small quantities; they affect most patients with constipation, and many with headach and dyspnœa. These circumstances, therefore, must be attended to in regulating the dose. The above gentleman has seldom given less than thirty grains, in divided doses, in a day, or exceeded sixty. He prefers the suboxyphosphate for internal use, and states, that it answers best in small doses, frequently repeated. It should be blended with white of egg, have a little pure fixed alkali added, and then be made into pills with powdered liquorice. Aloes is recommended for the removal of costiveness. When half a grain is combined with a pill, containing four grains of carbonate of iron, and taken thrice a day, the constipation will be obviated. When the internal use of iron brings on headach, difficult respiration, a quick, sometimes full pulse, which is also generally, hard and wiry, excessive languor, lassitude, &c. and such symptoms become alarming, the iron is to be left off, and four grains of camphor given every fifth hour.

At the same time, that preparations of iron were internally administered, Mr. Carmichael employed externally, for ulcerated cancers, the carbonate, phosphate, oxyphosphate, and arseniate of iron, blended with water, to the consistence of a thin paste, which was applied once every twenty-four hours. To occult cancers, the same gentleman applied a solution of the sulphate of iron, ℥j. to lbj. of water. The acetate of iron, diluted with eight or ten times its weight of water, was also used. These lotions were put on the part affected by means of folded linen, wet in them, and covered with a piece of oiled silk to prevent injury of the clothes. (See *An Essay on the Effects of the Carbonate and other preparations of Iron upon Cancer, &c. by R. Carmichael, 2d Ed. 8vo. Dublin,* 1808.)

Many remedies have acquired celebrity in cases of cancer, because very bad and malignant diseases, only supposed to be cancers, have got well, under their use. Such is probably the case with the carbonate of iron.

The only mode of treatment, which Mr. Pearson has ever seen do any particular benefit to cancer, is that of keeping the patient on a diet, barely sufficient for the support of life, such as barley-water alone, tea, &c. A milk diet has also been recommended.

With respect to the effects of a very low diet, Sir Astley Cooper protests strongly against the plan: if the patient be already weak, he says, you will thus render her still weaker, and soon bring her to the grave: in proportion as the strength declines, the pulse is quickened. He further declares, that we possess no medicine, which has any specific power over the disease, though the state of the constitution may sometimes be improved by Plummer's pills given at bed time, and the following draught in the day: ℞ Infus. Gentian. ℥iss. tinct. columbæ, ʒj. Ammon. carbon. gr. v. Sodæ Carbon. ʒss. Misce. Climate, he also regards, as having no particular effect on scirrhous disease. As mental trouble is frequently concerned in bringing on the complaint, he enjoins taking every possible means of quieting the patient's mind, and lessening her anxiety. (*Lancet, Vol.* 2, *p.* 379, 380.)

The old surgeons commonly dressed cancerous sores, with narcotic applications. Vesalius used cloths, dipped in the juice of the solanum; whilst others employed it mixed with oil of roses, and preparations of lead, and antimony. Others had recourse to the hyosciamus; but, of late years hemlock poultices have been the favourite narcotic application; and, in many cases, as Mr. J. Burns observes, they have undoubtedly abated pain, and diminished fetor; but this is all which can reasonably be expected. He thinks carrot poultices better, than those of hemlock, as they produce as much ease, and more powerfully diminish the fetor.

Sir Astley Cooper has no confidence in the utility of evaporating lotions. Warm applications he also represents as improper. The dressing, which he mostly prefers, is a plaster, made by blending ʒj. of the extract of belladonna with ℥j. of soap cerate. When inflammation is present, he does not object to the use of leeches. All local applications, as well as internal medicines, he considers as merely palliatives, unpossessed of any power of curing really scirrhous diseases. (See *Lancet, loco cit.*)

The fetor of cancers, having been thought to resemble that of the sulphuret of potash, (liver of sulphur) and the oxygenated muriatic acid being the best agent for decomposing, and destroying such smell, it has been recommended, as an application to cancerous sores. It may correct the fetor; but, it will never accomplish a cure. Carbonic acid has been said not only to correct the fetor, but, in some instances, completely to cure the disease. It was long ago proposed, says Mr. J. Burns, by Peyrilhe, and was again brought forward by Dr. Ewart. Experience, however, has not shown that the efficacy of carbonic acid, in cases of cancer, is very great. Fourcroy remarks: "After the first applications, the cancerous sore appears to assume a more favourable aspect; the sanies, which flows from it, becomes whiter, thicker, and purer, and the flesh has a redder and fresher colour; but, these flattering appearances are deceitful, nor do they continue long, for the sore speedily returns to its former state, and its progress goes on, as before the application." The best method of applying carbonic acid is, by means of a bladder, the mouth of which is fastened round the sore, with adhesive plaster. The air is introduced by a pipe, inserted at the other end.

Sometimes the fermenting poultice is employed.

Digitalis, as a local application, is entitled to about as much confidence as cicuta.

Tar ointment, gastric juice, absorbent powders, &c. have been tried; but, without any evident good. (See *J. Burns on Inflammation, Vol.* 2.)

Mr. Fearon rejected all internal remedies, as inefficient in the treatment of cancer, and, in the early stages of the complaint, recommended a method of practice, founded on his idea of the inflammatory nature of the disease. "In the beginning of scirrhous affections of the breast and testis, the mode I have adopted of taking away blood, is by leeches repeatedly applied to the parts. In this course, however, I have often been interrupted by the topical inflammation, produced by these animals, around the parts where they fastened. In delicate female habits, I have often lost a week, before I could proceed to the re-application of them. When the symptoms lead me to suspect the stomach, uterus, or any of the viscera, to be so affected, that the complaint either is, or, most probably, soon will become cancerous, I then have recourse to general bleedings. But, whether topical, or general, perseverance for a sufficient length of time, is necessary. Though the pulse never indicated such practice, yet the patients have not suffered by repeated bleedings; on the contrary, when they passed a certain time without losing blood, they felt a return of their symptoms, and of their own accord, desired to be bled again. To this plan of repeated bleedings, I joined a milk and vegetable diet, avoiding wine, spirits, and fermented liquors." Mr. Fearon used also to keep the belly open, and employ saturnine applications.

Of the method of treating cancer by pressure, I have spoken in another work, (*First Lines of the Practice of Surgery, Vol.* 1), and therefore, in this place, I need merely repeat, that it is a practice, which none of the best modern surgeons think entitled to approbation.

From the preceding accounts, we may infer, that scarcely any reliance is to be placed on any known remedy, or plan, in cases of real scirrhi, and ulcerated cancers. The operation is the only rational means of getting rid of the disease; and, to waste time, so as to allow the disorder to increase in a serious degree, merely for the sake of trying a train of unpromising medicines, is conduct unworthy of a wise surgeon's imitation.

Perhaps, in early cases, it may be right to make trial of arsenic, conium, preparations of iron, those of iodine, and, in particular, of the ointment of the hydriodate of potass, which Dr. Wagner found capable of dispersing one swelling reputed to be cancerous. (See *Revue Méd. Juin* 1823.) In France, this ointment is also applied to various tumors. Dr. Wagner's contained only eighteen grains of the hydriodate of potass to six drams of lard; but, in France, the proportions are as much as two drams of the first article to an ounce of the second. But, the practitioner should beware of devoting too much time to medicines, which will in all probability prove inadequate to the object, for which they are exhibited. Upon the whole, the operation is what we should generally adopt, as the surest, and the safest means of getting rid of cancerous diseases. As I have before remarked, the operation is always admissible, when every particle of the disease can be removed by it. Even large open cancers, if they can be entirely cut away, are often capable of being effectually cured.

The removal of cancerous disorders, even in the slightest and most trivial cases, should always be effected with the scalpel, in preference to caustic; the use of which, though it may sometimes succeed by producing a complete destruction of the diseased parts, causes severe agony, and, in the event of its not acting sufficiently on all the diseased parts, often renders the complaint more aggravated, and kills the patient, and this in a very short space of time.

In cases of cancer, the irritation generally occasioned by every application of the caustic kind, together with the pain and inflammation, which commonly ensue, are strong objections. Plunket's remedy, which is chiefly arsenic, is equally objectionable. Nor can you, at once, so certainly extirpate every atom of cancerous mischief with any caustic, as you can with the knife: for, with this, you immediately gain an ocular inspection of the surface surrounding the disease, so as to see and feel whether the disordered parts are completely removed, or whether any portion of the disorder requires a further employment of the instrument. With respect to the pain, that of caustics is infinitely greater, more intolerable, and more tedious, than that occasioned by the knife. When caustic also fails in destroying every particle of the disease at once, it almost always tends to enlarge, in a very rapid way, the original boundaries of the mischief. For an account of the method of removing scirrhi and ulcerated cancers, see *Mamma, Removal of.* Much additional information, respecting cancer, is contained in the 4*th Ed. of the First Lines of the Practice of Surgery, Vol.* 1, 8*vo.* 1819. *Le Dran's Operations in Surgery, p.* 87, *&c. Edit.* 2. *B. Bell's Surgery, Vol.* 2. *Justamond's Account of the Methods pursued in the Treatment of Cancerous and Scirrhous Disorders,* 8*vo. Lond.* 1780 ; *also his Surgical Tracts, &c.* 8*vo. Lond.* 1789. *James Hill, Cases in Surgery,* 8*vo. Edinb.* 1772. *Vindungus ab Harting, De Optima Cancrum Mammarum extirpandi ratione. Alsdorf,* 1720. (*Haller, Disp. Chir.* 2, 509.) *L. Rouppe, De Morbis Navigantium liber, accedit Obs. de Effectu Extracti cicutæ Storckiano in Cancro.* 8*vo. Lugd.* 1764. *G. Dowman, on the Nature, &c. of a Scirrhus,* 8*vo. Lond. A. Storck, An Essay on the Medical Nature of Hemlock, &c.* 8*vo. Lond.* 1760. *C. Molinarius Historia Mulieris a Scirrho curatæ,* 8*vo. 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CANCER SCROTI.——CHIMNEY-SWEEPERS' CANCER. (See *Scrotum.*)

CA'NCRUM ORIS. A deep foul, irregular, fetid ulcer, with jagged edges, which appears upon the inside of the lips and cheeks, and is attended with a copious flow of offensive saliva. According to Mr. Pearson, this disease is seldom seen in adults; but, most commonly in children from the age of eighteen months to that of six, or seven years. The gums, as well as the lips and cheeks, are sometimes affected, in which circumstance, the teeth are generally carious and loose. The ulceration is occasionally attended with abscesses, which burst either through the cheek, lip, or just below the jaw. Exfoliations are not unfrequent, and, when the disease is neglected, extensive sloughing sometimes happens.

Living in a marshy situation ; unwholesome food ; and inattention to cleanliness ; are suspected to be conducive to this disorder. The causes of the affliction seem not to be understood; but it is remarked, that the disease prevails most in houses, where children are crowded together. It is uncertain, whether the complaint is contagious.

Though children are the usual subjects of this disease, grown-up persons do not always escape its attacks.

The treatment recommended consists, in extracting diseased teeth and loose pieces of bone; directing a milk vegetable diet, with a prudent quantity of fermented liquors; and prescribing bark, sarsaparilla, and elm bark with sulphuric acid.

The best external applications are, diluted mineral acids; burnt alum; the decoctum cinchonæ, with sulphate of zinc; tincture of myrrh; lime-water, with spirit of wine, &c. (See *Pearson's Principles of Surgery, Edit.* 2, *p.* 287.)

CANTHA'RIDES. (*Lyttæ.*) Spanish, or French flies, with which the common blistering plaster is made. In surgery, they are also prescribed in incontinence of urine, gleets, &c. The tincture is sometimes used as a stimulating liniment.

CAPELINA. (from *capeline*, a woman's hat, French.) A double-headed roller, the middle of which is applied to the occiput. After two or three circles, the rollers intersect each other upon the forehead and occiput; then one being reflected over the vertex to the forehead, the other is continued in a circular track. They next cross each other upon the forehead, after which the first head is carried back obliquely towards the occiput, and reflected by the side of the other.

The last is continued in a circular direction; but the first is brought again over the sagittal suture, backward and forward, and so continued, till the whole head is covered.

By the ancients this bandage was sometimes applied in cases of hydrocephalus: it has no advantage, however, and is now hardly ever used.

CAPILLARY FISSURE. A very minute crack in the skull. The term came into use from the resemblance of such a fracture to a hair.

CAPISTRUM. (See *Bandage.*)

CARBUNCLE. (from *carbo*, a burning coal.) *Anthrax*. This is a very common symptom in the plague; but comes on also sometimes as a primary disease. The first symptoms are great heat and violent pain in some part of the body, on which arise one or several vesications, attended with great itching and a burning heat; below which a circumscribed, but very deep-seated, and extremely hard tumor may be felt. In some respects, it resembles the furuncle; but differs from it in having no central core, and in terminating in gangrene under the skin, instead of suppuration. (See *Gibson's Institutes, Vol.* 1, *p.* 50. *Philadelphia*, 1824.) This tumor soon assumes a dark red, or purple colour, about the centre, but is considerably paler towards the edges. A blister frequently appears on the apex, which, as it occasions an intolerable itching, is often scratched by the patient. The blister being thus broken, a brown sanies is discharged, and an eschar makes its appearance. Many vesications of this this kind are sometimes produced upon one tumor. (*Bromfield's Obs. Vol.* 1.)

Carbuncles have been distinguished into the *benign* and *malignant* kinds; but, as far as the disease can be judged of at present in this country, the distinctions are only founded upon the different degrees of violence, with which the disease makes its attack. Some carbuncles are said to be *pestilential*; while others are not at all infectious. Fortunately, all cases, which are met with in this island, are of the last sort; for, no opportunities of remarking the pestilential anthrax have occurred in England since the deplorable periods of 1665, and 1666.

The carbuncle sometimes appears in persons affected with typhoid fevers, in which case, it is attended with great weight and stiffness of the adjacent parts; the patient is restless and pale, the tongue white, or of a deep red, and moist; the pulse low, urine sometimes pale, sometimes very turbid, with all the other symptoms, in an exaggerated degree, which attend typhoid fevers. The patient often complains much of his head, either from pain, or giddiness. Sometimes, he is drowsy; at other times, he cannot get the least sleep. Occasionally, he is delirious. The case is also apt to be attended with chilliness, or rigors, and profuse perspirations. The patient is sometimes costive, sometimes afflicted with a profusion of stools; he generally complains of loss of appetite, nausea, and vomiting, takes but little nourishment, complains of difficulty of breathing, and is extremely low, with palpitations of the heart, and sometimes faintings. (See *Bromfield's Observations, Vol.* 1, *p* 122.)

Sometimes a little slough, of a black colour, appears in the middle of the tumor. This was supposed by the ancients to be a part of the body burnt to a cinder, or hard crust, by the violence of the disease. By some authors, the carbuncle is considered as a sort of gangrenous affection of the cellular substance. (*Latta.*) The progress of carbuncles to the gangrenous state is generally quick. Their size is very various; they have been known to be as large as a plate. Considerable local pain and induration always attend the disease. The skin, indeed, has a peculiar feel, like that of brawn. As the complaint advances, several apertures generally form in the tumor. Through these openings, there is discharged a greenish, bloody, fetid, irritating matter. The internal sloughing is often very extensive, even when no sign of mortification can be outwardly discovered.

The constitution is often so low and exhausted, that death follows. The carbuncle, indeed, is most frequent in old persons, whose constitutions have been injured by voluptuous living, and, hence, we cannot be surprised, that the local disease, influenced by the general disorder of the system, should very often assume a dangerous aspect.

The degree of peril may generally be estimated by the magnitude and situation of the tumor, the number of such swellings at the same time, the age of the patient, and the state of his constitution.

With regard to the local treatment, the grand thing is to make an early, and free incision into the tumor, so as to allow the sloughs and matter to escape readily. Also with the view of facilitating the escape of the discharge and internal sloughs of the cellular membrane, it is a good plan to remove, with a pair of scissors, a part of the dead skin, as soon as its detachment is sufficiently advanced. (See *Dict. des Sciences Med. T.* 2, *p.* 184.)

As much of the contents as possible is to be at once pressed out, and then the part is to be covered with an emollient poultice. Indeed, until the tumor is opened, no applications are more proper than emollient poultices, and, when an incision has been made, they are far preferable to any detergent antiseptic injections, made with bark, tincture of myrrh, &c. or to any lotions made with the sulphates of copper and zinc, nitrate of silver, &c. Fomentations also afford considerable relief, both before and after an opening has been made. As the discharge is exceedingly fetid and irritating, it will be necessary to put on a fresh poultice two or three times a day. The use of the poultice is to be continued, till all the sloughs have separated, and the surface of the cavity appears red, and in a granulating state, when soft lint and a pledget of some unirritating ointment should be applied, together with a compress and bandage. The manner in which the disease is protracted, by not making a proper opening in due time, cannot be too strongly impressed upon the mind of every practitioner, and it may justly be regarded as a frequent reason of the fatal terminations of numerous cases. Mr. Bromfield forcibly inculcates the necessity of making a timely opening for the discharge of the sloughs; for, says he, in case you rely on the opening, made by nature, the thin matter only will be discharged; the sloughy membranes will remain, and the orifice close up. (See *Vol.* 1, *p.* 128.)

It was formerly not an uncommon custom to remove the most prominent portions of carbuncles with the knife, or to destroy them with the actual and potential cauteries. The French in particular are partial to the method of burning the swelling with a hot iron, the employment of which is sanctioned by Pouteau. (See his *Œuvres Posthumes.*) Even now they sometimes touch the apex of the swelling with boiling oil, the muriate of antimony, or the actual cautery, especially, when the pain is excessively severe; and the practice is alleged to be the most expeditious mode of relief. In America, emollient poultices are continued until vesications appear, openings form, and a bloody serum begins to be discharged; the surface of the tumor is then freely covered with caustic vegetable alkali, which of course produces a good deal of pain, but this soon subsides, and the severe burning agony, peculiar to the complaint, is now quite removed. It was Dr. Physick, who first explained the proper period for the application; without which knowledge, Professor Gibson says, much mischief has resulted from ill-timed incisions, and the actual and potential cauteries. (*Institutes of Surgery, Vol.* 1. *p.* 52.)

In England, the disorder is generally subdued by milder means. With respect to the constitutional treatment, the Continental surgeons, in the beginning of the case, before a slough has formed, usually prescribe gently diaphoretic drinks, containing a sufficient quantity of tartrite of antimony to open the bowels. After this stage, they have immediate recourse to tonics and cordials. It should always be remembered, that the disease is for the most part met with in bad constitutions, and in persons who are weak and irritable. Hence, it is only when there is a full strong pulse, and the complaint is just beginning, that bleeding is allowable. Bark, camphor, wine, opium, æther, are the internal medicines most commonly needed. The diluted sulphuric acid is also highly proper, as well as aromatics, and a nourishing diet. As the pain is very severe, opium is an essential remedy. The constitutional treatment is very analogous to that of mortification, and, for this reason, I do not deem it necessary to enlarge the present article, by expatiating on this part of the subject. (See *Mortification.*)

In many of the southern parts of Europe, a malignant species of carbuncle, appears to be endemic, contagious, and very often fatal. For an account of this form of the disease, I would particularly advise the reader to consult *Richerand, Nosogr. Chir. T.* 1, *p.* ccx. *&c. Edit.* 4, *and Larrey, Mémoires de Chirurgie Militaire, T.* 1, *p.* 104, *&c. Ant. Tosi, De Anthrace seu Carbunculo Tractatus.* 4to. *Venetiis*, 1576. *This tract, notwithstanding its antiquity, is said to contain useful precepts: see Dict. des Sciences Méd. T.* 2, *p.* 184. *Bromfield's Chirurgical Cases and Obs. Vol.* 1. *L'Encyclopédie Méthodique, Partie Chir., art. Anthrax. Pearson's Principles. Richter's Anfansgr. der Wundarzn. B.* 1. *Boyer, Traité des Maladies Chir. T.* 2, *p.* 50, *&c. Physick's Case of Carbuncle, with remarks on the Use of Caustic in that Disease, in the Philadelphia Journ. of the Med. and Physical Sciences, Vol.* 2, *p.* 172. *W. Gibson, The Institutes and Practice of Surgery, Vol.* 1, *p.* 50, *&c. Philadelphia*, 1824.

CARCINOMA. (from καρκινος, a crab.) See *Cancer.*

CARIES. (from κειρω, to abrade.) Caries is a disease of the bones, supposed to be very analogous to ulceration of the soft parts; and this comparison is one of great antiquity, having been made by Galen. However, by the generality of the ancients, caries was not discriminated from necrosis.

It was from the surgeons of the eighteenth century, that more correct opinions were derived respecting caries. Until this period, writers had done little more, than mention the complaint and the methods of treating it. Some new light was thrown upon the subject by J. L. Petit, in his remarks upon exostosis and caries. (*Mal. des Os, T.* 2. *Chap.* 16, *p.* 27.) But, as he only spoke of the disorder, as one of the terminations of exostosis, he has not entered far into the consideration of it. The best observations on caries were first made by Dr. A. Monro, *primus.* (*Edinb. Med. Essays, V.* 5, *art.* 25.) This memoir contains the earliest correct ideas of *dry caries*, or *necrosis*, which is rightly compared to mortification of the soft parts, and named *gangrenous caries.*

The bones, like other parts of the body, are composed of arteries, veins, absorbent vessels, nerves, and a cellular texture; they are endued with vitality; they are nourished, they grow, waste, are repaired, and undergo various mutations, according to the age of the individual; and they are subject to diseases analogous to those of the soft parts. To the phosphate of lime, which is more or less abundantly distributed in their texture, they owe all their solidity, and, perhaps, it is to the same earthy substance, that the difference in their vital properties, and in their diseases, from those of the rest of the body, is to be referred. In fact, this particular organization, and inferior vitality of the bones, are generally supposed to account for the small number, peculiar character, and generally slow progress of their diseases. (*Dict. des Sciences Méd. T.* 4, *p.* 80.)

Bones of a spongy texture are more frequently attacked by caries, than such as are compact. Hence, the vertebræ; astragalus, and other bones of the tarsus; those of the carpus; the sternum; the bones of the pelvis, and the heads of the long bones, are often affected; and the bones of young persons are unquestionably more frequently the seat of caries, than those of old subjects.

But, as a modern writer has observed, though the soft and spongy bones are most subject to caries, they sometimes suffer a degree of injury sufficient to produce the death of a portion of their texture. This remark is illustrated by a case, where a musket ball had struck the head of the tibia, in which after death a sequestrum was found, with a cloaca leading down to it. (*Liston, in Edinb. Méd. and Surg. Journ. No.* 78, *p.* 50.)

In necrosis, the bone is entirely deprived of life; in caries, the vital principle exists, but a morbid action is going on, whereby the texture of the bone is altered, and rendered softer and lighter than natural. But, though these disorders are essentially different from each other, they frequently occur together in the same part, as Mr. Liston has correctly explained. (*Edinb. Med. and Surg. Journ. No.* 78, *p.* 50.)

In the most common species of caries, a loose, fungous flesh grows out of the interstices, formed on the surface of the diseased bone, and bleeds from the slightest causes; while, in the soft parts, a sinus generally leads down to the caries, and emits a very fetid, dark-coloured sanies. These symptoms, however, as well as the tendency in the accompanying ulcer or sinus, to produce large fungous granulations, are more constant in cases of necrosis, than in those of caries, some of which may remain a very considerable time unattended with any outward sore, abscess, or sinus, as we see illustrated in the caries produced by various diseases of the joints. And, indeed, particular forms of caries, (if they deserve that name) are rarely accompanied with suppuration: a fact, to which I shall again advert.

"The absorption of bone, like that of soft parts (says Dr. Thomson,) may be distinguished into interstitial, progressive, and ulcerative. We have ample proofs of the interstitial absorption, or that which is daily, hourly, and unceasingly taking place from every part of the substance of bone, in the deposition and removal of phosphate of lime, that has been tinged with madder. If too much earth be removed, the quantity of animal matter will be relatively increased, and a disposition given to softness of the bones—a state, which exists in the bones of children in the disease called the rickets, and in the bones of older people in that denominated mollities ossium, or the rickets of grown people.

"I have already had occasion to mention the effects of the progressive absorption of bone, as manifested in the progress of aneurisms and other tumors to the skin; but, the formation of pus is by no means a necessary, constant, or even frequent attendant on the progressive absorption in bone. Hydatids in the brains of sheep, tumors growing from the pia or dura mater in the human body (see *Dura Mater,*) or aneurism seated over the cranium, or within the cavity of the chest, are often the cause of the whole substance of a bone being removed, layer after layer, by progressive absorption, without the formation of a single particle of pus. (See *Aneurism.*) This state of the bone has often been confounded, but improperly, with that state of the bone, which arises from ulcerative absorption, the state, which is properly denominated caries, and in which one or more solutions of continuity may be produced upon the surface, or in the substance of the bones. The ulcerations occasioned in bones by the venereal disease afford by far the best marked examples of the effects and appearances of ulcerative absorption, or caries in bones, &c." (See *Thomson's Lectures on Inflammation, p.* 389.)

Caries has been divided into three kinds, according to the nature of its causes: 1. Caries from external causes; 2. from an internal local cause, where no outward injury of the bone, and no internal constitutional disease, can be suspected to have produced the disorder, and where the affection can be removed by local means. The caries of the finger bones from whitlows, is quoted as a specimen of this form of the disease. Perhaps, however, the case is generally rather an instance of necrosis; 3. from a general internal cause, or constitutional disease, in which cases, besides local remedies, it is necessary to employ such medicines, as are calculated to obviate the particular affection of the system, whence the diseased state of the bone has originated.

But, in addition to these general divisions of the subject, there are many circumstances, in relation to the varieties of caries, which may be said yet to lie in obscurity. If, as a modern writer remarks, the situation of the bones, the nature of their organization, and the slowness of their diseases, would let an attentive observer trace the formation, developement, and progress of caries, no doubt, there would be noticed a diversity in its symptoms, corresponding to its different species; and, probably, it would be found, that a venereal, or scrofulous caries would vary in its origin and progress, as much from a caries, arising from a purely local cause, as a venereal, or scrofulous ulcer differs from the kind of ulceration, that follows a common abscess. (*Dict. des Sciences Méd. T.* 4, *p.* 84.) The *worm-eaten* caries, as it has been termed, which penetrates the whole substance of a bone, and gives it an appearance as if it had been bored in hundreds of places, is a very different affection from some other forms of the disease, whether superficial, or extending to the deeper texture of the bone.

Abscesses, situated in the vicinity of bones, are frequently thought to be the cause both of necrosis and caries. This was the ancient doctrine, and it has found various advocates in modern times, especially Mr. Liston. (See *Edinb. Med. and Surg. Journ. Vol.* 20, *p.* 52.) Hence, the rule, to open such abscesses at an early period, in order to prevent the bone from being affected. If some abscesses, like those which form over the anterior surface of the tibia, and mastoid process of the temporal bone, be frequently attended either with caries, or necrosis, the latter is mostly the cause, and not the effect, of the suppuration. Pus, which is a bland, unctuous, inodorous fluid, never attacks the soft parts, with which it is in contact, until its qualities are changed by exposure to the air. When an abscess forms in the anterior part of the parietes of the abdomen, the peritoneum of that part, naturally a thin membrane, instead of being destroyed, becomes thick, and strong enough to resist the extension of the abscess towards the cavity of the abdomen. So also, when an abscess is formed over a bone, not originally diseased, or hurt by the same causes, which produced the abscess, and not injured by being kept exposed, or by astringent escharotic applications, neither caries, nor necrosis, is likely to happen. On the contrary, the periosteum, like the peritoneum, becomes thickened, and granulations are formed over it.

The venereal disease is sometimes a cause of caries; sometimes of necrosis; frequently of both affections together, and in other instances, of exostosis. When it attacks the bones of the nose, its destructive effects arise partly from necrosis and partly from caries, and the face is sadly disfigured. The bones of the palate are sometimes altered in the same manner; but, on other occasions, the effect upon them is chiefly necrosis.

In cases of cancer of the breast, the sternum and ribs are sometimes found carious. I believe, that, in such cases, the disease of the bones has nothing in its own nature, entitling it to be regarded as cancerous. It is a mere effect of the original disorder, and if the carious bone could be removed together with every particle of the disease of the soft parts, a cure would probably follow. Or, supposing the carious bone were the only portion of the disease left, it is conceivable, that the case might yet end in a cure.

Caries, arising from syphilis, most commonly affects the tibia, cranium, ossa nasi, ossa palati, and sternum; and, I believe, is mostly complicated with a greater, or less degree of necrosis.

Caries of the vertebræ is known by peculiar symptoms, among which a paralysis of the inferior extremities, and lumbar abscesses, are the most remarkable.

Cæteris paribus, caries from an external, or a local internal cause, is less dangerous than that, which proceeds from a constitutional disease, particularly when the latter is difficult of cure.

Caries of the spongy part of bones is more difficult to cure, than a similar affection of their compact parts. Caries of the carpal and tarsal bones is particularly obstinate. These bones being in close contact, the affection cannot easily be prevented from spreading from one to the other. Amputation is often the only means of cure. The same is frequently the case, when the spongy heads of the long bones, forming the large joints, become carious. Even this mode of relief is not practicable when the head of the bone lies very deeply, like that of the os femoris.

Caries of the ossa ilium, is also observed to be particularly difficult of removal.

Caries from scrofula, the most frequent case of all the examples of this disorder of the bones, (*Wissmann*) is more difficult of cure, than that from syphilis, and scurvy; for, some efficacious remedies against the latter diseases are known; but scrofula cannot be said to be within the reach of medicine. The prognosis is less favourable in old, than young subjects, and much depends on the extent of the disease, the patient's strength, and the state of the soft parts.

When caries arises from constitutional disease, internal remedies are of course indicated. Thus mercurial and sudorific medicines put a stop to caries from syphilis; while, vegetable diet, and acids, cure both the scurvy, and the caries dependent on it.

According to writers, the indications in the treatment of caries are; either to produce a change in the action of the diseased portion of bone, whereby it may regain a healthy state; or to destroy it altogether.

In the caries from constitutional causes, the first object seems to be brought about by the operation of such remedies as remove the original disease; and, I should much doubt, whether, in these cases, any very active local treatment is necessary, or free from objection. Of course, this remark is meant to apply only to examples, in which we possess some medicine, or plan, which is known to be a tolerably sure remedy for the general disease. This is not the case in caries from scrofula, and here issues, blisters, friction, with other local means, are unquestionably advantageous. (See *Joints* and *Vertebræ.*) But, surgeons have proceeded further, and, not content with issues, blisters, fomentations, &c. as means for quickening the action of the diseased bone, they have commonly recommended applying directly upon it the strongest stimulants, as the tincture of aloes or myrrh, a solution of the argentum nitratum, concentrated vinegar, or diluted muriatic acid.

For the destruction of caries, the actual and potential cauteries, and cutting instruments, have been employed.

On the Continent, and particularly in France, the plan of touching carious parts of bones with the actual cautery, after bringing them fairly into view by the previous use of the knife, is still pursued. It is thought, that the burning iron acts by changing the caries into a necrosis, irritating the subjacent sound parts, and exciting that action of the vessels, by which the dead or diseased part of the bones must be thrown off. Such is the doctrine inculcated by Boyer, and such is the practice sanctioned by some surgeons of the present day, amongst whom I find Mr. Liston.

Mr. Hey succeeded in cutting away a carious part of the tibia. He began the operation by dissecting off the granulations of flesh, which had arisen from the bone, and then sawed out, by means of a circular headed saw, a wedge of the tibia, two inches in length. The removal of this portion brought into view a caries of the cancelli, almost as extensive as the piece already removed. With different trephines, suited to the breadth of the caries, Mr. Hey removed the diseased cancelli of the bone, quite through to the opposite lamella. As the caries extended in various directions, it was not possible to remove the whole of it with a trephine, without removing also a large portion of the sound part of the bone, which Mr. Hey wished to avoid. By the assistance, therefore, of a strong sharp-pointed knife, he pursued the caries in every direction, until every part was taken away, which had an unsound appearance. The wound was simply dressed with dry lint; the whole surface was speedily covered with good granulations; and a complete cure was obtained, without any exfoliation.

Mr. Hey concludes this subject, as follows: "I have treated some other cases of caries of the tibia in the same manner, and with equal success. Where the extent of the caries is not so great as to prevent a complete removal of the morbid part, this method is extremely useful, and far superior to the use of the potential or actual cautery.

"The trephine is not wanted, where the cancelli of the bone are not affected with the caries. The diseased parts of the lamella may be removed with gouges or small chisels. Granulations of flesh will then arise from the sound parts of the bone, and become united with the integuments, which ought to be preserved as far as is possible." (*Pract. Obs. on Surgery.*)

In the treatment of caries, particularly that form of it which accompanies white-swellings, Mr. Liston considers ointments and poultices as unlikely to be productive of much good. In the first, or inflammatory stage, he praises topical bleeding, practised with moderation, and followed by issues, sinapisms, blisters, or the antimonial ointment. However, he thinks the most effectual remedy is the moxa. "In all deep seated pains of the joints (says Mr. Liston) this remedy affords the most speedy and complete relief, at the expense but of a trifling pain, of no long duration. The pain does not appear to be greater, than that arising from the formation of an eschar by potass, or any other of the potential cauteries, and lasts only during the time of the application, whilst the violent pain does not subside, perhaps, for twelve hours, after the employment of the potass." (*Edinb. Med. and Surg. Journ. No.* 78, *p.* 54.)

When caries is fairly established, and the integuments have given way, the same author represents the indications to be, either the immediate removal of the diseased bone, or the employment of means calculated to make it be thrown off by the constitution. "The first indication (he says) is to be accomplished, by the proper use of trephines, perforators, gouges, gravers, scoops, saws, and forceps of different kinds, for dividing or extracting; the second, by cauteries, actual, or potential. In general, a combination of both is required.

"In caries of the long bones, it becomes in general necessary to enlarge the opening through the outer lamella, by the application of the trephine, and perhaps by the use of a small saw, or cutting forceps, so as to connect the different perforations, and thus obtain access to the diseased cancelli. The scoop, or graver will answer well for the rest of the work. In most instances the actual cautery is next applied very freely, by which means the whole of the diseased surface will be thrown off, and healthy granulations fill up the breach." (*Op. cit. p.* 56.)

In the Medical and Chir. Trans. cases have been recorded by Mr. Dunn, and Mr. C. Hutchison, in which several of the tarsal bones in a state of caries were cut out, and the foot preserved. The same practice seems to be followed by Mr. Liston, with the addition of the cautery. He observes, that, when the disease is seated in one of the tarsal, or carpal bones, and entirely limited to it, its simple removal will be sufficient. But, when one is quite destroyed, and the surfaces, of others, with which it is articulated, are affected, these surfaces must also be cut out, and *the operation finished by the free application of the cautery.* The principle, which Mr. Liston lays down, is, that *the cautery is indispensable, whenever the cancellated texture of a bone is encroached upon.* The knife, for such operations, he says, should have a strong, sharp point and edge, with a thick back and firm handle. A scoop, graver, or gouge, and strong plyers, with some pairs of cutting forceps, will (with the cauteries for such cases as require them) complete the apparatus. The bone-forceps, with the cutting edges in a line with the handles, as used by Mr. Liston for some years in these operations, as well as amputation, are strongly commended, more especially when the metacarpal, or metatarsal bones are to be in part removed. In these operations, Mr. Liston has never found saws of the least use; and in several trials of the chain-saw, which he witnessed, it either broke, or got so wedged, that great difficulty was experienced in disengaging it, and bringing the operation to a conclusion. He does not approve of the half-headed trephine, because the bone must be denuded much higher, than where the division is to be made, in order to let the centre-pin be fixed. The annular saw, he also disapproves of, on account of the extensive division of the integuments, which its use requires. He does not enter into any particular reasons against Hey's saws, which have been found so useful by other practitioners; and the rotation saw lately invented by Professor Thal, of Copenhagen, is mentioned, but its merits not examined. In short, whatever some surgeons would execute with a saw in the operations under consideration, Mr. Liston would perform with his bone-forceps and other means. The facts, which he has reported, show clearly enough that the forceps, used by him, is a very efficient instrument, and, it is no slight circumstance in its favor, that Baron Dupuytren strongly commends it, and has publicly used it. (*Liston, in Edinb. Med. and Surg. Journ. No.* 78.)

If surgeons are often censurable for inert measures in a variety of diseases, I believe, they cannot be blamed for the same kind of inactivity in the treatment of caries, where they run, perhaps, into the opposite extreme, and, too confident in their knowledge of the causes and nature of the disease, they often make themselves too officious, and rather disturb, than promote the salutary processes of nature. (See *J. L. Petit, Traité des Mal. des Os, Paris,* 1741. *A. Monro, in Edinb. Med. Essays, Vol.* 5. *Weidmann de Necrosi Ossium, Francof.* 1793. *Callisen, Systema Chirurgiæ Hodiernæ, Vol.* 1, *p.* 493. *Boyer, Traité des Maladies Chir. T.* 3, *p.* 453 *et seq. Paris,* 1814. *Richerand, Nosogr. Chir. T.* 3, *p.* 134, *edit.* 4. *Paris,* 1815. *Dict. des Sciences Med. T.* 4, *p.* 78, *&c. J. Wilson on the Structure, Physiology, and Diseases of the Bones, &c. p.* 263, *8vo. Lond.* 1820. *L. Wissmann, De Rite Cognoscendis et Curandis Nudatione, Carie, et Necrosi Ossium, 8vo. R. Liston, Essay on Caries, in Edinb. Med. and Surg. Journ. No.* 78. *A good description of the different kinds of caries is yet a desideratum.*)

CASTRATION. The operation of removing a testicle. For an account of the cases rendering this measure necessary, see *Testicle, Diseases of.* The manner of operating is as follows: The patient being laid on a table of convenient height, the integuments covering the spermatic vessels in the groin, are to be divided. This incision should begin as nearly as possible, opposite to the opening in the abdominal muscle, and should be continued to the lower part of the scrotum.

The manner of beginning this incision is differently described by writers; some of them advising that the skin be held up by an assistant; others that the knife be used perpendicularly in this as in other parts. The latter mode is generally preferred by English surgeons. The length of the division is a more important consideration. A small wound will indeed serve to lay bare the spermatic chord; but it will not permit the operator to do what is necessary afterwards with dexterity, or facility; and as the scrotum must, either at first or at last, be divided nearly to the bottom, it had better be done at first. The spermatic chord, thus laid bare, is to be freed from its surrounding membranous connexions; and then the operator, with his finger and thumb, separating the blood-vessels from the vas deferens, must pass a ligature between them, and having tied the former only, must cut through the whole chord, at a quarter or half an inch distance from the said ligature, according as the state of the process and testicle will admit. This done; he is then, with the same knife, with which he has performed the former part of the operation, to dissect the testicle out from its connexion with the scrotum: the loose texture of the connecting cellular substance, the previous separation of the testicle from the spermatic chord, and the help of an assistant to hold up the lips of the wound, will enable him to do this with very little pain to the patient, and great facility to himself. If any considerable artery bleeds in the scrotum, it is to be tied. (*Pott.*)

Besides the facility, which a free incision in the scrotum affords to removing the testicle, the division being carried quite to its lower part, prevents the accumulation of matter there, which would otherwise happen, and seriously retard the healing of the wound.

Mr. S. Sharp once castrated a man, whose testicle weighed above three pounds, and some of the vessels were so varicose and dilated, as nearly to equal the size of the humeral artery. (*Operations of Surgery, chap.* 10.)

Desault first divides the chord, and, holding its upper end between the index finger and thumb of his left hand, he then takes up the articles with a pair of forceps, and they are immediately tied, by an assistant. (*Œuvres Chir. par Bichat, T.* 2.)

The spermatic artery, and any scrotal vessels, which require to be taken up, should be tied with fine silk ligatures, as recommended by my friend Mr. Lawrence. (See *Med. Chir. Trans. Vol.* 6, *p.* 197.)

Pott used to fill the cavity of the wound with lint; but Desault, and all the modern surgeons of this country, bring the edges of the wound together, and endeavour to heal as much of it as possible by the first intention. Some, with this view, use sutures and sticking plaster; others, only the latter, aided with compresses and a T bandage; which means, in my humble opinion, are quite enough.

The operation of the compresses and bandages cannot be too carefully attended to, as it is the surest means of preventing hemorrhage from any small arteries in the scrotum, while it conduces to the union of the parts. Care must be taken, however, not to let the pressure hurt the sound testicle.

The plan of dressing adopted by Mr. Lawrence, consists in retaining the edges of the skin in apposition with two or three sutures, and then applying a narrow strip of simple dressing. A folded cloth, kept constantly damp, is also laid over the wound. (*Med. Chir. Trans. Vol.* 6, *loc. cit.*) With respect to sutures, some doubt may be entertained of their utility after this operation, and I have remarked, that considerable irritation and an extensive erysipelas sometimes follow their employment. Roux also noticed their bad effects in a case, which occurred during his visit to this country. (See *Parallèle de la Chirurgie Angloise avec la Chirurgie Française, p.* 121.)

It is somewhat extraordinary, that Larrey should condemn the plan of uniting the wound, though, indeed, we cannot be surprised at his delivering this advice, when we recollect, that he disapproves of healing the stump, after amputation, by the first intention. The passage, relative to dressing the wound after castration, seems to be a contrast to the sensible observations which generally prevail in this author's publication: "*Il ne faut pas réunir les bords de la plaie, comme l'ont conseillé quelques practiciens, parcequ'ils doivent suppurer, et que la suppuration est nécessaire!*" (*Mem. de Chirurgie Militaire, T.* 3, *p.* 426.)

Larrey is joined by Roux and the rest of the French surgeons on this point. The main reasons, stated by the latter writer, for not bringing the wound together, are, that secondary hemorrhage cannot be well guarded against, except by filling the part with charpie; that the redundance and looseness of the skin render it difficult to keep its edges in exact contact, without removing a portion of it, and using sutures, which are objectionable; and that suppuration cannot commonly be prevented, because there is a large quantity of loose cellular substance in the wound, which substance readily suppurates. (*Parallèle de la Chirurgie Angloise avec la Chirurgie Française, &c. p.* 119, &c.) By applying cold water, and gentle compression to the part, I believe, however, such hemorrhage may generally be averted, and the union of the wound materially expedited. As a judicious writer observes: "In the London hospitals, complete union by the first intention is seldom, or never accomplished: yet, by attempting it, the wound is much diminished, and the cure of it rarely delayed later, than three or four weeks; whereas the wound, when stuffed with lint, is usually not healed in less than seven, or eight weeks." (See *Sketches of the Medical Schools of Paris by J. Cross, p.* 144.)

Sometimes, one or more vessels begin to bleed soon after the patient is in bed, although they effused no blood just after the removal of the testicle. Keeping the dressings and scrotum continually wet with the cold saturnine lotion very often suffices for the prevention and suppression of such hemorrhage: if not, the wound must be opened again, and the vessels tied.

J. L. Petit made some useful remarks on this operation. The vessels of the scrotum, says he, are not the only ones, which may be the source of hemorrhage. Anatomists know, that the septum which divides this part into two cavities, is furnished with an artery, that is not considerable, but, which becomes materially enlarged, in the case of a sarcocele, or other tumor. It is sometimes so considerable, that it causes a bleeding, which makes a surgeon, who has had no previous opportunity of seeing the occurrence, exceedingly uneasy. Such hemorrhage, says Petit, may be easily suppressed with a ligature; and, he assures us, that he has seen a surgeon dress the patient three times, without ever suspecting, that the bleeding, for which the applications were a third time removed, proceeded from this artery. (*Petit, Traité des Maladies Chir. T.* 2. *p.* 524 —525.)

The same experienced and able surgeon also acquaints us, that he has more than once extricated from trouble persons, who knew not how to stop the bleeding after the operation. He has seen some of them take off the dressings several times, without discovering the wounded vessel. As they imagined, that the only hemorrhage, which could follow castration must be from the spermatic artery, they contented themselves with examining the ligature on the cord, and increasing the compression, in order to stop the bleeding; but, finding their attempts fail, they were compelled to seek assistance. On being sent for, M. Petit found, that the blood did not issue from the cord, but from a small artery, under the skin, at the inferior angle of the wound. He easily stopped the hemorrhage, and explained, not only, that the cord had no share in the accident, but, that it is generally suspected without foundation. Indeed, says he, the least constriction will stop the bleeding from the spermatic artery; it is not essential to tie it;—"I myself am content with cutting the cord, so as to leave it rather longer than usual, and apply no ligature: I press it against the os pubis, near the ring of the external oblique; I lay over it a linen compress, half as thick as the finger, two inches in length, sufficiently broad to cover the part, and yet narrow enough to be placed entirely within the wound. Over this compress, I put dossils of lint; I fill the scrotum with plain lint, and then cover the whole with compresses, observing to put one, which is thicker, than the rest, above the pubes, immediately over that, which I have laid upon the cord, so that the bandage may make moderate pressure on this last part, yet sufficient to prevent bleeding." (*Op. cit. p.* 526—527.)

This quotation is not made with the view of inducing any modern operator to imitate the preceding practice, which, indeed, the advantages of the present mode of dressing the wound entirely forbid, as well as the greater security of the ligature; but, the passage is cited, for the express purpose of impressing on the mind of the young surgeon, that, in general, after the removal of a diseased testis, there is more risk of bleeding from the vessels of the scrotum, than those of the cord. I have never seen hemorrhage from the spermatic artery give trouble after the operation, but, have often known surgeons obliged to take off the dressings on account of bleeding in the scrotum.

In every operation, in which a considerable portion of skin is to be divided, and particularly in this, and in the amputation of women's breasts, it should always be remembered, that, as the division of the skin (the general organ of sensation) is the most acute and painful part of what is done by the knife, it cannot be done too quickly, and should always be done at once: the scrotum should constantly be divided to the bottom, and the circular incision in the skin of a breast always made quite round, before any thing else be thought of. If this be not executed properly, and perfectly, the operation will be attended with a great deal of pain which might be avoided, and the operator will be justly blameable. (*Pott.*)

When the diseased testicle is exceedingly large, or a part of the scrotum is diseased, the surgeon should take care to remove the redundant, or morbid portion of the skin, by including the piece, which he designs to take away, within two long elliptical incisions, which are to meet at the upper and lower part of the swelling. In this manner, as Mr. Samuel Sharp has observed, the hemorrhage will be much less, the operation greatly shortened, the sloughing of the distended skin prevented, and the recurrence of cancerous disease rendered less likely. (See *Treatise of the Operations, chap.* 10.)

Mr. Lawrence concurs with M de la Faye in thinking it best in this operation always to remove a large piece of the scrotum with the testicle, by which means the surface of the wound is lessened. (See *Med. Chir. Trans. Vol.* 6, *p.* 196.)

If the tumor be of a pyriform figure, perfectly smooth, and equal in its surface, and free from pain, notwithstanding the degree of hardness may be great, and the surgeon may, in his own opinion, be clear that the tumor is not produced by water, but is a true scirrhus, it is an excellent rule to make a small opening through the scrotum into the forepart of the tunica vaginalis, previously to the commencement of the operation, as recommended by Mr. Pott, so that, if the case be one of water or blood, its nature may be ascertained, and perhaps the testicle saved. "My reason for giving this advice (says Pott) is, that I was once so deceived by every apparent circumstance of a true, equal, indolent scirrhus, that I removed a testicle, which proved upon examination to be so little diseased, that, had I pierced it with a trocar previous to the operation, I could, and certainly should have preserved it." The best way is to make a small opening with a lancet, or knife; and not to introduce a trocar in the manner advised by Pott, because it would be highly censurable to injure the testicle, and put the patient to unnecessary pain, even though that organ might be found diseased, and to require removal.

It is well known, that the agony of tying the cord is immensely increased by including the vas deferens, and, as no good results from so doing, the practice deserves the severest reprobation, notwithstanding the opposite opinion of Mr. Pearson, (*Pract. Obs. on Cancer*, *p.* 74,) and the writer of the article *Castration* in Rees's Cyclopedia.

Cases are even recorded, in which the inclusion of the whole of the spermatic cord appears to have occasioned severe and perilous consequences, and these in so great a degree, that it was found necessary to cut and remove the ligature. Sometimes, says Petit, patients, on whom castration has been performed, suffer more or less acute pain in the kidneys. The suffering often becomes insupportable and highly dangerous, the belly being swelled, tense, and painful; the patient being affected with syncopes, and affections of the heart, sometimes with vomiting, and a retention of urine; lastly, a universal inflammation of the belly, and a violent fever, accompanied with delirium, are occasionally the fatal consequences of this operation. Petit was required to visit a patient, who had been in this deplorable state for twenty-four hours, after having suffered castration, and this distinguished surgeon could impute the sudden and violent symptoms to nothing, except the ligature on the spermatic cord; consequently, he advised, the ligature to be removed. The patient received some slight relief from this step, and, after having been bled twice within a short space of time, he found himself a great deal better; but, as the dressings became wet with blood, apprehension of bleeding began to be entertained. Petit, therefore, had recourse to moderate compression of the cord, in the manner above related. No hemorrhage ensued; the case afterwards went on well; and the patient recovered sooner, than was expected. (*Traité des Maladies Chir. T.* 2, *p.* 527, 528.)

In the operation of removing a testicle, one caution seems particularly necessary, viz. if the cord should be at all enlarged, the surgeon ought carefully to examine, whether the augmentation of its size may not be owing to a portion of intestine, or omentum, that is contained within it. (*Sabatier, Médecine Opératoire, T.* 1, *p.* 332, *Edit.* 1.) In one case of extirpation of the testicle, "after the operation was completed, and the wound dressed, the patient being seized with a fit of coughing, to the astonishment and dismay of the surgeon, the dressings were forced off by a protrusion of several convolutions of small intestines; from this, it was proved, that the patient had had a hernia; but, the diseased enlargement of the testicle had acted as a truss, and prevented the rupture from coming down." (See *Operative Surgery, by C. Bell, Vol.* 1, *p.* 226, *also p.* 224.)

There is another circumstance, which merits attention in the performance of this operation: when there are reasons, which oblige us to divide the cord high up, and this part has not been tied before such division is made, it may be drawn up by the cremaster within the abdominal ring, and some difficulty may be experienced in securing the spermatic arteries. Mr. B. Bell saw this happen twice, and the patients lost their lives from hemorrhage. Hence, when it is necessary to cut through the cord near the ring; perhaps, it may be best always to apply the ligature first, observing not to include the vas deferens. However, were the cord, previously to the application of ligatures to its arteries, to happen in any instance to be drawn up within the ring, a surgeon would be guilty of most supine neglect to let the patient die of bleeding; for, as Mr. C. Bell has remarked, we may follow the cord with perfect safety, even to the origin of the cremaster, which pulls it up, if attention be paid to the course of the cord, obliquely upward and outward, within the inguinal canal. Mr. Cline was present at the removal of a testicle, after which the spermatic could not be found: he therefore slit up the inguinal canal, and brought it into view again. In order to avoid this inconvenience, Sir Astley Cooper approves of the practice of passing a temporary ligature through the cord, as soon as it has been exposed. (See *Lancet*, *Vol.* 3, *p.* 41.)

It sometimes happens, that abscesses form in the remains of the spermatic cord, after the operation of castration. Such suppuration may frequently be prevented by the employment of bleeding directly after the operation, and repeating the evacuation on the first access of the inflammation of the part concerned. Besides venesection, low diet, neutral salts, diluents, &c. are indicated, and the part should be covered with an emollient poultice. When pus is completely formed, the abscess should be opened.

When the symptoms subside, says Petit, they, who are little versed in practice, are apt to fancy the abscess cured; but, they are sometimes mistaken. The matter is not always sufficiently near the surface to be felt, and, in this circumstance, the aponeurosis of the external oblique muscle is so tense, that it hinders the fluctuation from being distinctly felt. Indeed as the matter finds a lodgment under this aponeurosis, following the course of the sheath of the vessels, there is reason to fear, that it may lead to additional inflammation and suppuration, and extend up the duplicature of the peritoneum to the loins. In these cases, the abscess occasionally makes its way outward, and the dressings are inundated with matter; but, if this should not happen quickly, the sooner the tumor is opened the better. The opening ought unquestionably to be made wherever the fluctuation is plainly distinguishable; but, as Petit has remarked, the tension of the aponeurosis of the external oblique muscle makes the undulation of the matter less readily and plainly perceptible, than if the abscess were only in the fat. Therefore, in order to avoid mistake, this surgeon advises us to feel at the abdominal ring, as, in general, the pus can be more readily felt here, than in other situations. If matter is felt, and no resistance is experienced, Petit advises the finger to be passed into this opening, and in case the seat of the abscess should be found to be under the aponeurosis, we are recommended to divide, with a probe-pointed bistoury, the skin and fat immediately covering the ring, then to separate the fibres of this aperture, as it were, without cutting them. (See *Traité des Maladies Chir. T.* 2, *p.* 529, 530.) No doubt, this surgeon meant, that the division of the tendon ought to be made in the direction of its fibres. A few years ago, the operation for a bubonocele was performed, and as the testicle was found diseased, the surgeon made a complete division of the spermatic chord, tied the spermatic arteries, and then left the testicle in its natural situation. After a time, the absorbents had diminished the part to a very small inconsiderable tumor. (*H. Weinhold, in Journ. der Pract. Heilkunde von C. W. Hufeland und K. Himly*, 1812, *Zehntes Stück, p.* 112.) This case merits attention, because it is the first instance, I believe, in which such practice was ever tried. Subsequently, the following work has been published: "*Nouvelle Méthode de traiter le Sarcocele, sans avoir recours à l'Extirpation du Testicule; par C. Th. Maunoir*, 8*vo. Génève*, 1820." The new plan consists in dividing and tying the spermatic arteries, and leaving the rest of the chord and the testis undisturbed.

When disease, not merely an œdematous swelling, extends far up the chord, Pott, and the best surgeons of the present day, consider the operation of castration as too late: though, in such cases, Lisfranc has seen Dubois pull down the chord and then divide it, and Baron Dupuytren cut up the inguinal canal to the internal ring, all the patients died. (*C. Averill, Operative Surgery, p.* 103, *Lond.* 1823.)

Consult *Le Dran's Operations. Sharp's Operations of Surgery, chap.* 10. *Pott on the Hydrocele, &c. Sabatier, de la Méd. Oper. Tom.* 1. *Bertrandi Traité des Opér. de Chirurgie, chap.* 11. *Œuvres Chirurgicales de Desault par Bichat, Tom.* 2, *p.* 449. *Larrey Mémoires de Chirurgie Militaire, Tom.* 3, *p.* 423, *&c. Pearson on Cancerous Complaints. J. L. Petit, Traité des Maladies Chirurgicales, Tom.* 2, *p.* 519, *&c. C. Bell's Operative Surgery, Vol.* 1. *Richerand's Nosographie Chirurgicale, Tom.* 4, *p.* 281, *&c. Edit.* 2, *&c. A long account of the particular sentiments of several eminent surgeons is to be found in Rees's Cyclopædia, art. Castration. Roux, Parallèle de la Chirurgie Angloise avec la Chirurgie Française, p.* 119, *&c. Lawrence in Med. Chir. Trans. Vol.* 6, *p.* 196, 197. *Sketches of the Medical Schools of Paris, by J. Cross, p.* 139, *&c.*

CATAPLASMA ACETI. Made by mixing a sufficient quantity of vinegar with either oatmeal, linseed meal, or bread-crum. When linseed is employed, it is best to add a little oatmeal, or bread-crum, in order to keep the poultice from becoming hard. The vinegar poultice is generally applied cold, and is principally used in cases of bruises and sprains

CATAPLASMA ACETOSÆ. *Sorrel Poultice.* ℞ *Acetosæ* lbj. To be beaten in a mortar into a pulp.

CATAPLASMA ALUMINIS. Made by stirring the whites of two eggs with a bit of alum, till they are coagulated. In cases of chronic and purulent ophthalmy, it has been applied to the eye, between two bits of rag, and it has been praised as a good application to chilblains, which are not broken.

CATAPLASMA BYNES. (Malt.) ℞ *Farinæ Bynes. Spumæ Cerevisiæ*, q. s. This is applied to cases of gangrene and ill-conditioned extending sores. It is used in instances similar to those, in which the cataplasma fermenti is employed, and, by giving out carbonic acid gas, is supposed to operate as a gentle stimulus, and as a corrector of fetid effluvia.

CATAPLASMA CARBONIS. Made by mixing powdered charcoal with linseed meal and warm water, and is applied to improve the condition of several kinds of unhealthy sores.

CATAPLASMA CEREVISIÆ. Made by stirring some oatmeal, or linseed meal, in strong beer grounds. It is used in the same cases, as the Cataplasma Fermenti, and Cataplasma Bynes.

CATAPLASMA CONII VEL CICUTÆ. ℞ *Herbæ cicutæ exfoliatæ* ℥ij. *Aquæ fontanæ* ℔ij. To be boiled, till only a pint remains, when as much linseed meal as necessary is to be added.

Hemlock poultice is an excellent application to many cancerous and scrofulous ulcers, and other malignant sores; frequently producing a great diminution of the pain of such diseases, and improving their appearance. Justamond preferred the fresh herb, bruised.

CATAPLASMA DAUCI. ℞ *Radicis Dauci recentis* ℔j. Some bruise the carrots in a mortar into a pulp; while others recommend the carrots to be first boiled. Carrot poultice is employed, as an application to ulcerated cancers, scrofulous sores of an irritable kind, and various inveterate malignant ulcers.

CATAPLASMA DIGITALIS. Made by mixing linseed meal with a decoction of the leaves of the plant. It is said to have great sedative virtues, to be adapted to the same cases, as the cicuta poultice, and even to be more beneficial.

CATAPLASMA FARINACEUM. The bread and milk poultice, made by putting some slices of bread crum in milk, and letting them gently simmer over the fire in a saucepan, till they are properly softened. The mass is then to be mixed and stirred about with a spoon, and spread on linen, in order to be applied. This poultice, which is of the emollient kind, is with many persons the common one for all ordinary purposes. Most surgeons, however, employ, instead of it, the linseed poultice, which is cheaper, more readily made, not apt to turn sour, and in all common cases, quite as advantageous in every respect.

CATAPLASMA FERMENTI. *Fermenting Poultice.* ℞ *Farinæ Tritici.* lbj. *Cerevisiæ Spumæ, Yest dictæ*; ℔ss. These are to be mixed together and exposed to a moderate heat, till the effervescence begins. In cases of sloughing, and many ill conditioned ulcers, this is an application of great repute.

CATAPLASMA LINI. *Linseed Poultice.* ℞ *Farinæ Lini* ℔ss. *Aq Ferventis* ℔iss. The powder is to be gradually sprinkled into the hot water, while they are quickly blended together with a spoon.

This is the best, and most convenient of all the emollient poultices for common cases, and it has nearly superseded that of bread and milk, which was formerly much more frequently employed.

Mr. Hunter speaks, in the following terms, of the linseed poultice, and its uses.

"Poultices are commonly made *too thin*; by which means, the least pressure, or their own gravity, removes them from the part; they should be thick enough to support a certain form when applied.

"They are generally made of *stale* bread, and milk. This composition, in general, makes too *brittle* an application; it breaks easily into different portions, from the least motion, and often leaves some part of the wound uncovered, which is frustrating the first intention.

"The poultice, which makes the best application, and continues most nearly the same between each dressing, is that formed of the meal of linseed; it is made at once, and when applied, it keeps always in one mass.

"The kind of wound, to which the above application is best adapted, is a wound made in a sound part, which we intend shall heal by granulation. The same application is equally proper when parts are deprived of life, and consequently will slough. It is therefore the very best dressing for a *gunshot* wound, and probably for most *lacerated wounds*; for *lint*, applied to a part that is to throw off *a slough*, will often be retained till that slough is separated, which will be for eight, ten, or more days."

CATAPLASMA MURIATIS SODÆ. ℞ *Pulveris Lini, Micæ Panis ā. ā. partes æquales. Aq. Sodæ Muriatæ q. s.* This is used for diminishing scrofulous tumors and glands. When it excites too much irritation in the skin, a linseed poultice may be substituted for it, until this state has subsided.

CATAPLASMA PLUMBI SUBACETATIS.

℞ Liquoris Plumbi Subacetatis drach. j.
Aquæ distillatæ lib. j.
Micæ panis q. s.—Misce.

Practitioners, who place much confidence in the virtues of lead, externally applied, often use this poultice in cases of inflammation.

CATAPLASMA QUERCUS MARINI.

This is prepared by bruising a quantity of the marine plant commonly called *sea tang*, which is afterwards to be applied by way of a poultice.

Its chief use is in cases of scrofula, white swellings, and glandular tumors.

When this vegetable could not be obtained in its recent state, a common poultice of sea-water and oatmeal was substituted by the late Mr. Hunter and other surgeons of eminence.

CATARACT. (From *καταρασσω*, to confound or disturb; because the disease confounds or destroys vision.) *γλαγχωμα. ὑπόχυμα. Gutta opaca. Suffusio. Der graue Staar.*

A cataract is usually defined to be a weakness, or impediment to sight, produced by opacity of the crystalline lens, or its capsule. Professor Beer applies the term to every perceptible obstacle to vision, situated in the posterior chamber, between the vitreous humour and the uvea. (*Lehre von den Augenkrankheiten, B.* 2, *p.* 279, *8vo. Wien.* 1817.)

Hippocrates and the ancient Greeks described the cataract, as a disease of the crystalline lens under the name of *γλαυχωμα*; but, no sooner had Galen promulgated the doctrine of the lens being the immediate organ of sight, than the correct opinion of the ancient founder of medicine began to decline, and for many ages afterwards, had no influence in practice. In fact, the seat of the cataract was entirely forgotten, till about 1656, when first Lasnier, and, afterwards, Borel, Bonnetus, Blegny, Geoffroi, &c. revived the truth which had been so long extinct; and they, and a few others, believed that the disease was situated in the crystalline lens. The bulk of practitioners, however, remained ignorant of this fact even as late as the beginning of the eighteenth century, when the several publications of Maitre-Jan, Brisseau, St. Yves, and Heister, combined to render the truth universally known. In 1708, the celebrated M. Mery, who had hitherto joined in the belief, that the cataract was not a disease of the lens, communicated to the Academy of Sciences a memoir, in which he acknowledges the correctness of the statement made by Brisseau and Maitre-Jan, that vision can take place without the assistance of the crystalline lens; and he recommended a clergyman, who had a cataract, to have the lens extracted, which was successfully done by M. Petit.

A cataract, even in its highest degree, does not always produce complete blindness. For the most part, its formation takes place slowly; the cases, in which it originates very quickly, being but few, and those in which it is suddenly produced in a complete form, still more unusual.

The characteristic symptoms, commonly remarked when a cataract is slowly formed, are the following: 1. All objects, especially white ones, seem to the patient to be covered by a thin smutty or dusty cloud, which as the late Mr. Ware observed, is generally perceptible by the patient before any opacity is visible in the pupil. 2. The decline of vision bears an exact proportion to the increasing opacity distinguishable behind the pupil. 3. In most cases, the opacity is first discerned behind the pupil, most plainly also at the central point, the instances, in which it first presents itself at the edge of the pupil, being less frequent. 4. In eyes with a light coloured iris, the greater progress a cataract makes, the more clearly can one perceive at the edge of the pupil a blackish ring, which partly arises from the shadow of the iris falling on the cataract, but chiefly from the dark coloured pupillary edge of the iris, which, in a clear pupil, cannot be seen, but now that a greyish surface lies behind it, is rendered very manifest. This blackish ring is said by Mr. Guthrie to be very evident in cases of soft cataracts, and to arise from the back of the pupillary edge of the iris being pushed forward by the size of the lens. But if the dilatation be increased to its full extent, by the application of the extract of belladonna, an internal blacker circle will be seen to surround the turbid, or muddy part behind the iris, and the patient sees better for a short time. (*Operative Surgery of the Eye, p.* 197.) 5. As a cataract generally begins at the central point behind the pupil, such objects as are placed directly in front of the eye, are most difficultly seen even in the early stage of the disease, but those which are laterally placed, especially when the light is not too strong, and of course the pupil a good deal dilated, can yet be seen tolerably well. 6. Hence, when the opacity, at the central point behind the pupil, is at all considerable, the patient is completely blind in a strong light, while on the contrary, in a moderately dark room, a degree of vision is yet enjoyed. When the opacity is not far advanced, the eyesight may be improved for a short time by the patient's turning his back to the light. 7. Persons with incipient cataracts derive the greatest palliative aid from the use of convex glasses, because objects are magnified by them; but they only answer while the opacity is inconsiderable. 8. To such patients, the flame of a candle seems to be enveloped in a whitish misty halo, which always become broader the further the patient is from the light. When the cataract is far advanced, the flame of the candle cannot be seen, and the patient can only indicate the place, near which the light is, or say whether it is close or at a distance. 9. Lastly, a cataract, which forms slowly, produces in the course of its progress, no change in the mobility of the iris; and, if this effect sometimes takes place where the disease is very completely developed the nature of the case is now so manifest, that no surgeon is in any danger of mistaking the complaint for amaurosis.

The characteristic appearances of amaurosis are entirely different. 1. The opacity, perceptible behind the pupil, is at a considerable distance from this opening, as may be best seen when the eye is viewed sideways. 2. The opacity is somewhat concave. 3. Its colour inclines rather to a greenish, or reddish cast, than to grey. 4. The decline of the eyesight is not at all in a ratio to the degree of opacity, the patient being almost blind. 5. The pupil is more or less dilated; the iris nearly or quite motionless, its pupillary edge being here and there thrown into an angle, and of course it is not exactly circular 6. Even the cornea itself is not quite so clear and transparent as in the natural state. 7. The temporary increase, or diminution of blindness, so common in patients with incomplete amaurosis, never depends, as in those with cataracts, upon the degree of dilatation of the pupil, or the degree of light, but upon causes, which tend either to depress, or excite the system. 8. The misty halo, which such amaurotic patients perceive around the flame of a candle, is not like a whitish cloud, but has all the hues of the rainbow: indeed, the flame itself presents these colours, and when the patient goes to some distance from it, it generally seems split. 9. At no period of the complaint are spectacles of any service in enabling the patient to see better. Such objects as are situated to one side, cannot be seen more plainly, than those which are directly in front of the eye. (See *Beer's Lehre von den Augenkr. B.* 2, *p.* 281—284.) 10. The sight is not temporarily improved by the application of belladonna. (See *Guthrie's Operative Surgery of the Eye, p.* 212.)

According to this author, the first and most important division of cataract is into the *genuine* and *spurious;* for the obstacle to vision, situated in the posterior chamber, between the vitreous humor and the uvea, and making what is termed a cataract, may be either within the limit of the capsule of the lens, or between the anterior layer of that capsule and the uvea. The first case is the *genuine*; the second, the *spurious* cataract.

A genuine cataract, when a primary disease, and unattended from the first with other morbid effects in the eye, is mostly a single independent affection; on the contrary, as the spurious cataract is generally the consequence of internal ophthalmy, it is almost always more or less combined with a partial opacity of the anterior layer of the capsule, and, of course, with a genuine cataract.

The first variety of genuine cataract, noticed by Beer, is that which he calls *lenticular;* it always begins in the centre, or very nucleus of the lens, mostly presenting a very dull yellowish-grey colour, which is somewhat deeper at the centre, than at the margin of the pupil; a character retained even when the disease is in its most complete stage. The lenticular cataract is always formed very slowly, and except when the iris is too dark coloured, it is more or less attended with a blackish ring at the edge of the pupil, which ring becomes plainer as the disease advances. A genuine lenticular cataract never causes any alteration in the expansion or contraction of the iris; nor does it even in its highest degree deprive the patient of all power of vision, who in shady places, or when the pupil is artificially dilated with hyosciamus, or belladonna, is often capable of distinguishing pretty well many objects, which are placed laterally with respect to the eye. A lenticular cataract is usually at some distance from the uvea, so that the extent of the posterior chamber is manifest, while the opacity presents more or less of a convex appearance, and never that of very white cloudy specks. Frequently, as Beer observes, the lenticular cataract is unattended with any change in the capsule, or the liquor of Morgagni. In most cases of senile cataract, not preceded by inflammation, the capsule is said to remain transparent. (*Travers, Synopsis of the Diseases of the Eye, p.* 207, *8vo.-Lond.* 1820.)

The second species of genuine cataract, noticed by Beer, is the *capsular*, which he thinks should not be called *membranous*, as the expression may lead to mistake. The disease seldom commences in the centre of the pupil, and usually arises at its margin in the form of distinct, very white shining points, streaks, or specks; its colour, therefore, is always very light, and never altogether uniform, even when the disease is completely formed. The dotted, or mottled appearance of this cataract, is also particularly noticed by Mr. Travers. (*Synopsis of the Diseases of the Eye, p.* 207.) The blackish ring, which when the iris is light coloured, is even more evident in this, than the lenticular cataract, is here not owing to the shadow of the iris, but to its dark border; for this cataract is too near the iris for any shadow to be formed. This observation, however, is somewhat at variance with what Mr. Travers has remarked; for, when a transparent circumference can be seen on dilating the pupil with belladonna, he has never found the capsule opaque; and he believes, that the black rim may be considered as the diagnostic mark of the transparency of the capsule. But, where the opacity of the lens is diffused, this sign is of course absent. (*Med. Chir. Trans. Vol.* 4, *p.* 288.) The disease also has some effect on the motions of the iris, at least their quickness. A capsular cataract never remains long the only affection, but is followed by disease of the lens itself; a fact, says Beer, which cannot surprise us, when we consider, that it is through the medium of the capsule, that the particles of the lens are incessantly undergoing the changes of removal and reproduction.

The capsular cataract is subdivided by Beer into the *anterior capsular cataract;* the *posterior capsular cataract;* and the *complete capsular cataract*, in which both the front and back portions of this membrane are opaque.

The *anterior capsular cataract*, which is not at all unfrequent, does not continue long in this form after it has attained a high degree, but, according to Beer, becomes combined with an opacity, and, according to Mr. Travers, with a slow absorption of the lens itself. (*Synopsis, &c. p.* 207.) "When the capsule is completely opaque, (says Mr. Travers) we can hardly judge of the texture of the lens." But, in such examples, "the lens is commonly diminished in bulk; it undergoes a waste after the opacity of the capsule, so as in process of time to become a membranous cataract. This I conceive to be owing to the obliteration of the vessels of the capsule, from which those of the lens are derived. When the capsular opacity is congenital, it is either purely capsular, or only a very small piece of lens remains. When the capsule turns opaque from injury, the lens is soon greatly reduced in bulk, as appears from the falling in, or concavity of the iris, which loses its support, and is demonstrated in the operation. This observation renders the operation with the needle appropriate to the cataract, in which the capsule is opaque, in cases which are not very recent." (*Med. Chir. Trans. Vol.* 4, *p.* 286.) In the interior capsular cataract, according to Mr. Guthrie, the lens does not generally undergo any diminution, but for the most part, an enlargement, in consequence of becoming opaque and soft. But he admits, that the reverse is frequently the case in infants, only a small portion of the lens being left, and the rest of the contents of the capsule fluid. (See *Operative Surgery of the Eye*, p. 233.) The anterior capsular cataract, may be known by its light grey, and in some places, completely chalk-white colour, intersected by shining, mother-of-pearl-like streaks and spots. As the capsule is at the same time thicker, than natural, the posterior chamber is lessened, and the cataract is not unfrequently close to the uvea, especially when the lens has also completely lost its transparency. In this stage, the movements of the iris are likewise rendered less quick, and the shadow at the margin of the pupil is entirely absent. Hence, vision is not only hurt, but quite impeded, in regard to any correct sensation of light, whether the patient be in a light, or shady situation; and frequently a faint light is completely invisible to him.

The *posterior capsular cataract* belongs to the rarer forms of the disease of the eye, but, says Beer, when it happens, *the lens always participates in the opacity much more quickly, than occurs in the anterior capsular cataract.* Hence, the disease can never be observed up to its perfect developement. Respecting the state of the lens, some difference prevails between the statement of Beer and that of Mr. Travers: the latter gentleman informs us, that where the opacity of the posterior capsule is met with, which he agrees with Beer in considering as very rare, *the lens and anterior capsule are usually transparent;* "and when this is not the case, and the cataract escapes with a posterior fold of opaque capsule, it is always accompanied with a considerable discharge of vitreous humour." (*Synopsis of the Diseases of the Eye*, *p.* 209.) And, in speaking of the opacity of the posterior capsule, in another work, he informs us, that he has not observed, that, in this case, the lens undergoes any diminution. (*Med. Chir. Trans. Vol.* 4, *p.* 286.) Like the anterior capsular cataract, it is denoted by a whitish-grey, unequal variegated colour; but no light coloured, chalk-white spots and streaks are ever discernible, which while the lens retains its transparency, may be owing to the distance of the cataract from the pupil. However, the opacity situated behind the pupil, always seems concave, when the eye is inspected, not from before, but from every side of it. While the posterior half of the capsule is not completely opaque, the lens is not materially affected; the eyesight is only more or less weakened; and sometimes, especially with the aid of a magnifying glass, a tolerable degree of vision is enjoyed, notwithstanding the considerable opacity behind the pupil. This species of cataract has not itself any influence over the motions of the iris, and after the lens becomes opaque, it is not softened.

Though the *complete capsular cataract* is not the rarest species of genuine cataract, it cannot be said to be very common. In addition to the symptoms of the anterior capsular cataract, it presents few, yet decided characters, which indicate it previously to an operation: viz. the iris is nearly motionless, the cataract lying close to that organ; the posterior chamber for the same reason is effaced; and an inexperienced surgeon might really suppose the anterior portion of the capsule were adherent to the uvea, unless he convinced himself of the contrary by producing an artificial dilatation of the pupil with hyosciamus, or belladonna. Sometimes, the iris even seems thrust out, by this large cataract, towards the cornea in a convex form; and the patient can only perceive the strongest kinds of light. Though such is the statement of Beer, I concur with Mr. Guthrie in regarding the above characters, which may attend any large soft cataract, as well as the complete capsular one, as by no means a demonstration of the existence of the latter. (*Operative Surgery of the Eye*, *p.* 235.)

The third species of genuine cataract is the *cataracta Morgagniana*, which some term the milk cataract, and others confound with the purulent cataract. It is one of the rarest forms of the disease; so rare indeed, that Mr. Travers regards the case as purely hypothetical. (*Synopsis of Diseases of the Eye*, *p.* 208.) The following is the form of disease, described by Beer, under this name; it proceeds from a total conversion of the lens into a milky fluid, or thin jelly, frequently attended with a complete capsular cataract. Its origin is said to be always quick, and an immediate effect of chemical injuries of the eye. The following are the symptoms of the case, while it is uncomplicated with disease of the lens and capsule; a state, which can never continue long. Though the colour is milk-white, it is delicate and thin, like that of diluted milk. The whole pupil seems cloudy, but whenever the eye-ball moves suddenly and violently, or the eye lid is rubbed over the eye, the opaque substances change their shape and position. The posterior chamber is nearly annihilated, which may be owing to the quantity of fluid, or gelatinous substance collected. While the lens and capsule are not materially changed, the sight suffers only a diminution, though it is very cloudy, and small objects cannot be distinguished at all.

When, however, the lens and capsule become opaque, vision is quite abolished, a certain power of knowing light from darkness only remaining. Not unfrequently, says Beer, when the lens itself is in a dissolved state, the capsule is partially opaque, the eye is kept quiet for a few minutes, and the patient stands or sits in an upright posture, two rows of opaque matter can be plainly seen; the upper being the least white of the two; the lower presenting a chalky whiteness. However, as soon as the patient suddenly or violently moves his eye, or head, or the eyelid is rubbed over the eye, both these rows of opaque matter disappear, and the colour of the opacity behind the pupil again seems uniform.

The fourth species of genuine cataract, described by Beer, is the *capsulo-lenticular cataract*, to which he conceives the liquor of Morgagni in an altered state may likewise often contribute, as may be inferred from the prodigious size of this cataract. It is by no means uncommon, and is attended with the following characteristic symptoms. The colour of the opacity close to the uvea, is partly chalk-white, partly like that of mother-of-pearl, and, in many places, both these colours can be evidently seen disposed one over the other, that of mother-of-pearl, however, being always most superficial. Exposure of the eye to the most vivid light scarcely causes any motion of the iris, but the pupil is circular, without any angles in it. After the application of the extract of henbane or belladonna, the iris contracts again exceedingly slowly, and the pupil is long in returning to its former diameter. Besides the obliteration of the posterior chamber, the anterior one itself is mostly diminished, in consequence of the iris being pushed towards the cornea by the very large size of the cataract, and hence, the sensation of light is very indistinct.

The capsulo-lenticular cataract is not unfrequently the consequence of a slow inflammatory process in the iris, the lens and its capsule; and hence, several varieties of this case, and its not unfrequent combination with a spurious cataract; all which different modifications, says Beer, should be correctly understood previously to an operation, in order to form a just prognosis of its event, and to know what method of operating ought to be adopted.

Of these varieties the first is the *capsulo-lenticular cataract, conjoined with slight depositions of new matter upon the anterior capsule of the lens.* These after-formations upon the front layer of the capsule, as Beer calls them, put on very different appearances, and accordingly receive various appellations. For instance, the *marbled capsulo-lenticular cataract*, when the chalk-white new formed substances upon the anterior layer of the capsule are so arranged as to resemble the variegated appearance of marble. The *window*, or *lattice capsulo-lenticular cataract*, when the new deposited substances cross each other, leaving darker coloured interspaces. The *stellated capsulo-lenticular cataract*, when the new matter runs in concentric streaks towards the middle of the pupil. The *central capsulo-lenticular cataract*, when a single elevated, white, shining point is formed on the anterior capsule, while the rest of this membrane is tolerably clear, and the lens not completely opaque. The *dotted capsulo-lenticular cataract*, when the front layer of the capsule presents several distinct unconnected depositions on its surface. The *half-cataract*, or *cataracta capsulo-lenticularis dimidiata*, when one half of the front layer of the capsule is covered with a white deposite. In all these, and some other examples, says Beer, the lens is found to be converted to its very nucleus into a gelatinous, or milky substance.

The second variety of the capsulo-lenticular cataract, pointed out by Beer, is the *encysted*, indicated by its snow-white colour; sometimes lying so close to the uvea, as to push the iris forward towards the cornea; and, at other times, appearing to be at a distance from the uvea. These circumstances, as Beer remarks, almost always depend upon the position of the head; for, when this is inclined forwards, the cataract readily assumes a globular form, and projects considerably towards the anterior chamber. Frequently, this variety of the capsulo-lenticular cataract constitutes the kind of case, to which the epithets, *tremulous* or *shaking* and *swimming*, or *floating*, are applied. According to Beer, the reason of such unsteadiness in the cataract is owing to the broken, or very slight connexion of the capsule of the lens with the neighbouring textures. The same author has never seen any case of this kind, which had not been preceded by a violent concussion of the eye, or adjacent part of the head. Both layers of the capsule are opaque, and sometimes considerably thickened. The third variety of the capsulo-lenticular cataract, described by Beer, is the *pyramidal*, or *conical*, which is one of the rarer forms of the disease, and always brought on by violent internal inflammation of the eye, especially affecting the lens, its capsule, and the iris. It may be known by a white, almost shining, conical, more or less, projecting new formed substance, which grows from the centre of the anterior layer of the capsule, and is almost in close contact with the pupillary margin of the iris. Hence, the iris is always quite motionless, and the pupil angular. Sometimes, this growth from the capsule extends itself so far into the anterior chamber, as nearly to touch the inner surface of the cornea, and sometimes actually to adhere firmly to it: a circumstance, says Beer, which is very constant in the conical staphyloma of the cornea, though not discoverable till the operation is performed. The power of discerning light is feeble and indistinct, and sometimes, entirely abolished. Mr. Guthrie, (as I think) very correctly regards this case as an advanced degree of the disease presently described under the name, given to it by Beer, of *lymph cataract:* it ought, indeed, to be classed as a *spurious* cataract. (See *Guthrie's Operative Surgery of the Eye*, p. 246.)

The fourth variety of the capsulo-lenticular cataract is the *siliquose.* Though principally met with in young children, it is not one of the most uncommon affections in adults, and in the former, it is often falsely regarded as a congenital complaint. When this cataract is extracted either from children, or grown-up persons, Beer says, that the dried shrivelled capsule is always found round the equally dry nucleus of the lens, like a husk, or shell. In children, however, he says, that the nucleus of the lens is often scarcely perceptible, while, in adults, it is always of considerable size, and this may be the reason, why this cataract in children does not present so bright a yellow-white colour, as it does in grown up persons. In infants, in which it is frequently seen in the first weeks of their existence, it is manifestly produced by a slow and neglected inflammation of the lens and its capsule, arising from too strong light. In adults, the inflammation, exciting this form of cataract, is always owing to external violence; yet Beer supposes, that a considerable diminution of cohesion between the capsule and the adjacent textures must likewise have a principal share in bringing on the disease, which, in grown-up persons, is constantly preceded by a concussion of the eye-ball, from the cut of a whip, the lash of a horse's tail, &c. Professor Schmidt had never seen this kind of cataract, except in boys and girls, who in their early childhood had been afflicted with convulsions; and hence, he thought, that the cause of the disease was owing to a partial loosening of the capsule from its natural connexions by the violence of the convulsive paroxysms. (*Abhandlung über Nachstaar und Iritis nach Staar. perationen, Wien.* 1801, *4to.*) However, Beer assures us, that he has seen infants, scarcely two months old, affected with this cataract, which had not been preceded, or followed by any convulsions; while a much larger number of children with the same kind of cataract had fallen under his notice, where more, or less severe blows on the head had been received. With respect to the convulsions, spoken of by Schmidt, he also questions, whether they and the cataract might not be owing to the same cause, viz. the preceding inflammation within the eye? In children, says Beer, this form of cataract may be known by its light grey, whitish, though seldom very white, colour, its diminutive size, and considerable distance from the uvea, and by the freedom, with which the iris moves, when no adhesions exist at any points between this organ and the cataract, as occasionally happens; a proof of the previous inflammation of the capsule, lens, and neighbouring textures. The eye-sight is never quite impeded, but only much diminished. On the contrary, in adults, as Beer has remarked, this cataract invariably presents a dazzling white hue, and only a few points of it are of a smutty yellowish white colour, whence the case has been sometimes termed the *gypsum cataract.* It is not convex, but rather flat; it does not approach the iris; and, when free from adhesions to the uvea, which are more likely to happen in adults, it has no effect on the motion of the iris. Vision is generally entirely lost, with the exception of the power of discerning the light, and, even this faculty is sometimes destroyed, in consequence of the previous violence done to the eye, whereby not merely the lens and its capsule, but also the retina, have suffered.

According to Beer, one of the rarest varieties of the *capsulo-lenticular cataract* is that *accompanied with a cyst of purulent matter.* It is indicated by a deep lemon colour, very slow motion of the iris, manifest abolition of the posterior chamber, slight convexity of the iris, trivial perception of light, and the weak, unhealthy constitution of the patient. The purulent cyst, which sometimes contains a very fetid matter, and was therefore called by Schiferli the *putrid cataract,* (*Theoretisch-Praktische Abhandlung über den Grauen Staar, 8vo. Jena, und Leipz.* 1797,) may sometimes be taken out, without being broken, together with the whole capsule of the lens, with the aid of the forceps, or cataract-tenaculum, as was first correctly remarked by Professor Schmidt. In one single example, Beer found the cyst of matter between the lens and the anterior portion of its capsule. Mr. Travers has likewise seen an example of suppuration within the capsule, which projected through the pupil in a globular form, and was filled with pus. The case happened in a lad, and had been preceded by a severe blow on the eye. (*Synopsis of the Diseases of the Eye, p.* 206.)

The sixth, and last variety of the capsulo-lenticular cataract, mentioned by Beer, is the well-known case, described by the French under the name of *cataracte barrée*, the *bar-cataract*, and by Schmidt under the appellation of the *cataract with a girth* or *zone.* The case, says Beer, is one of the least frequent. The diagnosis is easy; for, behind the diminished, more or less angular pupil, the cataract can be plainly seen, to which is attached, either in a more or less perpendicular, or horizontal direction, a chalk-white, generally very shining, and thickish kind of bar, or girth, which is closely adherent at both its extremities to the pupillary margin of the uvea, and sometimes reaches, but often only on one side, more or less towards the ciliary processes. The iris is therefore completely motionless, the uvea not being merely adherent to the substance forming what is termed the *bar*, or *girth*, but also closely connected with the whole front portion of the capsule. The perception of light is either very indistinct, or quite lost, and, not unfrequently, the globe of the eye is somewhat smaller, than natural. Beer says, that he has never met with this variety of cataract, except after violent internal inflammation of the eye. He describes the substance, composing the *bar* or *girth*, as being of various consistence, and sometimes firm and almost cartilaginous. In two cataracts of this sort, which he extracted from a boy twelve years of age, he found the *bar*, strictly speaking, ossified, and the capsule, which was nearly cartilaginous, was adherent to a very small, firm nucleus of the lens, though they were yet capable of separation. In a dead subject, Beer also examined such a cataract, in which the outer end of the *bar* scarcely extended to the greater ring of the uvea, but the inner end reached over the ciliary processes to the ciliary ligament, from which latter part it was inseparable. (*Lehre von den Augenkr. B,* 2, *p.* 302.)

OF SPURIOUS CATARACTS.

The most frequent, according to Beer, is what he names the *lymph-cataract.* It is, without exception, the effect of an inflammation, which is chiefly situated in the iris, the lens, and its capsule. Hence, it is frequently combined with a genuine cataract. The nature of the disease may be known from the patient's account, that the present blindness has been preceded by a painful tedious affection of his eye and head: and from an examination of the eye itself, in which the pupil will be found more or less diminished and angular; the iris either perfectly motionless, or nearly so; the eyesight, and even sometimes the perception of light, more or less impeded, or lost, and this not merely in proportion to the quantity of lymph observable immediately behind the pupil, but also in proportion to other morbid effects produced in the organ by inflammation. Lastly, the surgeon may notice directly behind the pupil a plastic lymph, either in the form of a delicate kind of net-work, or of a thick web of a snow-white colour. Sometimes, in this variety of spurious cataract, though very little coagulating lymph appears upon the anterior portion of the capsule of the lens, and what is effused, as well as the lens itself, is almost clear and transparent, yet, the eyesight is considerably impaired; and, on more careful examination of the pupil, something of a dark-brown colour is perceived, which often projects, at several points behind the pupillary edge of the iris, a good way towards the centre of the pupil. In this substance, one may discern, with a good magnifying glass, new vessels extending from those of the uvea, and formed by the previous inflammation, by means of which vessels, this mass, and the delicate layer of lymph, are connected with the capsule of the lens. According to Beer's sentiments, it is only the real lymph-cataract, which rightly deserves the epithet *membranous*, which is sometimes wrongly applied to the *capsular cataract;* for, says he, *the lymph-cataract alone consists of an adventitious membrane*, *formed by inflammation*, of a web of plastic lymph, which may be very thin, and semitransparent, while the lens and its capsule are nearly quite clear, though the patient may be almost or completely blind, when the effects of the inflammation have extended to the choroides and retina.

The *spurious purulent cataract* is much less frequent, than the lymph-cataract. In neglected cases of hypopium *(see this word,)* where the pupil is already quite covered with pus, the greater part of the effused matter is sometimes absorbed, and the pupil can be seen again, but, immediately behind it, a quantity of coagulating lymph can be discerned as in the lymph cataract, sometimes even projecting partly into the anterior chamber, but blended with particles of purulent matter, so as to give it a light yellowish tinge, and a clustered appearance. The pupil is always diminished, adherent to the morbid substance, and angular; the motionless iris projects towards the cornea; and not only the eye-sight, but even the perception of light are completely lost, or the latter at least much diminished.

A rare variety of spurious cataract, described by Beer, is the *blood-cataract.* Either from some considerable injury of the eye, a large quantity of blood is extravasated in the chambers, and, slowly absorbed during the ophthalmy caused by the violence, a part of it, however, remaining in the posterior chamber in the form of small clots, encysted in the lymph, which was effused during the inflammation; or else in the course of a more tedious and neglected case of hypopium, blood is effused in the chambers of the eye, and, not mixing with the pus, still continues in the same form behind the pupil, after the matter has been absorbed. In the first example, this cataract looks like a reddish web, interwoven with silvery streaks, or threads; the pupil, though angular, is seldom contracted; the iris nearly, or quite motionless; and, not only is the light clearly distinguished, but a partial degree of vision sometimes retained. On the contrary, in the second instance, the opacity behind the pupil is very dense, white, studded with reddish, or brownish points, or specks, having a clustered appearance, and frequently projecting through the pupil into the anterior chamber; while the pupil itself is very small, and angular, the iris quite incapable of motion, and generally either no perception of light remains, or only a very confined indeterminate sensation of it. Beer says, that this cataract may easily be mistaken for lymph, and that its differences can only be made out with a good magnifying glass.

The *dendritic cataract* of Schmidt, the *arborescent cataract* of Richter, or the *choroid cataract*, as Beer observes, is not one of the least frequent of the spurious cataracts, and is invariably the consequence of a violent concussion of the globe of the eye, with, or without a wound, whereby a portion of the tapetum of the uvea is loosened, and becomes placed upon the anterior layer of the capsule, more or less resembling in its appearance the arborescent form of the stone termed a dendritis. Immediately after such a concussion of the eye-ball, the patient complains of a serious diminution and confusion of vision. Whoever examines the eye only superficially, will certainly not discern the pieces of the tapetum lying upon the yet perfectly transparent capsule of the lens, for the most careful inspection will be necessary for the purpose, and sometimes the aid of a magnifying glass will be requisite. But, as the lens and its capsule are mostly at the same time loosened from their connexions, they likewise generally become deprived of their transparency, and, as soon as this has happened, the displaced portion of the tapetum can be readily seen. When inflammation ensues, the flakes of the tapetum become closely adherent to the front layer of the capsule of the lens, and even the pupillary edge of the uvea acquires the same kind of connexion, so that the perception of light is diminished. But, says Beer, when inflammation follows, the pupillary margin of the uvea remains free, the iris is perfectly moveable, the light clearly distinguishable, though the lens and its capsule be entirely opaque, and sometimes the flakes of the tapetum resembling the arborescent *streaks* of the dendritis alter in shape, size, and position, but never completely disappear, though they may not closely adhere to the capsule. *(Lehre von den Augenkr. B.* 2, *p.* 303, 309.*)*

A particular case is described by Mr. Guthrie, as more truly deserving the name of *choroid* cataract; it arises without any blow, or concussion of the eye, in consequence of a low, or anomalous inflammation of the iris. The pupil closes nearly to a point, which remains sufficiently free from opacity for sight to take place with the aid of spectacles. "On the subsidence of the inflammation, the iris by the natural efforts of the part, or under the influence of belladonna, is drawn towards its outer circle, or circumference, and the pupil is apparently enlarged; but, the uvea in retracting, does not keep pace with its anterior part, or leaves attached to the capsule of the lens so considerable a portion of its pigment, as to prevent the passage of the rays of light through it, whilst the pupil, at a distance, seems to be of its natural size and blackness." A minute inspection, however, shows that the pupil is nearly closed. Mr. Guthrie adds, that the operation for closed pupil, by division, (the only proper one) is not advisable as long as the patient can see well enough for the common purposes of life. (See *Operative Surgery of the Eye*, *p.* 249.)

Another classification of cataracts, which is of great importance to an operator, is that which is founded upon their consistence; for, as Beer remarks, this makes not only a great difference in the prognosis, but also in the choice of a method of operating.

When the opaque lens is either more indurated, than in the natural state, or retains a tolerable degree of firmness, the case is termed, a *firm*, or *hard cataract*. When the substance of the lens seems to be converted into a whitish, or other kind of fluid, lodged in the capsule, the case is denominated a *milky* or *fluid cataract*. When the opaque lens is of a middling consistence, neither hard, nor fluid, but, about as consistent, as a thick jelly, or curds, the case is named a *soft*, or *caseous cataract*. When the anterior, or posterior, layer of the crystalline capsule becomes opaque, after the lens itself has been removed from this little membranous sac, by a previous operation, the affection is named a *secondary cataract*.

The harder the cataract is, the thinner and smaller it becomes. In this case, the disease presents either an ash-coloured, a yellow, or a brownish appearance: According to Beer, its colour is very dark. The interspace, betwixt the cataract and pupil, is considerable. The patient distinctly discerns light from darkness, and when the pupil is dilated, can even plainly perceive large bright objects. In the dilated state of the pupil, a black circle surrounding the lens is very perceptible. The motions of the iris are free and prompt; and the anterior surface of the cataract appears flat, without any degree of convexity. (*Richter's Anfangsgr. der Wundarzn. p.* 177. 3 *B. Beer, Vol. cit. p.* 309.)

Beer says, that it is only the genuine lenticular cataract, which can be hard, and it is chiefly met with in thin, elderly persons; but, with respect to the opinion, that all cataracts in old persons are firm, he says, this is frequently contradicted by experience. In cataracts, extracted from thin, aged individuals, the lens is sometimes found dwindled, as hard as wood, nearly of a chesnut-brown colour, and with its two surfaces as flat as if they had been compressed. This case has sometimes been denominated the *dark-grey cataract*, and, is very difficult to make out previously to an operation, being liable to be mistaken for an incipient amaurosis. Hence, in order to judge of it effectually, the pupil should always be dilated with hyosciamus, or belladonna.

To the firmish, consistent kind, Beer refers several capsulo-lenticular cataracts, namely, the *encysted*, and *conical*, or *pyramidal cataracts*, that to which he applies the epithet, *dry siliquose*, the *gypsum-cataract* in particular, and the *bar-cataract*, which at least is always partly firm, as well as all the varieties of *spurious cataract*. (*Beer, B.* 2, *p.* 309.)

The fluid, or milky cataract, has usually a white appearance; and irregular spots and streaks, different in colour from the rest of the cataract, are often observable on it. These are apt to change their figure and situation, when frequent and sudden motions of the eyes occur, or when the eyes are rubbed and pressed; sometimes, also, these spots and streaks vanish, and then reappear. The lower portion of the pupil seems more opaque than the upper, probably, because the untransparent and heavy parts of the milky fluid, sink downward to the bottom of the capsule. The crystalline lens, as it loses its firmness, commonly acquires an augmented size. Hence, the fluid cataract is thick, and the opacity close behind the pupil. Sometimes, one can perceive no space between the cataract and margin of the pupil. In advanced cases, this aperture is usually very much dilated, and the iris moves slowly and inertly. This happens because the cataract touches the iris and impedes its action. The fluid cataract is sometimes of such a thickness, that it protrudes into the pupil, and presses the iris so much forward, as to make it assume a convex appearance. Patients, who have milky cataracts, generally distinguish light from darkness very indistinctly, and sometimes not at all; partly, because the cataract, when it is thick, lies so close to the iris, that few or no rays of light can enter between them into the eye; partly, because the fluid cataract always assumes, more or less, a globular form, and therefore has no thin edge, through which the rays of light can penetrate. (*Richter's Anfangsgr. der Wundarz.* 3 *B.* 174, 175.) Mr. Travers believes, that fluid cataracts are rarely contained in a transparent capsule, and his experience has taught him, that this membrane is partially opaque, presenting a dotted, or mottled surface. The opaque spots are most distinguishable when viewed laterally. (See *Med. Chir. Trans. Vol.* 4, *p.* 284.)

According to Beer, a fluid cataract is mostly conjoined with a complete opacity of the capsule: its diagnosis therefore is commonly very difficult, and sometimes its nature cannot be known with certainty, until an operation is undertaken. When the capsule is opaque only in some places, he states, that the following circumstances may be noticed. The cataract lies close to the uvea, and when the patient inclines his head forwards, the cataract presses the iris towards the cornea, and the anterior chamber becomes evidently smaller; but, when he lies upon his back, the cataract recedes in some degree from the uvea. The power of distinguishing the light is unequivocal. When the head is kept quiet for a long time, a thick sediment, and a thinner part can be plainly remarked in the cataract; during which state, that is, while the two substances are undisturbed, the patient can sometimes distinguish large well lighted objects, as through a dense mist; but, when the head, or eye, is quickly moved, these two substances become confused together again, and the cataract again presents a uniform white colour. (*Vol. cit. p.* 312.) It cannot be denied, says Beer, that what is called the *congenital* cataract, and which presents itself in infants soon after birth, when their eyes have been exposed to immoderate light, is not unfrequently fluid; but in such cases, it must not be presumed, that the lens is always in this state; for, in fact, the cataract is often of that sort, which Beer describes under the name of *dry-soliquose.*

Sometimes the opaque lens is of a middling consistence, neither hard, nor fluid, but about as consistent as thick jelly, curds, or new cheese. Cases of this description are termed soft or caseous cataracts. The consistence, here spoken of, may be confined to the two surfaces of the lens, or may exist in its very centre. The first case is the most frequent. The diagnosis is not difficult; for, it always has a light grey, greyish-white, or seagreen colour. When it is far advanced, it quite impedes the eyesight, and sometimes considerably interferes with the perception of light. (*Beer, B.* 2, *p.* 310.) As the lens softens in this manner, it commonly grows thicker and larger, even acquiring a much greater size than the fluid. It is not unfrequent to meet with caseous cataracts of twice the ordinary size of a healthy crystalline lens. The motions of the iris are very sluggish. (*Richter's Anfangsgr. der Wundarzn. p.* 178. 3 *B.*) Indeed, Beer says, that it is sometimes requisite to use the hyosciamus, (or rather belladonna) in order to ascertain, that no adhesions exist between the uvea and the cataract, for, in such cases, the posterior chamber is very often completely abolished, as the more caseous the lens is, the larger it is; and hence likewise the black ring at the edge of the pupil is not at all owing to the shadow of the iris, but entirely to the dark border of the iris at the margin of that opening. According to Beer, the colour of such cataracts is never uniform, but more or less speckled; the spots, however, either have no determinate outline, or they seem like mother-of-pearl fragments, into which the cataract crumbles when extracted, or couched, or else they assume the appearance of clouds. (*Beer, B.* 2, *p.* 311.) According to Mr. Travers, the caseous cataract has a heavy dense appearance, uniformly opaque, a clouded, not a fleecy, whiteness, and sometimes a greenish, or dirty white tinge. (*Med. Chir. Trans. Vol.* 4, *p.* 285.) He further states, that what he terms the *flocculent* or *fleecy*, and the *caseous*, or *doughy* cataracts, are most frequently met with; the *fluid*, or *milky* cases, and those called *hard*, being comparatively rare. (*Op. et loc. cit.*)

In estimating the consistence of cataracts, it is now universally admitted, that their size is a better criterion of it, than their colour; and, "the larger and more protuberant the lens, pressing forwards into the pupil and against the iris, the greater is the certainty of its being soft." (See *Guthrie's Operative Surgery of the Eye, p.* 209.)

As Beer observes, a cataract, which is recent, and has originated suddenly, especially in young subjects, requires much more circumspection, ere an operation is determined upon, than a cataract, which has already existed a long while, and the formation of which has been only gradual, particularly, in an old subject: for, the first case is more frequently owing to a concealed slow kind of inflammation, than is generally supposed. (*Vol. cit. p.* 314.)

Formerly cataracts were denominated *ripe*, or *unripe;* terms, which previously to the time of Mr. Pott, who fully exposed their impropriety, often led to the error of supposing, that every cataract must acquire an increase of consistence with time, a hardness indicated by a pearly colour, and be thereby rendered more fit to be depressed or extracted. "This opinion, (as Mr. Guthrie has observed) founded on the hardness or softness of the cataract, as dependent upon its duration, is contradicted by experience; for, cataracts of fifteen or twenty years' duration, and of a pearly colour, have been extracted perfectly soft, whilst others, of one year's standing and of a milky colour, have been found hard. Neither is the relative state of blindness, under these particular circumstances a more just criterion; patients having been found almost entirely blind with a soft cataract, whilst, through a hard one, they could still distinguish objects and colours." (*Operative Surgery of the Eye, p.* 190.) A cataract was also called ripe, as soon as it was in a state, which would admit of no increase, whether the eye-sight was completely lost or only diminished, and whether the pupil was entirely occupied by it, or not. Thus, says Beer, the *siliquose cataract* in its most advanced stage, never totally fills the pupil, and the patient can sometimes even discern colours; nor does the *floating capsular-lenticular cataract* fill the pupil in a greater degree; and yet both these cases are completely ripe for an operation. On the other hand, to the unripe cataracts belong the *central cataract of the capsule and lens*, the *posterior capsular cataract*, and *the slight degree of lymph-cataract.* Most of these cataracts, after, perhaps, remaining for years in this state, not unfrequently all of a sudden become complete, upon an accidental and slight attack of ophthalmy; but, sometimes, they remain unchanged during life. (*Beer, B.* 2, *p.* 316.)

Another very useful and practical division of cataracts is into those which are called *simple local*, and into others, which receive the name of *complicated.* A *simple local* cataract is so denominated by Beer, when the patient is in every other respect perfectly healthy, and no disease prevails in any other part, however distant from the eye. A cataract may be *complicated* in three ways; for, it may be attended either with other simultaneous disease in the eye itself, or its appendages, when the case is termed a *local complicated cataract;* or there is some other disease prevailing in the system, either unconnected, or connected, with the production of the cataract, which then has the epithets *general complicated* applied to it: or, lastly, both descriptions of complication exist together, the *complete complicated cataract.* According to Mr. Guthrie, *idiopathic* or *constitutional cataract* generally affects both eyes; and the *local* or *accidental* form of the disease is more frequently confined to the organ, that has been injured either by external violence, or active inflammation. (*Op. cit. p.* 190.) However, from my being acquainted with several cases, in which a cataract arose in one eye, without any previous injury or inflammation, and continued many years single, in one case 2 years, I conclude, that the exceptions to a part of the foregoing statement are by no means unfrequent.

Amongst the *local complicated* cases is the *adherent cataract.* The preternatural cohesion may be one of the anterior layer of the capsule with the uvea, produced by effused lymph; it may consist in a very firm connexion of the posterior layer of the capsule with the membrana hyaloidea; or it may be an unusually close cohesion of the whole of the capsule with the lens; or, says Beer, all the three species of adhesion may exist together. (*P.* 318.)

The adhesion of the capsule of the lens to the uvea (synechia posterior) is generally obvious enough; for, as Beer has observed, the pupillary margin of the iris is not completely circular, and is more angular the stronger the light is. The cataract lies close to the uvea, and is very white. The motions of the iris are more or less obstructed, and, when the adhesion is extensive, are quite prevented. The perception of light is indistinct, often very faint, and sometimes entirely lost, for the preternatural adhesion is always the consequence of previous internal ophthalmy, which, besides occasioning opacity of the lens and its capsule, readily produces other serious effects upon the retina, the choroid coat, and vitreous humour, quite adequate to account for the loss of sight, and the incapacity of distinguishing the rays of light. When the anterior layer of the capsule is adherent only at a single point to the uvea, the extent of the adhesion may be readily ascertained by artificially dilating the pupil with hyosciamus, or belladonna; and the information, thus obtained, will have great weight in the selection of a method of operating. (*Beer, loco cit.*)

Some other local complications of cataract are so obvious, that they cannot fail to be understood; as, for instance, its combination with an adhesion of the iris to the cornea (*synechia anterior*); with closure of the pupil, unattended by any adhesion of the uvea to the anterior capsule of the lens (*synechia posterior*); as in watchmakers, and hysterical, or hypochondriacal subjects, the complications with atrophy, hydrophthalmia, cirsophthalmia, specks and scars upon the cornea, pterygium, and various forms of ophthalmy.

According to Beer, the combination of cataract with glaucoma, is also readily made out by any body who has once seen the case; for the cataract always presents a greenish, and sometimes quite a sea-green colour; it is of prodigious size, so as to project through the pupil towards the cornea: the colour of the iris is more or less changed, nearly in the same manner as after iritis; the iris is perfectly motionless; the pupil very much expanded and drawn into angles, for the most part towards the canthi; the lesser circle of the iris is nowhere visible, because it lies concealed under the far-projecting soft cataract, the light cannot be perceived, though the blinded patient is frequently conscious of false luminous appearances within the eye (*photopsia*); and, lastly, the case is invariably accompanied with more or less of a varicose state of the blood-vessels of the eye. The origin of this sort of cataract is constantly attended with severe, obstinate headach.

There are, says Beer, two other local complications, which are much more difficult to learn before an operation. The first is a cataract combined with a dissolution of the vitreous humor (*synchysis*), the diagnosis of which, indeed, when the affection prevails in a considerable degree, is tolerably easy, as the cataract trembles, and the iris always swings backwards and forwards upon the slightest motion of the eye-ball; the globe itself is somewhat affected with atrophy; the eye is quite spoiled, and feels flaccid and unresisting; the sclerotica, immediately around the cornea, is bluish, as in infants; and, the perception of light is uncertain. On the other hand, when the synchisis is not far advanced, the only symptoms are a suspicious softness of the eye-ball, and a swinging of the iris, when the eye is suddenly, or violently moved.

The other complication of cataract, sometimes very difficult to detect previously to an operation, is amaurosis. When, indeed, the pupil is extraordinarily large, the iris nearly, or quite motionless, and the patient cannot distinguish day from night, and, of course, not the least glimmer of light, no great powers of divination are required to predict with certainty, that no operation will restore the eyesight, which is abolished not by the cataract, but by the existing amaurosis. On the other hand, when the motions of the iris are nearly as free as in the natural state, the pupil as small as it usually is in a given degree of light, the patient capable of judging accurately of the strength of the light and yet the cataract conjoined with amaurosis, which, with the exception of the faculty of perceiving the light, completely impedes vision, it is then only by a careful inquiry into the history of the disease, that certain circumstances, attending the origin of the cataract, and indicating in some measure the prevalence of amaurosis, can be traced: sometimes in consequence of one eye being affected with amaurosis, and not with cataract, a reasonable suspicion may be deduced, that the eye with cataract is also amaurotic; yet, says Beer, in such a case, nothing certain can be known before an operation is done.

He considers the general complications of cataract to be as numerous as the diseases of the constitution itself, or as the affections of other organs, besides the eye; but, the most common are scrofula, gout, syphilis, psora, old ulcers of the leg, and an unhealthy constitution.

CAUSES; PROGNOSIS; &c.

Persons, much exposed to strong fires, as blacksmiths, locksmiths, glassmen, and persons, above the age of forty, have been reckoned more liable to cataracts, than other subjects. (*Wenzel.*) In young persons, the disease is, by no means, unfrequent: even children are often affected, and some are born with it. Beer assents to the general correctness of the opinion, that old age is conducive to cataracts, since the disease is most frequently observed in old persons. Yet, says he, that age, nay a very great age, cannot be deemed a regular cause of cataract, is clear from the circumstance of many very old, and even decrepit, individuals being able, with the aid of spectacles, to read the smallest print; and it would seem, that other causes, besides old age, are essential to the production of cataracts; as, for instance, immoderate exertion of the eye during youth, particularly, in such employments as expose the organ to a strong reflected light. (*Lehre von der Augenkr. B.* 2, *p.* 325.)

Amongst the circumstances, which promote the formation of cataracts, Beer enumerates rooms illuminated only by reflected light; and all kinds of work, in which the eyes are employed upon shining, small, microscopic objects, especially when, during such labour, a determination of blood to the head and eyes is kept up by the compressed state of the abdomen, the cataract often seeming to come on more or less quickly with inflammation of the capsule, and lens. And, according to the manifold experience of the same author, one of the most important, though least noticed, causes promoting the formation of cataract, is allowing very strong light suddenly to enter the eyes of a new born, or very young delicate infant, the consequence of which is, that cataracts form more or less quickly with inflammation of the capsule and lens, or remain for life incomplete, as is the case in the central capsular-lenticular cataract. The habitual examination of minute objects, in a depending position of the head, by which an undue proportion of blood is thrown upon the organ, is said frequently to bring on cataracts. (See *Medico-Chir. Trans. Vol.* 4, *p.* 279.) In the majority of instances, true cataracts arise spontaneously, without any assignable cause. Sometimes however, the opacity of the lens is the consequence of external violence; a case, which, more frequently, than any other, gets well without an operation.

Frequently (says a modern writer) the cataract "proceeds from an hereditary disposition, which has existed for several successive generations; while, in other cases, it attacks several members of the same family, without any disposition of this kind being recognizable in their progenitors. Among others, Janin mentions a whole family of six persons, who laboured under this disease. (*Obs. sur l'Œil, p.* 149.) Richter extracted the cataract from a patient, whose father and grandfather had been affected with the same malady, and in whose son, at that period, it had begun to manifest itself. He adds, that he had seen three children, all born of the same parents, who acquired cataracts at the age of three years. (*On the different Kinds of Cataract, p.* 3.) "During my apprenticeship with the late Mr. Hill, of Barnstaple, I was present, when he operated on two brothers, and a sister, all of whom were adults, and who stated, that three or four others of their family were affected with symptoms not unlike those, which they had experienced at the commencement of the complaint. I myself recently operated on two gentlemen advanced in years, who informed me, that they had a brother, on his return from India, who was similarly affected." (See *Adams's Pract. Observations on Ectropium, Artificial Pupil, and Cataract, p.* 101. *London,* 1812.) Beer speaks of families, in which the children all became afflicted with cataracts at a certain age; cases, says he, where an operation, though done by the most skilful practitioner, hardly ever succeeds. (*Lehre von den Augenkr. B.* 2, *p.* 331.)

Long exposure of the head and eyes to the rays of the sun, together with a bent position of the body, as in some kinds of field labour, is reckoned by Beer, a cause promoting the formation of cataracts on the approach of age; also hard labour near strong fires, as near ovens and forges, in glass houses, &c. In England, little credit is given to these opinions.

Beer says, that he has, also, learned from repeated observation, that exposing the eye to the vapour of concentrated acids, naptha, and alcohol will sometimes bring on a cataract; a statement, which will be received in this country with some hesitation, where the vapour of ether has been occasionally recommended for the dispersion of opacities of the lens and its capsule. The dust of lime is also supposed to be conducive to the disease, cataracts being said to be frequent amongst the workmen in lime-pits and kilns. In such cases, I conceive, that the cataract has mostly been the result of inflammation.

Wounds of the eye, where the weapon has pierced the capsule and the lens, and especially violent concussions of the forepart of the globe of the eye, though no wound may exist, are in general followed by a cataract, as an immediate consequence. This is the case, says Beer, even when no inflammation arises from the injury, the cataract often occurring in a few hours, and in so considerable a degree as not to admit of being mistaken.

The cause of cataract, thus rapidly produced, must depend, in Beer's opinion, upon the complete separation of the lens, from its connexions with the capsule, and not unfrequently in part upon the detachment of the capsule itself from the neighbouring textures; for, in such cases, this membrane also gradually becomes opaque.

According to Beer, cataracts frequently arise from a slow, insidious, inflammation of the lens and its capsule.

With respect to the prognosis, it must be evident from what has been premised, that there are many cataracts, in which the cure is highly problematical, and others, in which the impossibility of restoring vision, even in the slightest degree, may be predicted with absolute certainty.

With the little positive information, which surgeons possess concerning the causes of cataracts, scarcely any expectation can ever be entertained of curing opacities of the lens and its capsule, by means of medicine, so as to supersede all occasion for an operation. A possibility of success, as Beer remarks, can exist, only when the cause of the cataract is ascertained, admits of complete removal, and the disease is in an early stage. And, he has learned from manifold and repeated trials, that the attempt to cure an incipient cataract will never succeed, except when some determinate and obvious general or local affection of a curable nature has had a chief share in the production of the disease of the eye; as, for instance, scrophula in a mildish form, syphilis (?) and the sudden cure of eruptions, or old ulcers of the legs, (?) or a slow insidious inflammation of the iris and capsule of the lens. In some examples of this kind, Beer could only check the further progress of the cataract, and, even when the eyesight was improved, it was never rendered perfectly clear. And, when the cataract was far advanced, and quite developed, with the exception of the general melioration of the health, and an improved state of the eye, whereby it was put in a better condition for the operation; not the slightest benefit was derived from medicine. (*Lehre, &c. B.* 2. *p.* 333)

In this country, no faith is put in these notions, respecting the constitutional influence of rheumatism, gout, scrofula, syphilis, &c. in the production of cataracts, except where such general disorders directly excite inflammation of the eye, and opacity of the lens or its capsule is brought on as a consequence of such inflammation. Indeed, Mr. Guthrie maintains, that scrofulous inflammation is rarely propagated to the interior of the eye, and that strumous subjects are not more subject to cataract than other individuals; an opinion, in which I perfectly coincide. He also remarks that there is no evidence of syphilitic patients being particularly liable to cataracts, and this, even when they have suffered severely and frequently. In short, he absolutely denies the power of this and other constitutional diseases to promote the formation of an opacity of the lens and its capsule, unless inflammation of the eye be excited by them: (see *Operative Surgery of the Eye, p.* 191) a sentiment, which, I think, is consonant to every fact revealed to us by daily experience.

The principal external remedies that have been tried for the cure of the cataract, are, bleeding, cupping, scarifications, setons, issues, blisters, and fumigations; and the chief internal remedies are aperients, emetics, cathartics, sudorifics, cephalics, and sternutatories. Formerly, preparations of eye-bright, millepedes, wild poppy, henbane, and hemlock, were credulously extolled, as specifics for the disorder.

Scultetus asserts, that he checked the progress of a cataract, by applying to the eye the gall of a pike, mixed with sugar; and Spigelius boasted of having successfully used, for this purpose, the oil of the eelpout (*mustela fluviatilis.*)

Cataracts are said to have been cured in venereal patients, while under a course of mercury. Probably, however, many such cases might have been mere opacities of the cornea, or, at most, only transient opacities of the capsule, or depositions of lymph in the posterior chamber, the consequence of existing, or previous inflammation. Wenzel placed no reliance whatever on the power of any remedies to dissipate a cataract, and, as he had remarked their inefficacy in numerous instances, he felt authorized in declaring, that internal remedies, either of the mercurial, or any other kind, are inadequate to the cure of this disorder; and equally so, whether the opacity be in the crystalline, or in the capsule, whether incipient, or advanced.

Although the late Mr. Ware coincided with Wenzel, and Beer, in regard to the uncertainty of all known medicines to dissipate an opacity, either in the lens, or its capsule, or even to prevent the progress of such opacity, when once begun, yet according to his observations, many cases prove, that the powers of nature are often sufficient to accomplish these purposes. The opacities, in particular, which are produced by external violence, Mr. Ware had repeatedly seen dissipated in a short space of time, when no other parts of the eye had been hurt. In such cases, the crystalline lens is generally absorbed, as is proved by the benefit, which is afterwards derived from very convex glasses. In some of these cases, though the crystalline had been dissolved, the greater part of the capsule remained opaque, and the light was transmitted to the retina only through a small aperture, which had become transparent in its centre. Instances are also recorded, in which cataracts, formed without any violence, have been suddenly dissipated in consequence of an accidental blow on the eye. The remedies, which Mr. Ware found more effectual than others, were the application to the eye itself of one, or two drops of æther, once or twice, in the course of the day, and occasionally rubbing the eye, over the lid, with the point of the finger, first moistened with a weak volatile, or mercurial liniment. While Mr. Guthrie admits, that opacities perceptible behind the iris, have been cured under a course of medicine, he considers such events very rare, and to have been accomplished only when the opacity arose from slight depositions in the capsule, the result of simple inflammation, rather than from any affection of the crystalline itself. A haziness of the capsule, caused by the extension of inflammation of the iris to it, he says, may almost always be relieved under the treatment proper for the cure of iritis; but, he does not believe, that an opacity of the lens, distinctly discerned to be such, has ever been removed by medicine. He expresses his decided opinion, that if any lenticular cataracts have really been cured, they were caused by external violence, and disappeared in consequence of their dissolution in the aqueous humour, and the action of the absorbents, the opacity of the lens having been the result of a rupture of its capsule. Mr. Ware, who at one time, supposed incipient cataracts might be cured by spirituous applications, and particularly the sulphuric æther, latterly abandoned the opinion; and it would seem from a note in the third edition of his book on the cataract, that the cases he published in the first and second, and as proceeding from an external injury, were of the latter description. (*Guthrie's Operative Surgery of the Eye, p.* 250.) In short, the operation is now regarded as the only means, affording any rational hope of restoring the eye-sight of patients afflicted with cataracts.

Notwithstanding also the perfection, to which the operation, with all its different modifications, is really brought, its performance will not always re-establish vision; nay, says Beer, it is frequently counterindicated; and, even in favourable cases, the result of the operation is exposed to so many contingencies, that it is rather a matter of surprise, that, on the whole, so much success should attend it, as is found to happen.

When an operation for a cataract is done apparently under favourable circumstances, and its event is unexpectedly very incomplete, or quite unsuccessful, surgeons in vain ascribe the failure to the particular method of operating, which they have hitherto adopted, and uselessly abandon it for another; because none of these methods, including that which is preferred, brought to the highest state of perfection possible, can be applicable to all cataracts. But, says Beer, the reason of the ill success is generally rather owing to the operation not having been indicated, or to a mode of operating, not well calculated for the particular case, having been selected. He ridicules the idea of adhering exclusively to any one plan of operating; and whenever the question was put to him, "what is your plan?" he answered, that his custom was to operate in the manner, which appeared to him the best adapted to each particular case, about which he was consulted. A surgeon should be able to distinguish, first, the cases of cataract, in which an operation may be done with the best chance of success; secondly, the examples, in which the prognosis is more or less doubtful; and, lastly, the cases, in which there is a great probability, or an absolute certainty of the operation failing, in which last circumstance the practice is prohibited.

According to Beer, the result of an operation will probably be favourable; 1. When the cataract is a genuine local complaint, perfectly free from every species of complication. 2. When the conformation of the eye and surrounding parts is such, as to allow whatever method of operating may be most advantageous for the particular case, to be done without difficulty. 3. When the patient is intelligent enough to behave himself, in a manner, which will not disturb the precision and safety of the requisite proceedings in the operation, or the subsequent treatment. 4. When the operator, not only possesses all requisite medical and surgical knowledge in general, but is capable of judging correctly, what method of operating suits the particular case; and when besides he has derived from nature and acquirement such mental and corporeal qualities, as are essential to a skilful operator on the eye: viz. an acute eye-sight, a steady, but light, skilful hand, excellently qualified for mechanical artifice in general; long, pliant fingers; a delicate touch; a certain tenderness, in the scientific treatment of this particular organ; complete fearlessness; invincible presence of mind; and proper circumspection. 5. When the requisite instruments are not too complicated; but well adapted to the purpose, and in right order. 6. When the domestic condition of the patient is such as not to occasion any particular disadvantages during, or after the operation. Yet, says Beer, even with this fortunate combination of circumstances, uniform success must not be expected; for, a patient, whose sight is quite prevented by this disease, and who previously to its origin, was already far-sighted, will be still more so after the removal of the diseased lens, and in order to see distinctly, the most common objects, which are near, he will be obliged constantly to employ suitable glasses. An individual of this description, though the operation be done with great success, is apt not to be satisfied. But, such patients, as were short-sighted previously to the formation of their cataracts, are more pleased with the restoration of vision; as, before the operation, their eye-sight was much less, than what it is now, and in general they can lay aside the glasses, which they formerly made use of, without having occasion for any others. Lastly, as Beer remarks, although patients, who, before the origin of their cataracts, were neither far nor short sighted, are sensible of the important benefit of an operation, inasmuch as they now plainly discern all objects again, yet they are usually obliged to employ spectacles in reading, writing, or doing any kind of fine work.

On the other hand, the result of an operation Beer considers always more or less doubtful; 1. When the cataract is only locally complicated, as, for instance, with pterygium, which may not form any absolute reason against the experiment. 2. When the conformation of the eye and surrounding parts, causes several hinderances to the operator; as is the case, when the eye is small, and deep in the orbit, and the fissure of the eye-lids very narrow. 3. When the patient is either very stupid, and obstinate; rough-mannered; particularly timid; or badly fed. 4. When the surgeon knows how to operate only in one way, in which, perhaps, he has also not had sufficient experience, and when possibly he is also deficient in the qualities specified above, as essential to a good operator on the eyes. 5. When the instruments are bad. 6. When in the patient's domestic affairs, there are any circumstances, which cannot be removed, and are likely to have a bad effect upon the operation, as an unwholesome, damp room, great uncleanliness, &c. 7. When the origin of the cataract was attended with repeated, or tedious head-ach, though this may have subsided a long while. 8. When the patient is particularly subject to catarrhal and rheumatic complaints, especially affecting the eyes. 9. When the patient has often had, or still labours under an attack of erysipelas, notwithstanding the parts inflamed be remote from the eye. 10. When the patient's skin is peculiarly irritable. 11. When in his childhood, or youth, he has been frequently afflicted with convulsions, or epileptic fits, though these complaints may have ceased many years. 12. When there is the least tendency to certain constitutional diseases, scrophula, gout, syphilis, &c. Gout, however, does not always make an operation fail, as we learn from Mr. Travers, who, in three cases, extracted the cataract from gouty subjects, and, though a smart attack of the disease followed the operation, the eyes were unaffected, and the sight was well recovered. (*Synopsis of the Diseases of the Eye, p.* 297.) 13. When the patient's habit is bad, though not affected with any definite disorder. 14. When the patient in his youth has often been troubled with attacks of ophthalmy. 15. When he cannot perceive the different degrees of light, and correctly describe them, while nothing to account for this state can be detected in the eye itself. 16. The result of an operation is always very doubtful, when there is the slightest tendency to hysteria, or hypochondriasis. 17. When the patient is subject to violent mental emotions, mania, &c. 18. When the eye to be operated upon can still discern things, however feebly: a state, which generally produces an involuntary resistance to the necessary measures in the operation. 19. When the cataract is the consequence of a wound, though free from complication. 20. When the patient is in the state of pregnancy. 21. When one eye has been already destroyed by suppuration. 22. And lastly, when one eye has already been operated upon without success by a man, whose professional judgment, skill, and caution, are unquestionable.

According to Beer, the result of the operation will be more or less unfavourable; 1. When the patient is affected with gutta, or acne rosacea, not the effect of hard drinking, but rather of scurvy. 2. When evident traces of some general disease of the constitution are present. 3. When the patient has been ill, and is only yet convalescent. 4. When any other disease, though not constitutional, is present. 5. When the cataract is adherent for a considerable extent to the uvea, or an incurable, though not very severe chronic inflammatory affection of the eye-lids, or eye-ball, prevails, as, for instance, an habitual inflammation of the Meibomian glands; ectropium of the lower eye-lid; the remains of a pannus; or, a strong aversion to light.

Lastly, as Beer observes, every operation must fail, when the cataract is manifestly joined with complete amaurosis, a dissolution of the vitreous humor, dropsy, or atrophy of the eye, some species of ophthalmy, glaucoma, or a general varicose affection of the blood-vessels of the eye.

The capacity of distinguishing light from darkness; and, in a shady place, where the pupil is not too much contracted, of perceiving bright colours and the shadows of objects, is, as Scarpa has particularly noticed, a very important desideratum in every case, selected for operation.

The power of distinguishing light from darkness, is even more satisfactory, than motion of the iris. I saw many years ago, in St. Bartholomew's and the York hospitals, several cases of complete gutta serena in both eyes, in which there was the freest contraction and dilatation of the pupils. Had such patients been also afflicted with cataract (a complication by no means unfrequent), and a surgeon, induced by the moveable state of the iris, had undertaken an operation, it must of course have proved unavailing, since the rays of light could only have been transmitted to an insensible retina. Richter, and Wenzel, make mention of these peculiarities, and the latter refers the phenomenon to the iris deriving its nerves wholly from the lenticular ganglion, while the immediate organ of sight, is constituted entirely by another distinct nerve. Hence, motion of the iris is not an infallible criterion, as authors have stated (*Wathen*), that the retina is endued with sensibility. Relating to this subject, Mr. Lucas has made a curious remark: he attended, in conjunction with Hey and Jones, five children of a clergyman at Leaven, near Beverley, who were all born blind. He writes, "None of them can distinguish light from darkness, and although the pupil is in common, neither too much dilated nor contracted, and has motions, yet these do not seem to depend upon the usual causes, but are irregular." (*Med. Obs. and Inq. Vol.* 6.)

The reciprocal sympathy between the two organs of sight, is so active, that no one, solicitous to acquire either physiological or pathological knowledge respecting them, ought, for a moment, to forget it. Hence, in the examination of cataracts, it is of the highest importance to keep one eye entirely secluded from the light, while the surgeon is investigating the state of the iris in the other; for, the impression of the rays of light upon one eye, sensible to this stimulus, is known to be often sufficient to produce corresponding motions of the iris in the opposite one, although in the state of perfect amaurosis. In other examples of cataract, the pupil may be quite motionless, and yet sight shall be restored after the performance of an operation. (*Wenzel.*) There are two circumstances, however, which may prevent us from ascertaining, whether the retina is sensible to light or not: the first is, a circular adhesion of the crystalline capsule to the iris. Here Richter thought, that some opinion might be formed of the nature of this case, by observing the distance between the cataract and pupil: inferring, that when the space, between the pupil and opaque lens, was inconsiderable, such an adhesion had happened; and, when the cataract did not seem particularly close to the pupil, and yet the patient could not discern light from darkness, that it was complicated with amaurosis. The second circumstance, sometimes utterly preventing the ingress of any light to the healthy retina, is the round bulky form of the cataract.

But, although the power of distinguishing light from darkness is more satisfactory, than motion of the iris, it is not an unequivocal test of the retina being perfectly free from disease. While the gutta serena is incomplete, the patient can yet distinguish light, and the shadows of objects. Dilatation of the pupil is, also, a deceitful criterion of the complication of gutta serena with the cataract. When the cataract is large, or adherent to the iris, the pupil is frequently much dilated, though the optic nerve may be natural and sound: the pupil often continues quite undilated in a perfect gutta serena. (*Richter.*)

From all this it must be manifest, 1st, that the irregularity, and inconstancy of the symptoms of gutta serena, together with the possibility of particular states of the cataract rendering the patient utterly unconscious of the stimulus of light, make it necessary for the surgeon to be particularly attentive to the appearance, and to the history of the origin and progress of the disease, in order to understand the real condition of certain causes. 2dly. That, when the patient can distinguish light from darkness, though the iris may be motionless, there is good ground for trying an operation. Possibly, in this circumstance, an incipient *amaurosis* may exist, but, the *chance of* the defect of the iris arising from other causes; the *certainty*, that the opaque body *must* be removed from the axis of sight, (even if the disease of the retina be cured,) ere sight can be restored; and the *improbability*, that an operation to cure the cataract, will render the other complaint at all less remediable; fully justify the attempt. Frequently, the patient has a full-formed cataract in one eye, which presents the signs of amaurosis, while an incipient cataract, or one as much advanced, exists in the other, which, at present, is free from these symptoms: in this case (says Mr. Travers,) the cataract of the latter should be removed, without delay. (*Synopsis, &c. p.* 314.)

The concurrent testimony of almost all writers upon the subject tends to prove that the restoration of sight has sometimes been effected in the most hopeless cases, and I am therefore, of opinion with Mr. Lucas, that in all doubtful cases, an operation should be tried as a remedy, by no means violent or hazardous. (*Med. Obs. and Enquiries, Vol.* 6, *p.* 257.)

I shall conclude this part of the subject, with annexing the sentiment of Mr. Travers, viz. that it would be incorrect to say, that the operation is unadvisable in all cases of cataract, in which the patient has no sense of light; for, it is possible, that the density of the lens may be such as absolutely to exclude the light, and that the motions of the iris may be therefore suspended; or from some degree of pressure of the lens, or adhesion of the uvea to the capsule, that the pupil may be undilated, and the circumference of the lens permanently covered. But, undoubtedly, says Mr.

Travers, a case of this description is unpromising. "A strong sense of light, by which at least to know the direction, in which it enters the apartment, to be sensible of its falling on the eye, and of a shade, as the hand for example, intercepting it, with a corresponding freedom of motion of the pupil, is the most favourable state for the operation." (*Synopsis of the Diseases of the Eye, p.* 315.)

As it not unfrequently happens, that cataracts, produced by external violence, spontaneously disappear, (*Pott, Hey, &c.*) the operation should never be too hastily recommended for them.

Respecting the question, whether an operation ought to be done, when only one eye is affected with cataract, and the other is sound, some difference of opinion prevails.

One reason assigned by the condemners of this practice, viz. that one eye is sufficient for the necessities of life, is but of a frivolous description; and, another, that the patient would never be able to see distinctly after the operation, by reason of the difference of the focus in the eyes, is, (I have grounds for believing) only a gratuitous supposition, inconsiderately transmitted from one writer to another. In support of what I have here advanced, and to prove that success does sometimes, probably in general, (if no other causes of failure exist,) attend the practice of couching, and extraction, when only one eye is affected with a cataract, I refer to a case reported by Maitre-Jan. (*Traité des Maladies de l'Œil. Edit. Paris,* 1741, 12*mo. Obs. sur une Cataracte laiteuse, p.* 196.)

Baron Wenzel was in the habit of extracting cataracts with the most successful result, when only one eye was affected with the disease, as may be learnt by referring to the cases here specified. (*Cases* 6, 13, 16, 19, 22, 25, 29, 30, 31, 34, &c. *Treatise on the Cataract.*)

Richter was formerly convinced, that the advice not to operate, when there is a cataract only in one eye, ought, for several reasons, to be disregarded; he reminds us of the wonderful consent between the eyes, so that one is seldom diseased without the other, sooner or later, falling into the same state; and hence he questions, whether it may not be possible to prevent the loss of the sound eye by a timely operation? *An non caveri possit jactura integri oculi tempestive extrahendo cataractam prioris?* (*Obs. Chir. Fascic.* 1.) He adverts to the remarkable case related by St. Ives, where a man was wounded in the right eye by a small shot, and, shortly afterwards, had a cataract in it; he then gradually became blind in the left, but soon recovered his sight in it, after the cataract had been extracted from the right one. Here let us notice, that St. Ives (*Maladies des Yeux, Chap.* 15, *Art.* 3.) makes no mention of any confusion in vision, in consequence of the different refracting powers of the two eyes in question. From some modern publications, indeed, it would appear, that in a few instances, an incipient cataract in one eye has actually disappeared of itself, after the operation had been performed for a complete one in the other. (*Carmichael in Med. and Physical Journ. Vol.* 19, *and Stevenson in Edinb. Med. and Surg. Journ. No.* 77, *p.* 521.) This is a circumstance, which is urged by the latter gentleman, not only as a strong reason for disregarding the common opinion, that a cataract should never be operated upon while the other eye enjoys useful vision, but as a powerful motive for doing the operation even at an early period, so that, if there be no cataract in the other eye, the operation may be the means of preventing its formation, or, if it be already beginning, the chance of its dispersal by the effect of the removal of the other cataract may be taken. In the *Medical and Physical Journ.* for May 1808, is also an ingenious paper defending the practice of operating when only one eye is affected. Another reason, judiciously assigned by Richter, (*Obs. Chirurg. Fascic.* 1.) for disregarding the above precept, is, that in waiting until a cataract forms in the other eye, the existing one, which is at this moment, perhaps, in the most favourable state for the operation, may soon change so much for the worse (for instance it may contract such adhesions to the iris), as either to destroy all prospect of relief, or, at most afford but a very precarious and discouraging one. The length of time necessary to wait is also uncertain and tedious. I once saw a man in St. Bartholomew's Hospital, who had had a cataract in one eye fifteen years, during all which time the other continued quite sound; and another case of twenty years' standing has lately been communicated to me. It is right to state, that Richter latterly inculcated a contrary opinion to what he formerly espoused, yet, without specifying the particular facts which induced him to revoke his former sentiments. The principal reason stated by him is, that the patient, not only does not see much more acutely with the two eyes after the operation, than with one before it, but, he frequently sees more confusedly, because the eye that has been operated on, cannot see well without the aid of a glass, which, perhaps, the sound one does not require. (*Anfangsgründe der Wundarzn, Dritter, B. p.* 199.)

When I remember that no cases are adduced by this author to contradict the rationality of his former sentiments; when I also reflect upon the facts recorded by Maitre-Jan, St. Ives, and Wenzel; when I contemplate, that Callisen mentions, as the feeble ground of his adopting the common opinion, that, in one single instance of this description, he was unsuccessful, without particularizing from what immediate cause the failure arose; there appears to my mind strong cause to believe, that the advice, not to operate, when there is only one cataract, and the other eye is perfect, is at least a subject which merits further investigation. Warner's objection is similar to that specified by Richter: he writes, "the eye, from which the crystalline lens is removed, cannot be restored to a degree of perfection at all equal to that of the sound eye, without *the assistance of a convex glass:* (*Description of the Human Eye and its Diseases, p.* 85,) but, is not the power of using both eyes at the same time, even with the inconvenience of being necessitated to employ a glass for the purpose, preferable to being blind of one? The cases quoted, at all events prove, that confusion in vision, is not always the result of the practice: whether the fact is concordant with the modern theory of vision, is entirely another consideration; if it should be found incompatible with it, we must infer, that our knowledge of optics still continues imperfect; not that such well attested examples as some alluded to, are unworthy of belief.

When there is a fully formed cataract in one eye, and vision is retained in the other, Mr. Travers thinks the postponement of the operation wrong. "I am satisfied (says he) that the cataractous eye, if it becomes the subject of an accidental inflammation, is strongly disposed to go into amaurosis; and, further, that the retina loses its vigor by the permanent exclusion of light. I speak from repeated observation of the fact. The objection to the operation on the ground of inconvenience, arising from the difference of focus of the two eyes, when one only is the subject of disease, is trivial, and a consideration altogether subordinate: such a defect may always be remedied by glasses properly adjusted. In several cases of amaurosis, ensuing upon cataract, I have been disposed to regard the change in consistence and volume of the lens, as productive of a destroying inflammation; in others, of a partial absorption of the vitreous humor." (*Synopsis of Diseases of the Eye*, *p.* 313.)

For some decided information on the foregoing interesting question, I have referred to Beer; but he seems not to have entered into its consideration at all. The only instance, in which he approaches the subject, is, when he notices the custom of covering the eye, which yet possesses more or less vision, when the other alone has a cataract in a fit state for an operation. (*Lehre von den Augenkr. B.* 2, *p.* 351.)

The reason, which has induced me to allot so much space for the consideration of the question, whether an operation should be undertaken, when only one eye is affected, is a conviction of the importance of the decision made about it. Were I to judge only from what has been said by writers, I should be confident, that a determination in the negative must be erroneous; but, when I know, that my experienced and judicious friend Mr. Lawrence joins in the belief, that the practice is not productive of advantage, the only inference, which I venture to make, is, that the subject deserves further experiment.

Mr. Guthrie even declares, that he has met with several cases, "in which great inconvenience was sustained from the confusion of vision caused by a successful operation;" and in one instance, the patient actually wished him to destroy the sight gained by the operation. He therefore joins in the opinion that the operation should not be attempted on one eye while the other is sound. (*Operative Surgery of the Eye*, *p.* 258.)

On the other hand, however, we have the evidence of Dr. Andrew Smith, a gentleman whose observations appear to be deduced from considerable experience in the ophthalmic hospital at Chatham. He admits, that a slight degree of double vision does occur for a short time after the lens has been extracted. In cases where the lens was broken up, however, this casual imperfection did not occur, as before the lens was absorbed, the eye became accustomed to its privation. "The following (says he) were the remarks I made on the cases, in which extraction was performed. Three saw objects double when the bandage was first removed, and for nearly twenty-four hours; and then singly. Two saw double for about three hours; and one of them, two days afterwards, upon being surprised, and opening his eyelids suddenly, experienced for a few seconds the same imperfection. A sixth saw constantly double for four days, and after that as distinctly as ever he did; and the other three cases, as above remarked, always single." (*Edinb. Med. and Surgical Journ. No.* 74, *p.* 14.) On the whole, I consider this question, which is a very important one in practice, by no means decidedly settled; and, as far as the evidence of various writers upon it extends, I think those who are in favour of operating upon a cataract, though the other eye is sound, have the best of the argument.

When there are cataracts in both eyes, most authors are of opinion that there is no reason, why one should not be operated upon immediately after the other. As, however, the ophthalmy is likely to be more severe, *cæteris paribus*, when both eyes are operated upon at the same time, Scarpa, who gives the preference to the needle, disapproves of this mode of proceeding, and assures us, that, in patients with cataracts in both eyes, his experience has taught him, that it is by no means advantageous to operate upon one immediately after the other; but that it is better to wait till one eye is well, before any attempt is made upon the other. (*Saggio di Osservazioni*, *&c. p.* 255.)

On this point, the following is Beer's sentiment:—When cataracts are completely formed in both eyes, the patient willing, and every thing promises a favourable result, both eyes may be operated upon at the same time. On the contrary, when any circumstances are present, which render the event of the operation very doubtful, it is most advisable to make the attempt only on one eye, even though the patient absolutely wish more to be done, so that if the first operation should fail, but the complication of this cataract afterwards change considerably to the advantage of the patient, one eye would still be left for a second more favourable attempt. (*Lehre von den Augenkr. B.* 2, *p.* 350.)

With regard to this question, I should say with Mr. Guthrie that if I were the patient myself, I should always prefer to have the operation done only on one eye in the first instance.

Some years ago, it was the common doctrine, that no operation should be undertaken for a cataract, before the patient had attained the age of docility and reason, and, in a point of view, abstractedly surgical, there can be no doubt of the rectitude of such advice; but, when it is further considered, how essential sight is to the acquirement of education; that youth is the condition best adapted for this indispensable pursuit; that when the child's head is steadily fixed, the needle admits of being employed; that, with the aid of an assistant, this object can most effectually be accomplished; that, when the operation is delayed, the cataract may acquire adhesions; that, persons have not only had cataracts successfully depressed or broken, at a very early age, but with the assistance of a *speculum oculi*, have even had them extracted, (see *Ware's Note*, *p.* 90 *of Wenzel's Treatise*,) which is universally acknowledged to be a far more difficult process; and that the pupil of the eye, in a young subject, is nearly as large as in an adult; (*Warner's Description of the Human Eye and its Diseases*, *p.* 34,) I cannot help thinking with Mr. Lucas, that after a child is old enough to bear an operation, the attempt to cure a cataract with the needle *may be proper* at any age. Surgeons do not refuse to operate for the hare lip, as early as two years of age, or even earlier; they do not not wait for docility and reason in the patient, to make him manageable, and sensible of the propriety of submitting quietly to the performance of the operation; they render him tractable by force, and thus they wisely succeed in making perhaps, with more certainty, than reliance upon the fortitude of any human being would afford, a very precise incision, such as the nature of the operation demands; and, why should they refuse to attempt the cure of cataracts, in children, when the motives are more urgent, and it is equally in the power of art to substitute means, quite as effectual as docility and reason in surgical patients? What experienced operator would trust to these qualities, when he undertakes any grand operation, even on the most rational and firm adult? (*Critical Reflections on the Cataract*, 1805.)

Of late years, the attention of surgeons has been much drawn to the subject of operating on the cataracts of children, and the propriety of the practice seems to be now firmly fixed on the basis of experience. It is even ascertained, that the needle may be successfully employed on children of the most tender age. The late Mr. Saunders, surgeon to the London Infirmary for curing diseases of the eye, may be said to have had the principal share in promoting the adoption of this important improvement. His practice confirmed, what reason had long ago made probable, and the judgment, tenderness, and skill, with which he operated, on the eyes of infants, as well as those of adults, were followed by a degree of success, which had never been previously witnessed, and which infused quite a new spirit into this most interesting branch of surgery. Subjects from eighteen months to four years old, received most benefit from Mr. Saunders's operations; and, if any intermediate time be selected, Dr. Farre (the editor of this gentleman's publication) is inclined to recommend the age of two years. "The parts have then attained a degree of resistance, which enables the surgeon to operate with greater precision, than at an earlier period; yet, the capsule has not become so tough and flexible, as it does at a later period, after the lens has been more completely absorbed.

"But, this is not the greatest, although a considerable advantage of an early operation; for, in cases, in which the patient has no perception of external objects, the muscles acquire such an inveterate habit of rolling the eye, that, for a very long time after the pupil has been cleared by an operation, no voluntary effort can control this irregular motion, nor direct the eye to objects with sufficient precision for the purpose of distinct and useful vision. The retina too, by a law, common to all the structures of an animal body, for want of being exercised, fades in power. Its sensibility, in many of the cases, cured at the ages of four years, and under, could not be surpassed in children, who had enjoyed vision from birth; but, at eight years, or even earlier, the sense was evidently less active; at twelve, it was still more dull; and from the age of fifteen and upwards, it was generally very imperfect, and sometimes the mere perception of light remained. But these, observations do not apply to those congenital cataracts, in which only the centre of the lens and capsule is opaque, the circumference being transparent, for, in those, the retina is exercised by a perception, although an imperfect one, of external objects, the motions of the muscles, which direct the globe, are associated, and an absorption of the lens does not take place: therefore, in this variety of the disease, the argument in favour of an early operation, is not so much a medical, as a moral one—it is preferable for the purposes of education and enjoyment." (*Saunders on Diseases of the Eye*, *p.* 153, 155.)

Besides Mr. Saunders, several other surgeons of the present day have become zealous advocates for operating upon the cataracts of children. Even Mr. Ware, before his death, strongly recommended the use of the needle in the congenital cataract of infants and children. His mode of operating, I shall hereafter notice. The late Mr. Gibson, of Manchester, likewise urged the propriety of couching young subjects, and fixed on the age of six months, as preferable to that of two years. "Whatever objections (says he) have been urged against the safe and effectual use of the couching-needle in infants, have always appeared to me so slight, and so easily surmountable, that, without inquiring particularly into the real state of the question, I have long concluded, that the same motives, which would induce an operator to couch a cataract at any period of adult life, would equally lead him to perform that operation at any earlier period, when a cataract existed. Acting upon this presumption, *I have operated upon children of all ages, for ten years past.*" (See *Edinb. Med. and Surgical Journal*, *Vol.* 7, *p.* 394.)

Mr. Gibson's paper being dated June, 1811, we are of course given to understand, that he pursued this practice from the year 1801, and he asserts, that his experience had embraced a considerable number of cases.

"In performing the operation of couching infants, it has always appeared to me, (says this gentleman,) that the advantages to be gained by restoring vision at so early a period, are so important, as to bear down any obstacles which may occasionally be opposed to the safe use of the needle. Even the risk of deranging the figure of the pupil forms no solid objection to its use; and may always be avoided by steadiness and good management. Should even a slight change in its figure be produced, it is seldom in the least detrimental to distinct vision, and can scarcely be considered a blemish in the eye of any one; except, perhaps, in that of a geometrician; who may easily reconcile to himself the presence of an oval opening, where one of a circular form should exist. It may farther be observed, that, if an operator cannot depend upon his management of the eye, so as to render it steady by the introduction of the couching needle, he can avail himself of the assistance of a speculum to restrain its motions.

"The following observations will apply principally to infants under twenty months old. The advantages, which an operator possesses, in operating upon a child of this age, as compared with a child of three years old, or upwards, are important. An infant is not conscious of the operation intended: it is free from the fears created by imagination, and can oppose very feeble resistance to the means employed to secure it with steadiness. At an early age, it has not acquired the power of retracting the eye deep in the socket, so that the operator has always a good prospect of introducing the couching-needle with ease by watching a proper opportunity. The eye has not, at this time, acquired the unsteady rolling motion, which, after a few years, is so common and remarkable in children born blind, or reduced to that state soon after birth. So that this impediment to the easy introduction of the needle does not exist in infants a few months old. The operator also has it in his power to administer a dose of opium, sufficient to render the steps necessary to expose the eye, almost entirely disregarded by his patient. With respect to the state of the eye itself, but, particularly, that of the cataract, this is more favourable for the operation, than at any future period of life. *In infants, the cataract is generally fluid*, and merely requires the free rupture of its containing capsule, which is in that case generally opaque. The capsule, however, is tender, and easily removed by the needle, so as to leave an aperture sufficiently large for the admission of light. The milky fluid, which escapes from the capsule, is soon removed by absorption. If, on the other hand, (says Mr. Gibson) the cataract should be soft, it is generally of so pulpy a softness, that the free laceration of the anterior part of its capsule, and the consequent admission of the aqueous humor, ensure its speedy dissolution, and disappearance, without the necessity of a second operation. Should the cataract happen to be hard, there will be no more difficulty in depressing it, than in an adult.

"The advantages (says Mr. Gibson) which an operator will possess, when he attempts the removal of a cataract in a child of a few months old, are peculiar to that period. In proportion as the age of the patient advances, until he arrives at the age of discretion, and can estimate, in some measure, the value of sight, by feeling its loss, the difficulties, opposed to the use of the couching needle, increase. His fears of the operation, the unsteadiness of the eye, and his power of retracting it within the orbit, present considerable, but not insuperable obstacles; such, however, as every surgeon would willingly dispense with, if he had it in his power.

"Before an operation, at an early age is recommended, the practitioner ought (as at any other age) to ascertain, that the cataract is not complicated with a defective state of the retina, or with a complete amaurosis. Such cases are by no means uncommon. Some years ago, I recollect to have seen five or six children, the families of two sisters, who were all totally blind, and in an idiotic state, with cataracts accompanied by amaurosis." (*Gibson Op. et loco cit.*)

I find also in this gentleman's paper, some arguments, which have been repeated in Mr. Saunders's work. "Few practitioners, at all conversant with cases with blindness from birth, will deny, that, it is highly probable, that the eye may lose a considerable part of its original powers, from the mere circumstance of its having so long remained a passive organ. Hence, probably it happens, that, in some cases of congenital cataract, the only benefit conferred on the patient, by an operation, is that of enabling him to find his way in an awkward manner, and to discriminate the more vivid colours. Such patients have never been able to discern small objects, or to judge, in any useful degree, of figure or magnitude; I am well aware, however, says Mr. Gibson, that, in some rare instances, such a defective state of the eye exists from birth.

"Another circumstance, which must have attracted the attention of oculists, is, that, in a few years, the eye of a patient born blind, acquires a restless and rolling motion, which is at length so firmly established by habit, that he has little control over it. This motion unfortunately continues, for a considerable time, after sight has been restored to such a person, and is a very material obstacle to the early attainment of a knowledge of the objects of vision. He cannot fix his eye steadily upon one point for a moment, and the inconvenience, which arises from this unsteadiness, is, to such a person, occasionally as great a bar to the distinct view of an object, as the unsteady motion of the same object would be to one, whose vision is perfect. This inconvenience any one can appreciate, and, as far as I know, it is completely avoided by restoring sight at an early age."

As a motive for operating on infants, Mr. Gibson also comments on the loss of those years, which ought to be spent in education. (See *Edinb. Med. and Surgical Journal, Vol.* 7, *p.* 394, 400.)

Mr. Guthrie also joins in recommending the cure of cataracts in children: he considers the period of dentition an unseasonable one for the operation; but excepting the time of this process, if the child be healthy, he thinks it qualified for the attempt at any age, reckoning from that of six months; and that "even if the operation be delayed until the end of the third or fourth year, little or no inconvenience is found to arise from it." (*Operative Surgery of the Eye, p.* 362.)

When once it is decided to operate upon a cataract, the sooner the operation is generally done, the better, because the anxiety of the patient increases, as Beer says, with every day, nay, with every hour. Just before the operation, care must be taken not to let the patient eat a great deal, nor load his stomach with substances difficult of digestion; and, if the stomach and bowels should already be disordered by what they contain, their contents ought to be carefully removed previously to the operation. In the same manner, if the surgeon wish to keep off much inflammation, and the patient should be constipated, this state must be obviated by suitable medicines. And, lastly, when, at the request of the patient himself, the operation is deferred for a few days, the greatest caution must be used not to let him expose himself to any causes, likely to bring on catarrhal, or rheumatic complaints. (*Beer, B.* 2, *p.* 344.) The following advice, delivered by Scarpa, with respect to the preparation of patients for operations on the eye with the needle, is valuable: In ordinary cases, there is not the least occasion for any preparatory treatment previous to the operation; all that prudence requires is, that the patient should abstain from animal food, and fermented liquors, for a few days, before submitting to it, and should take one dose of a gentle purgative. But this, like every other general observation is liable to particular exceptions. Hypochondriacal men, hysterical women, and patients subject to affections of the stomach and nervous system, should take, for two or three weeks before the operation, tonic bitter medicines, particularly the infusion of quassia, either with, or without a few drops of sulphuric æther to each dose; or, in other cases, ʒj of Peruvian bark, with ℈j of valerian, may be administered two or three times a day with particular benefit. It is observed by the most accurate writers upon this subject, that, in such persons, the symptoms consequent to operations upon the eyes are often much more violent than in common cases; and it therefore seems proper to endeavour, previously, to meliorate their constitutions. When the patient is timid, it is advisable to give him, half an hour before the time of operating, about fifteen drops of the tinctura opii, with a little wine.

Some patients, besides being afflicted with cataracts, have the edges of the eye-lids swollen and gummy, with relaxation, and chronic redness of the conjunctiva. In this case, before undertaking to couch, it is advisable to apply a blister to the nape of the neck, and to keep it open for two or three weeks, by means of the savin cerate, and to insinuate every morning and evening, between the palpebræ and globe of the eye, a small quantity of the following ointment, the strength of which is to be gradually increased: ℞ Unguenti hydrargyri nitratis ℥iv. Adipis Suillæ ℥viij. Olei Olivæ, ℥ij. When this ointment does not produce the desired effect, an ointment recommended by Janin, (*Mémoires sur l'Œil*,) should be substituted: it consists of ℥ss of hog's lard, ʒij of prepared tutty, ʒij of armenian bole, and ʒj of the white precipitate of mercury. At first, care should be taken to use it lowered, with twice or thrice its quantity of lard. In the day time, a collyrium, composed of ℥iv of rosewater, ℥ss of the mucilage of quince seeds, and gr. v. of the sulphate of zinc, may also be frequently used with considerable advantage. By such means, the morbid secretion from the Meibomian glands, and membranous lining of the eye-lids, will be checked, and the due action of the vessels, and natural flexibility of the eye-lids restored. (*Saggio di Osservazioni, &c. sulle principali malattie degli occhi, Venez.* 1802.)

There are three different operations practised for the cure of cataracts, viz. one termed *couching*, or *depression*, of which the method, called *reclination*, is a modification, as will be hereafter explained; another named *extraction;* and a third denominated *keratonyxis*, which consists in puncturing the cornea with a needle, the point of which is to be conveyed through the pupil, so as to reach the cataract, which is to be gently broken into fragments. As Beer observes, each of these modes has, in particular cases, manifest advantages over the other two; but, no single method will ever be exclusively preferred, and invariably followed, by any man of experience and judgment. In every operation for a cataract, the position of the patient, assistants, and surgeon, is of great importance. In order to enable the assistant, who stands behind the patient, to be conveniently near the head of the latter, Beer prefers letting the patient sit on a stool, which has no back. However as I shall presently notice, some eminent surgeons have urged good reasons in favour of employing a chair, which is completely perpendicular. When the left eye is to be operated upon, the same assistant is to apply his right-hand under the patient's chin, and press the head of the latter against his breast, at the same time that he inclines it and himself more or less forward towards the operator, who sits upon rather a high stool, in front of the patient. In this country, a music-stool is commonly preferred, the height of which can be regulated in a moment, by simply turning the seat round to the right, or left, whereby the screw, with which it is connected, is made to rise, or descend, as may be found most desirable. The same assistant then places his left-hand flat upon the left side of the patient's forehead, with the points of the fore and middle fingers, somewhat under the edge of the upper eye-lid; and, with the fore-finger, he is now to raise the edge of this eye-lid, as much as possible, following that finger immediately with the middle one, so as to fix the eye-lid with greater certainty. The ends of these fingers, however, must be so applied, as not to touch the globe of the eye in the slightest manner, much less make any pressure upon it, yet, so that the upper part of the eye-ball and cornea may be gently resisted by them, when the eye rolls upwards away from the instrument about to be introduced, whereby this position, which is extremely inconvenient to the operator, may be immediately rectified. The patient should also sit obliquely opposite a clear window, so that a sufficient light may fall obliquely upon the eyes, without any rays being reflected to the cornea, and becoming a hinderance to the operator. Nor should light from any other quarter be ever allowed to fall upon the eyes. The surgeon should sit in front of the patient, whose head ought to be directly opposite the operator's breast, whereby the latter will be enabled to see from above, with the greatest correctness, every thing in the eye during the operation, and will not be under the necessity of raising his arms too considerably. Supposing it to be the left eye, which is to be operated upon, he next effectually draws down the lower eye-lid with the left fore-finger, the end of which must be placed over the edge of the eye-lid, towards the globe of the eye, just like those of the assistant, who supports the upper eye-lid. The middle finger is then to be applied in a similar way over the caruncula lachrymalis. The operator now takes in his right-hand the requisite instrument for the operation, viz. the needle, or knife, which is to be held, like a pen, between the thumb and the fore and middle fingers. By this particular arrangement of the fingers of the assistant and operator, which, indeed, is partly ineffectual where the fissure of the eye-lids is very narrow, and the eye-ball is diminutive and sunk in the orbit, the restless eye of the timid patient is fixed; for a point of the finger is disposed on every side, to which the eye, can possibly turn away from the instrument about to be introduced, and when the cornea is gently touched with the extremity of the finger, the wrong position, which the eye is about to take, is immediately prevented. This method of fixing the eye, says Beer, is not merely indispensable for young operators, but is the only perfectly unobjectionable one, which can be employed on this delicate organ, since all mechanical inventions for this purpose, like the speculum oculi, which keeps the eye steady, by considerable pressure, or other contrivances, like Rumpelt's instrument, which does the same thing by means of a short pointed instrument *attached* to a kind of thimble, and with which the sclerotica is pierced and held motionless, are found by experience to be worse than useless. And, as a proof of this fact, Beer adverts to the numerous patients, who come out of the hands of such operators as employ these instruments, with a more or less hurtful loss of the vitreous humour, and other ill consequences; a statement, which nearly agrees with the observations of Wenzel and Ware.

While the late Mr. Ware coincided with Wenzel and Beer, respecting the general objections to specula, he remarks, that, in some instances of children born with cataracts, he had been obliged to fix the eye with a speculum; without the aid of which, he found it totally impracticable to make the incision through the cornea, with any degree of precision, or safety. His speculum was an oval ring, the longest diameter of which is about twice as long as the diameter of the cornea, and the shortest about half as long again as this tunic. Annexed to the upper rim of the speculum is a rest, or shoulder, to support the upper eye-lid, and, by its lower rim, it is fixed to a suitable handle. Beer entertained no higher opinion of other inventions, made for the purpose of enabling surgeons to operate on both eyes with the right hand; for, says he, the right eye should always be operated upon with the left-hand, and the left with the right, and he who cannot learn to be equally skilful with both his hands, must always remain a bungler. (*Lehre von den Augenkr. B.* 2, *p.* 347—350.)

Mr. Alexander, whose great skill in operations on the eye is universally acknowledged, employs no assistant for raising the upper eye-lid, or fixing the eye, which objects he accomplishes himself; and, in Germany, this independent mode of proceeding has been particularly commended by Barth. (*Etwas über die Ausziehung des grauen Staare, für den geübten Operateur,* 8*vo. Wien.* 1797.)

The preceding directions, respecting the position of the assistant, the seats for the patient and surgeon, and the mode of fixing the eye, are chiefly those of Professor Beer. Whether these instructions are in every respect better than the following, which combine the sentiments of some other writers of experience, the impartial reader must judge for himself. The patient should be seated rather low, opposite a window where the light is not vivid, and in such a manner, that the rays may fall laterally upon the eye about to be couched. The other eye, whether in a healthy or diseased state, ought always to be closed, and covered with a handkerchief, or any thing convenient for the purpose; for, so strong is the sympathy between the two organs, that the motions of the one constantly produce a disturbance of the other. The surgeon should sit upon a seat, rather higher than that upon which the patient is placed; and, in order to give his hand a greater degree of steadiness in the various manœuvres of the operation, he will find it useful, to place his elbow upon his knee, which must be sufficiently raised for this purpose, by a stool placed under the foot. The chair, on which the patient sits, ought to have a high back, against which his head may be so firmly supported, that he cannot draw it backward during the operation. The back of the chair must not slope backward, as that of a common one, but be quite perpendicular, in order that the patient's head may not be too distant from the surgeon's breast. (*Richter's Anfangsgr. der Wundarzn. p.* 207, 3 *B.*)

The propriety of supporting the patient's head rather upon the back of the chair, on which he sits, than upon an assistant's breast, as Bischoff has observed, is founded upon a consideration, that the least motion of the assistant, even that necessarily occasioned by respiration, causes, also, a synchronous motion of the part, supported on his breast, which cannot fail to be disadvantageous, both in the operation of extraction, and of couching. However, as this is not at present the common practice, the inconvenience of having the back of the chair between the assistant and the patient, may more than counterbalance the circumstance, in which it seems to be advantageous.

In certain cases, where the muscles of the eye, and eyelids, are incessantly affected with spasm; or, where the eye is peculiarly diminutive, and sunk as it were, in the orbit, the elevator for the upper eye-lid, invented by Pellier, and approved by Scarpa, may possibly prove serviceable: in young subjects, it materially facilitates the operation.

The particular sentiments of Wenzel and Ware, concerning the mode of fixing the eye, will be further explained in the description of the extraction of the cataract.

OF COUCHING, OR DEPRESSION OF THE CATARACT, AND RECLINATION.

The operation of couching was once supposed to consist altogether in removing the opaque lens out of the axis of vision, by means of a needle, constructed for the purpose; but, it is well known to be frequently effectual on another principle, even when the nature and consistence of the cataract do not admit of the depression of the opaque body. Experience fully proves, that the diseased lens, when broken and disturbed with the needle, and especially when freely exposed to the contact of the aqueous humor by a proper laceration of its capsule, is gradually dissolved and removed by the action of the absorbents.

Indeed, couching now means a variety of operations; for, it comprehends not merely the *depression* of the cataract, not simply its *displacement* in any direction whatsoever, not only the *breaking of it piecemeal*, and the *pushing of the fragments into the aqueous humor*, but likewise the *mere disturbance* of *the opaque body*, whereby its absorption is sometimes effected, without any kind of depression, or displacement of it at all with the needle. When therefore, the merits of couching are investigated, it is necessary to define precisely what modification of it is meant, and for what particular kind of case its application is designed; for, no surgeon of the present day would confine himself exclusively to one method of operating; and as Mr. Guthrie has remarked, "In considering the advantages, or disadvantages from any, or all of the different operations for cataract, it is absolutely necessary to recollect, that no individual operation is applicable to every species of the disease; that each kind requires an operation for its relief, or cure, sometimes of a particular nature; and differing essentially from that which is found most advantageous in another. To collect then all the objections, which can be urged against any of the operations, from a consideration of every case of cataract, to which it is and is not, applicable, is merely to confuse the subject, and has generally been done for the purpose of recommending some particular mode of proceeding, rather than to regulate these operations, by the general principles of surgery." (*Operative Surgery of the Eye, p.* 365.) In this respect, the doctrines of Pott, Callisen, Hey, and Scarpa, are undoubtedly wrong, though their sentiments are blended with many valuable and important truths. Beer, who is by no means a great advocate for depression, admits its utility in particular cases. It is easily comprehensible, says he, that, in this way, a firm and large cataract, either cannot be removed without injuring the retina, and the attachment of the corpus ciliare to the vitreous humor, or not far enough to prevent the opaque body from rising again at the first opportunity. Hence, the former complaints about the frequent return of the cataract, and other ill consequences, unappeasable vomiting, suddenly produced amaurosis, and severe inflammation, &c. But, while Beer acknowledges the frequency of these ill effects of depression, he condemns the universal rejection of it, attempted at the present day, and the unlimited substitution for it of *reclination*, which consists in applying the needle in a certain manner to the anterior surface of the cataract, and depressing the opaque body into the vitreous humor, in such a way, that the front surface of the cataract is now the upper one, its back surface the lower one, its upper edge backwards, and its lower edge forwards; a change, which Beer says, cannot be made without an extensive destruction of the cells of the vitreous humor. Hence, with few exceptions, this author thinks the common mode of depression should be preferred. (*Lehre von den Augenkr. B.* 2, *p.* 352.) And, in this sentiment, he is joined by Mr. Travers, who remarks, that the real objection to couching is the breaking up of the fine texture of the globe of the eye, by the forcible depression of the lens. "Whether it be depressed edgeways, or breadthways, makes no difference in the result; it must still occupy a breach in the cells of the vitreous humor, and must derange and disorder that delicate texture, and those connected with it. A slow insidious inflammation marked by a gradual developement of the symptoms of disorganization, viz. congestion of vessels, turbid humors, flaccid tunica, and palsied iris, is too often the consequence. The sight, instead of improving, when the immediate effects of the injury are passed away, remains habitually weak and dim, or declines and fades altogether. The advocates for *reclination* seem to forget, that the principle, which is the same in both operations, is the real ground of objection. As to the position of the lens, I suspect less mischief is done by the old method of depression, as less force is required to break a space for the vertical, than the horizontal lens, provided the depression be carried to no greater extent, than is necessary to clear the inferior border of the pupil." (*Synopsis of the Diseases of the Eye, p.* 318.)

The form of couching needles should vary according to the object designed to be effected by the operation. The needle, used by the late Mr. Hey; that recommended by Scarpa; and another employed by Beer, are the principal ones.

The length of Mr. Hey's needle is somewhat less than an inch. It would be sufficiently long if it did not exceed seven-eighths of an inch. It is round, except near the point, where it is made flat by grinding two opposite sides. The flat part is ground gradually thinner to the extremity of the needle, which is semi-circular, and ought to be made as sharp as a lancet. The flat part extends in length, about an eighth of an inch, and its sides are parallel. From the part where the needle ceases to be flat, its diameter gradually increases towards the handle. The flat part is one-fortieth of an inch in diameter. The part which is nearest the handle, is one-twentieth of an inch. The handle, which is three inches and a half in length, is made of light wood, stained black. It is octagonal, and has a little ivory inlaid in the two sides, which correspond with the edge of the needle.

Mr. Hey describes the recommendations of this instrument in the following terms:

1. "It is only half the length of the common needle; and this gives the operator a greater command over the motions of its point, in removing the crystalline from its bed, and tearing its capsule. It is also of some consequence, that the operator should know how far the point of his needle has penetrated the globe of the eye, before he has an opportunity of seeing it through the pupil; as it ought to be brought forwards when it has reached the axis of the pupil. Now he may undoubtedly form a better judgment respecting this circumstance, when the length of his needle does not much exceed the diameter of the eye, than when he uses one of the ordinary length, which is nearly two inches. The shortness of the needle is peculiarly useful, when the capsule is so opaque that the point cannot be seen through the pupil.

2. "As this needle becomes gradually thicker towards the handle, it will remain fixed in that part of the sclerotis, to which the operator has pushed it, while he employs its point in depressing and removing the cataract. But the spear-shaped needle, by making a wound larger in diameter, than that part of the instrument, which remains in the sclerotis, becomes unsteady, and is with difficulty prevented from sliding forwards against the ciliary processes, while the operator is giving it those motions which are necessary for depressing the cataract.

"On the same account the common spear-shaped needle may suffer some of the vitreous humor to escape during the operation, whereby the iris and ciliary processes would be somewhat displaced, and rendered flaccid; whereas the needle which I use, making but a small aperture in the sclerotis, and filling up that aperture completely during the operation, no portion of the vitreous humor can flow out so as to render the iris and ciliary processes flaccid.

3. "This needle has no projecting edges; but the spear-shaped needle, having two sharp edges, which grow gradually broader to a certain distance from its point, will be liable to wound the iris, if it be introduced too near the ciliary ligament, with its edges in a horizontal position. Besides, however, the needle be introduced, one of its sharp edges must be turned toward the iris

in the act of depressing the cataract; and, in the various motions which are often necessary in this operation, the ciliary processes are certainly exposed to more danger, than when a needle is used which has no projecting edge.

4. "It has no projecting point. In the use of the spear-shaped needle, the operator's intention is to bring its broadest part over the centre of the crystalline. In attempting to do this, there is great danger of carrying the point beyond the circumference of the crystalline, and catching hold of the ciliary processes, or their investing membrane, the *membrana nigra*."

Mr. Hey asserts, that his needle will pass through the sclerotis with ease; depress a firm cataract readily, and break down the texture of one that is soft. "If the operator finds it of use to bring the point of the needle into the anterior chamber of the eye (which is often the case), he may do this with the greatest safety, for the edges of the needle will not wound the iris. In short, if the operator, in the use of this needle, does but attend properly to the motion of its point, he will do no avoidable injury to the eye, and this caution becomes the less embarrassing, as the point does not project beyond that part of the needle by which the depression is made, the extreme part of the needle being used for this purpose." (*Hey.*)

Scarpa employs a very slender needle, possessing sufficient firmness to enter the eye without hazard of breaking, and having a point, which is slightly curved. The curved extremity of the needle is flat upon its dorsum, or convexity, sharp at its edges, and has a concavity, constructed with two oblique surfaces, forming in the middle a gentle eminence, that is continued along to the very point of the instrument; there is a mark on that side of the handle, which corresponds to the convexity of the point. The surgeons of the Leeds Infirmary have had one advantage in the needle, which they have used in imitation of Baron Hilmer; I mean, having it made of no greater length, than the purposes of the operation demand. A couching needle is sufficiently long when it does not exceed, at most, an inch in length: this affords the operator a greater command over the motions of the point, and enables him to judge more accurately, how far it has penetrated the globe of the eye, before he has an opportunity of seeing it through the pupil. When Scarpa's needle is preferred, it should therefore be of no greater length, than the operation requires. The needle, here described, will penetrate the sclerotic coat as readily as any straight one, of the same diameter, and, by reason of its slenderness, will impair the internal structure of the eye less in its movements, than common couching needles. When cautiously pushed in a transverse direction, till its point has reached the upper part of the opaque lens, it becomes situated with its convexity towards the iris, and its point in the opposite direction; and, upon the least pressure being made with its convex surface, it removes the cataract a little downward, by which a space is afforded at the upper part of the pupil, between the cataract and ciliary processes, through which the instrument may be safely conveyed in front of the opaque body and its capsule, which it is prudent to lacerate in the operation. In cases of caseous, milky, and membranous cataracts, the soft pulp of the crystalline may be most readily divided, and broken piece-meal by the edges of its curved extremity; and the front layer of the capsule lacerated into numerous membranous flakes, which, by turning the point of the instrument towards the pupil, may be as easily pushed through this aperture into the anterior chamber, where Scarpa finds absorption takes place more quickly, than behind the pupil.

Beer, and many other skilful operators, give the preference to a straight spear-pointed needle. Scarpa's needle, made quite straight, is a very eligible instrument, and Beer's small spear-pointed needle, which is sold at almost every shop for surgical instruments deserves all the reputation which it possesses.

As Mr. Travers has observed, in all cases of operation with the needle, the employment of a solution of the extract of belladonna in an equal part of distilled water, is a point of the first importance. "The space, included between the eyebrow and lash, should be thickly painted with the solution once, or oftener, in the twenty-four hours, and this varnish should be preserved moist for a period of half an hour, in order to admit of its absorption. The frequency of the application must be determined by its effect upon the pupil. The preternatural dilatation should not be permanently maintained; for, if it be, the pupil will in all probability be mis-shapen," when the use of the belladonna is suspended, and the iris recovers its power. (*Synopsis of the Diseases of the Eye, p.* 322.)

The couching needle (if the curved one be used) is to be held with its convexity forward; its point backward; and its handle parallel to the patient's temple. The surgeon, having directed the patient to turn the eye towards the nose, is to introduce the instrument boldly through the sclerotic coat, at the distance of at least one line and a half from the margin of the cornea, for fear of injuring the ciliary processes. Most authors advise the puncture to be made at about one line, and some even at the minute distance of 1-16th of an inch (*Hey*) from the union of the cornea with the sclerotica; but, as the ciliary processes ought invariably to be avoided, and there is no real cause to dread wounding the aponeurosis of the abductor muscle, as some have conceived, the propriety of puncturing the globe of the eye, at the distance of one line and a half, or two, from the margin of the cornea, as advised by Petit, Platner, Bertrandi, Beer, &c. must be sufficiently manifest.

Nor is it a matter of indifference, at what height the needle is introduced, if it be desirable to avoid, as much as possible, effusion of blood in the operation. Anatomy reveals to us, that the long ciliary artery pursues its course to the iris, along the middle of the external convexity of the eyeball, between the sclerotic and choroid coats; and hence, in order to avoid this vessel, it is prudent to introduce the instrument a full line below the transverse diameter of the pupil, as Dudell, Guntz, Bertrandi, Beer, Scarpa, &c. have directed. If the couching needle were introduced higher, than the track of the long ciliary artery, it would be inconvenient for the depression of the cataract.

The exact place, where the point of the needle should next be guided, is, no doubt, between the cataract and ciliary processes, in front of the opaque lens, and its capsule: but, as I conceive, the attempt to hit this delicate invisible mark, borders upon impossibility, and, perhaps, in the common manner of bringing the needle from the posterior chamber to the upper edge of the lens, is never effected without injuring those processes, as Mr. Guthrie positively asserts, (*Operative Surgery of the Eye*, *p.* 270,) I cannot refrain from expressing my dissent to the common method of passing a couching needle at once in front of the cataract. On the contrary, it seems safer to direct the extremity of the instrument immediately over the opaque lens, and, in the first instance, to depress it a little downward, by means of the flat surface of the needle, in order to make room for the safe conveyance of the instrument, between the cataract, and corpus ciliare, in front of the diseased crystalline and its capsule; taking care, in this latter step of the operation, to keep the marked side of the handle forward, by which means the point of the needle will be in an opposite direction to the iris, and will come into contact with the diseased body, and the membrane binding it down in the fossula of the vitreous humor. When this has been done, and the case is a firm cataract, the instrument will be visible through the pupil, Scarpa now pushes its point transversely, as near as possible the margin of the lens, on the side next the internal angle of the eye, taking strict care to keep it continually turned backward. He then inclines the handle of the instrument towards himself, whereby its point is directed through the capsule, into the substance of the opaque lens; and, on making a movement of the needle, describing the segment of a circle, at the same instant inclining it downward and backward, he lacerates the former, and conveys it, in the generality of cases, with the latter, deeply into the vitreous humor. Perhaps, the greatest inconvenience of Scarpa's method is that likely to arise from passing the point of the needle into a firm cataract, whereby the opaque body may become fixed on the end of the instrument, and follow it when it is withdrawn, instead of remaining below the pupil. Indeed Mr. Guthrie considers it a point of great importance in this operation never to pierce the lens, and that this rule should even be followed "*if necessary*, at the expense of the ciliary processes," of which, he thinks, the principal utility, terminates with the removal of the lens. (*Operative Surgery of the Eye*, *p.* 271.) To me, who prefer Scarpa's manner of depressing the cataract a little in the first instance, so as to make room for the passage of the needle between it and the ciliary processes into the posterior chamber, the necessity of ever wounding those processes, for the purpose of avoiding to pierce the lens, seems hardly conceivable. At the same time, I believe with Mr. Guthrie, that, in the common practice of moving the needle from the posterior chamber to the upper part of the cataract, the ciliary processes must suffer more or less injury.

Beer, as I have explained, gives the preference to a spear-pointed straight needle, one flat surface of which, at the period of its first introduction into the eye, is turned upwards; the other, downwards; one edge, directed towards the nasal, the other, towards the temporal canthus; and the point towards the centre of the eyeball. Beer prefers this mode of proceeding, in order to avoid moving the lens too soon out of its natural situation, whereby the subsequent manœuvres of depression or reclination, he thinks, would be rendered very uncertain and incomplete. He also recommends the surgeon to support his hand in some measure on the patient's cheek, by means of the little finger, so as to have it in his power to check the too sudden and deep entrance of the instrument into the eye, liable to happen when the broadest part of the spear-point has passed through the sclerotica. (*Lehre, &c. B.* 2, *p.* 354.)

It happened, unfortunately for the credit of the operation of depression, that Petit admonished surgeons to beware of wounding the anterior layer of the crystalline capsule: he had an idea, that, when this caution was observed, the vitreous humor would afterwards fill up the space, previously occupied by the lens, and that thus the refracting powers of the eye might become as strong as in the natural state, and the necessity for using spectacles be considerably obviated. But, we are now apprised, that leaving this very membrane, from which Petit anticipated such great utility, even were it practicable to leave it constantly uninjured in its natural situation, would be one of the worst inculcations that could possibly be established; for, in many cases, where extraction proves fruitless, in some, where depression fails, the want of success is owing to a subsequent opacity of the crystalline capsule; in short, blindness is reproduced by the secondary membranous cataract. It seems more than probable, that, in some of the instances, where the opaque lens has been said to have risen again, nothing more has happened, than the disease in question. Therefore, notwithstanding the whole capsule in the majority of cases may be depressed with the lens out of the axis of vision, as it is not a constant occurrence, I cannot too strongly enforce the propriety of extirpating, as it were, every source and seat of the cataract in the same operation, and, in imitation of the celebrated Scarpa, who is entitled to the honour of having first pointed out the great importance of this practice, I shall presume to recommend, as a general rule in couching, always to lacerate the front layer of the capsule, whether in an opaque or transparent state.

The capsule of the crystalline lens may retain its usual transparency, while the lens itself is in an opaque state. In this case, an inexperienced operator might, from the blackness of the pupil, suppose, not only that he had removed the lens, but also the capsule from the axis of sight; and, having depressed the cataract, he might unintentionally leave this membrane entire in its natural situation. Therefore, if there should be any reason for suspecting, that the anterior layer of the capsule has escaped laceration; if, in other words, the resistance made to moving the convexity of the instrument forward, towards the pupil, should give rise to such a suspicion; for the sake of removing all doubt, it is proper to communicate to the needle a gentle rotatory motion, by which its point will be turned forward, and disengaged, through the transparent capsule, opposite the pupil: then, by repeating a few movements downward and backward, it will be so freely rent with the needle, as to occasion no future trouble.

Beer divides both the operations of couching and reclination into three stages; the first is that in which the needle is introduced into the eye; the second, that in which it is passed into the posterior chamber, and placed across the anterior surface of the cataract, and the third, that in which the depression, or reclination of the cataract is accomplished.

If a straight, slender, spear-pointed needle be used, and the second stage of the operation be completed by the introduction of the extremity of the instrument into the posterior chamber, (which I particularly recommended to be done in the manner directed by Scarpa) then, according to the directions given by Professor Beer, when depression is indicated, the needle is to be immediately carried to the uppermost part of the cataract, with its point directed somewhat obliquely downwards; and with that surface, which, in the first instance, was applied to the front of the lens, now placed upon its superior edge; then the opaque body is to be pushed rather obliquely, downwards and outwards, so far below the pupil, that it can no longer be distinguished. After this has been done, the needle is to be gently raised, in order to see whether the cataract will continue depressed, and, if it be found to do so, the needle is to be withdrawn in the same direction, in which it was introduced.

On the other hand, says Beer, when reclination is to be practised, the needle after being applied to the front surface of the cataract, is not to be moved further out of the position of the second stage of the operation, but its handle is merely to be raised diagonally forwards, whereby the cataract will be pressed downwards and outwards to the bottom of the vitreous humor, and turned in the manner already specified. Beer has delivered what appears to me one valuable piece of advice for operators on the eye with the needle: whether depression, or reclination, is to be done, says he, a surgeon can only use this instrument without injurious consequences on the principle of a lever; and every attempt to press with the whole length of the instrument is not only ineffectual, with respect to the progress of the operation, but so hurtful to the eye, that bad effects must follow, as may be readily conceived, when it is recollected how violently the ciliary nerves must be stretched.

As for the modifications of the manœuvres, rendered necessary by the varieties of cataracts, they are (says Beer) so unimportant in all cases of depression, that a young operator will easily understand them himself. But, things are far otherwise in the practice of reclination; for, when the case is a completely formed *capsular-lenticular cataract*, and the opaque capsule is so thin, as to be torn during the turning of the lens, the latter body will indeed be placed in the intended position at the bottom of the eye, but the capsule itself, which has merely been lacerated, must form a secondary cataract, unless the surgeon, with a sharp double-edged needle, immediately divide it in every direction, and remove it as far as possible from the pupil. When, during reclination, a *softish lens*, or one which is *pulpy* to its very nucleus, breaks into several pieces, it is necessary, in order not to have afterwards a considerable secondary lenticular cataract, to put the larger fragments separately in a state of reclination, while the smaller ones may either be depressed, or (if the pupil be not too much contracted) they may be pushed into the anterior chamber, where they will soon be absorbed. *When the cataract is partially adherent to the uvea*, Beer recommends an endeavour to be first made, with the edge of the needle, (which is to be introduced flat between the cataract and the uvea, above or below the adhesion) to separate the adherent parts before the attempt at reclination is made. Should it be a cataract, which always rises again as soon as the needle is taken from it, though the instrument has not pierced it at all, the case is termed the *elastic cataract*, in which the lens is not only firmly adherent to its own capsule, but this also to the membrana hyaloidea. Here Beer thinks, that the best plan is first to carry the needle to the uppermost point of the posterior surface of the lens, and by means of perpendicular movements of the cutting part of the instrument, to endeavour completely to loosen this preternatural adhesion of the cataract to the vitreous humor, when reclination may be tried again, and will perhaps succeed. But, says Beer, when the continual rising of the cataract is caused by the operator's running the needle into it, the instrument must either be withdrawn far enough out of the eye to let it be again properly brought into the posterior chamber, when reclination may be effectually repeated; or, if the cataract be firmly fixed on the needle at the bottom of the eye, the instrument should not be raised again, but previously to being withdrawn, it should be rotated a couple of times on its axis, whereby the pierced lens will be more easily disengaged from the needle, and at last continue depressed. (*Lehre von den Augenkr. B.* 2, *p.* 356—358.)

In addition to Beer's directions for couching and reclination, the following observations seem to me to merit attention.

When the case is a *fluid* or *milky* cataract, the operator frequently finds, that, on passing the point of the couching needle through the anterior layer of the capsule, its white milky contents instantly flow out, and, spreading like a cloud over the two chambers of the aqueous humor, completely conceal the pupil, the iris, and the instrument, from his view; who, however, ought never to be discouraged at this event. Although it seems to me most prudent, to postpone the completion of operations with the needle, in the example of blood concealing the pupil, in the first step of couching, and not to renew any attempt before the aqueous humor has recovered its transparency; I am inclined to adopt this sentiment, chiefly because the species of cataract is, in this circumstance, generally unknown to the operator, consequently he must be absolutely incapable of employing that method of couching, which the peculiarities of the case may demand. Speaking of this case, however, Beer says, "the surgeon must hasten the completion of extraction, or reclination, though possibly the operation may not always admit of being continued, or, if gone on with, it must be done, as it were blindfold." (*Lehre, &c. B.* 2, *p.* 361.) When a milky fluid blends itself with the aqueous humor, and prevents the surgeon from seeing the iris and pupil: this event is itself a source of information to him, inasmuch as it gives him a perfect in-sight into the nature of the cataract, which he is treating; and instructs him what method of operating it is his duty to adopt. The surgeon, guided by his anatomical knowledge of the eye, should make the curved point of the needle describe the segment of a circle, from the inner, toward the outer canthus, and in a direction backward, as if he had to depress a firm cataract. (*Scarpa.*) Thus he will succeed in lacerating, as much as is necessary, the anterior layer of the capsule, upon which in a great measure, the perfect success of the operation depends; and, not only in the milky, but almost every other species of cataract.

The extravasation of the milky fluid in the chambers of the aqueous humor, spontaneously disappears, very soon after the operation, and leaves the pupil of its accustomed transparency. "In twelve cases of a dissolved lens, on which I have operated," says Latta, "the dissolution was so complete, that, on entering the needle into the capsule of the lens, the whole was mixed with the aqueous humor, and all that could be done, was to destroy the capsule as completely as possible, that all the milky matter might be evacuated. In ten of these cases, vision was almost completely restored in four weeks from the operation." Mr. Pott, in treating of this circumstance, viz. the effusion of the fluid contents of the capsule into the aqueous humor, observes, that so far from being an unlucky one, and preventive of success, it proves on the contrary, productive of all the benefit which can be derived from the most successful depression or extraction, as he has often and often seen.

When the cataract is of a *soft*, or *caseous* description, the particles of which it is composed, will frequently elude all efforts made with the needle to depress them, and will continue behind the pupil in the axis of vision. This has been adduced as one instance that baffles the efficacy of couching, and may really seem, to the inexperienced, an unfortunate circumstance. It often happens in the operation of extraction, that fragments of opaque matter are unavoidably overlooked and left behind; yet Richter confesses, that such matter is frequently removed by the absorbents. Supposing a caseous cataract were not sufficiently broken, and disturbed in the first operation, and that, consequently, the absorbents did not completely remove it, such a state might possibly require a reapplication of the instrument; but this does not generally occur, and is the worst that can happen. It is quite impossible to determine *a priori*, what effect will result from the most trivial disturbance of a cataract; its entire absorption may, in some instances, follow, while in others, a repetition of the operation becomes necessary for the restoration of sight. Even where the whole firm lens has re-ascended behind the pupil, as Latta and Hey confirm, the absorbents have superseded the necessity for couching again. The disappearance of the opaque particles of cataracts was, in all times, and in all ages, a fact of such conspicuousness, that, as appears from the authority of Barbette and others, it was recorded, even previously to the discovery of the system of lymphatic vessels in the body. Indeed the modern observations of Scarpa and others, so strongly corroborate the account, which I have given, of the vigorous action of the absorbents, in the two chambers of the aqueous humor; and, particularly, in the anterior one, that, from the moment the case is discovered to be a soft, or caseous cataract, it seems quite unnecessary to make any further attempt to depress it into the vitreous humor. Mr. Pott sometimes, in this circumstance, made no attempt of this kind, but contented himself with a free laceration of the capsule, and, after turning the needle round and round, between his finger and thumb, within the body of the crystalline, left all the parts in their natural situation, where he hardly ever knew them fail of dissolving so entirely, as not to leave the smallest vestige of a cataract. This eminent surgeon even practised occasionally what Beer sanctions, and Scarpa so strongly recommends at this day; for he sometimes pushed the firm part of such cataracts through the pupil into the anterior chamber, where it always disappeared, without producing the least inconvenience: we must, at the same time add, that he thought this method wrong, not on account of its inefficacy, but an apprehension that it would be apt to produce an irregularity of the pupil, one of the worst inconveniences attending the operation of extraction. But the deformity of the pupil, after extraction, seems to proceed either from an actual laceration of the iris, or a forcible distention of the pupil, by the passage of large cataracts through it, a kind of cause that would not be present in pushing the broken portions of a caseous lens into the anterior chamber. Hence, it does not seem warrantable to reject this very efficacious plan of treatment. It is well deserving of notice, that Mr. Hey, who has several times seen the whole opaque nucleus and very frequently small opaque portions fall into the anterior chamber, makes this remark: "Indeed, if the cataract could, in all cases, be brought into the anterior chamber of the eye, without injury to the iris, *it would be the best method of performing the operation.*" What the same author also observes in the subsequent part of his work, is strikingly corroborative of the efficacy of Scarpa's practice. The practice of the Italian professor consists, in lacerating the anterior portion of the crystalline capsule, to the extent of the diameter of the pupil, in a moderately dilated state; in breaking the pappy substance of the diseased lens piecemeal; and in pushing the fragments through the pupil, into the anterior chamber, where they are gradually absorbed.

One great advantage of couching, insisted upon by Scarpa, depends upon its generally removing the capsule, at the same time with the lens, from the passage of the rays of light to the retina. Sometimes, however, this desirable event, by which the patient is extricated from the danger of a *secondary membranous cataract*, does not take place. What most frequently constitutes the secondary membranous cataract, is the anterior half of the capsule, which not having been removed, or sufficiently broken, in a previous operation, continues more or less entire in its natural situation, afterwards becomes opaque, and thus impedes the free transmission of the rays of light to the seat of vision. Sometimes the secondary membranous cataract presents itself beyond the pupil, in the form of membranous flakes, apparently floating in the aqueous humor, and shutting up the pupil: at other times, it appears in the form of triangular membranes, with their bases affixed to the *Membrana Hyaloidea*, and their points directed towards the centre of the pupil. When there is only a minute membranous flake suspended in the posterior chamber, Scarpa thinks it by no means necessary for the patient to submit to another operation; vision is tolerably perfect, and, in time, the small particle of opaque matter will spontaneously disappear. But when the secondary membranous cataract consists of a collection of opaque fragments of the capsule, accumulated so as either in a great degree or entirely to close the pupil; or when the disease consists of the whole anterior half of the opaque capsule, neglected in a prior operation, and continuing adherent in its natural situation, it is indispensable to operate again; for, although in the first case, there may be good reason to hope, that the collection of membranous fragments might, in time, disappear, yet it would be unjustifiable to detain the patient for weeks and months in a state of anxiety and blindness, when a safe and simple operation would restore him, in a very short space of time, to the enjoyment of this most useful of the senses. In the second case, says Scarpa, it is absolutely indispensable: for while the capsule remains adherent to its natural connexions, the opacity seldom disappears, and may even expand over a larger portion of the pupil. He advises the operation to be performed as follows: when the aperture in the iris is obstructed by a collection of membranous flakes, detached from the membrana hyaloidea, the curved needle should be introduced, with the usual precaution of keeping its convexity forward, its point backward until arrived behind the mass of opaque matter; the surgeon is then to turn the point of the needle towards the pupil, and is to push through this opening, regularly one after another, all the opaque particles into the anterior chamber, where as we have before noticed, absorption seems to be carried on more vigorously than behind the pupil. All endeavours to depress them into the vitreous humor, Scarpa has found to be in vain; for scarcely is the couching needle withdrawn when they all re-appear at the pupil, as if (to use his own phrase) carried thither by a current: but when forced into the anterior chamber, besides being incapable of blocking up the pupil, they lie, without inconvenience, at the bottom of that cavity and in a few weeks are entirely absorbed.

When the *secondary membranous cataract* consists of the whole anterior layer of the crystalline capsule, or of several portions of it connected with the membrana hyaloidea, Scarpa, after cautiously turning the point of the needle towards the pupil, pierces the opaque capsule: or, if there be any interspace, he passes the point of the instrument through it; then, having turned it again backward, he conveys it, as near as possible, to the attachment of the membranous cataract, and after piercing the capsule, or each portion of it successively, and sometimes carefully rolling the handle of the instrument between his finger and thumb, so as to twist the capsule round its extremity, he thus breaks the cataract, as far as it is practicable, at every point of its circumference. The portions of membrane, by this means separated from their adhesions, are next cautiously pushed, with the point of the couching needle turned forward, through the pupil, into the anterior chamber. In these manœuvres the operator must use the utmost caution not to injure the iris, and ciliary processes, for, upon this circumstance depends the avoidance of bad symptoms after the operation, notwithstanding its duration may be long, and the necessary movements of the needle frequently repeated. If a part of the membranous cataract be found adherent to the iris, (a complication, that will be indicated when, upon moving it backward, or downward with the needle, the pupil alters its shape, and, from being circular becomes of an oval, or irregular figure), even more caution is required than in the foregoing case, so as to make repeated, but delicate movements of the needle, to separate the membranous opacity, without injuring the iris. Beer's mode of proceeding in such a case, I have already described.

Scarpa does not deem it necessary to vary the plan of operating above explained, if occasionally the cataract be formed of the posterior layer of the capsule. And according to this author, the same plan also succeeds in those rare instances where the substance itself of the crystalline wastes, and is almost completely absorbed, leaving the capsule opaque, and including, at most, only a small nucleus, not larger than a pin's head. Scarpa terms it the *Primary Membranous Cataract*, and describes it as being met with in children, or young people under the age of twenty; as being characterized by a certain transparency, and similitude to a cobweb; by a whitish opaque point, either at its centre or circumference; and, by a streaked and reticulated appearance: he adds, that whosoever attempts to depress such a cataract is baffled, as it re-appears behind the pupil, soon after the operation: he recommends breaking it freely with the curved extremity of the couching needle, and pushing its fragments into the anterior chamber, where they are gradually absorbed in the course of about three weeks.

No other topical application is generally requisite, after the operation, but a small compress of fine linen upon each eye; and the patient ought to be kept in a quiet, moderately darkened room. On the following morning, a dose of some mild purgative salt, such as the sulphate of soda, or magnesia, may usually be administered, with advantage. I shall not enlarge upon the method of treatment, when the inflammation, subsequent to couching, exceeds the ordinary bounds; in hypochondriacal, hysterical, and irritable constitutions, this is more frequently met with, and I have already touched upon the propriety of some preparatory measures before operating upon these unfavourable subjects.

Beer remarks, that, although after extraction, very cautious trials of the sight are indispensable, they are by no means proper after depression, or reclination; for, the action of the muscles of the eye in the inspection of objects at various distances, is very liable to make the opaque body rise again. Hence, as soon as the pupil is clear, Beer recommends covering both eyes (even when one only has been operated upon) with a plaster, and simple linen compress, which last is to be fastened on the forehead with a common bandage. The same experienced operator also enjoins perfect quietude of the body and head for some days.

The patient, he says, may either lie in bed, or sit in an arm-chair, as may be most agreeable, care being taken to avoid all sudden motions. The most proper food for the patient is such as is easily digested not too nutritious, and does not require much mastication. Every thing must be avoided, which has a tendency to excite inflammation in the eye. On the third, or fourth day, the eye should be opened, and afterwards be merely protected by a green silk eye screen, which should also be gradually dispensed with. The patient should be careful to do whatever is agreeable to the eye, which has been operated upon, and as carefully avoid every thing, which irritates it, or causes a disagreeable sensation in it, a difficulty of opening the eyelids, or keeping them open, a discharge of tears, or a redness of the white of the eye, &c.

Of the thrombus under the conjunctiva, sometimes caused by the prick of the needle, and of the readily bleeding granulations which occasionally shoot up at the puncture, I need not here particularly speak. For relieving the obstinate vomiting, sometimes excited by injury of the ciliary nerves, or that of the retina, Beer recommends castor, musk, and opium, except when the eye is in a state of inflammation, in which circumstance, the antiphlogistic treatment is preferable. Such vomiting, Beer joins other writers in believing, is often produced by a firm lens being depressed too far, so as to injure the retina; a case, however, which is usually combined with a suddenly produced, complete, or incomplete amaurosis. Here, unless the position of the lens can be changed by a sudden movement of the head, the above class of medicines will be of no use. This kind of amaurosis may also take place, without any vomiting, and, as Beer has had opportunities of remarking, it will not always subside, even though the cataract be made to rise again. The same amaurotic affection may also result from the surgeon hurting the retina by pushing the needle too deeply against this membrane. According to Beer, the ophthalmy, liable to happen in these cases, as well as after extraction and keratonyxis, is always most severe in the iris and neighbouring textures. (*Von den Augenkr. B.* 2, *p.* 361—63.)

I cannot help remarking how judicious it is never to attempt too much at one time in any mode of couching. It happens in this, as in most other branches of operative surgery, that celerity is too often mistaken for skill: the operator should not only be slow and deliberate in achieving his purpose; he should be taught to consider, that the repetition of couching may, like the puncture of a vein, be safely and advantageously put in practice again and again; and with far greater security, than if, for the sake of appearing expeditious, or avoiding the temporary semblance of failure, a bolder use of the couching needle should be made, than the delicate structure of the eye warrants. We read, in Mr. Hey's *Practical Observations on Surgery*, that he couched one eye seven times, before perfect success was obtained; had he been less patient, and endeavoured to effect by one or two rough applications of the instrument, what he achieved by seven efforts of a gentler description, it is highly probable, that the structure of the eye would have been so impaired, as well as the consequent ophthalmy so violent, as to have utterly prevented the restoration of sight.

All the various methods of couching having now been described, I subjoin the sentiments of Beer, respecting the circumstances, by which the choice of depression, or reclination, ought to be regulated. According to this author, when the cataract is very firm, or moderately so, with a scabrous surface, or the case is what has been already described under the name of *encysted cataract*, or when the cataract consists of any tough membrane, both depression and reclination can only be a palliative remedy, for, says he, none of these cataracts after the operation can be dissolved and absorbed, but must remain in the eye, as a foreign unorganized body, ready at every opportunity to rise again, and partially or completely blind the patient anew. Beer assures us, that he has carefully examined the eyes of persons after death, on whom depression or reclination had been practised, in some instances, twenty or more years previously; but, in almost all the examples, the lens was found firm and undissolved, or at most only diminished, with, or without its capsule. Membranous cataracts were very trivially lessened; though they had quite lost their rough consistence, and were changed into a firmish white mass. In a living person, Beer says, he saw an instance, in which a cataract rose again after it had been depressed by Hilmer thirty years previously: it was small, angular, and, when the pupil was dilated, it floated from one chamber of the eye into the other. When extracted, which was done with complete success, it was found to be almost ossified. In 1805, Beer extracted from a woman, forty years of age, a very large, hard, yellowish white lenticular cataract, which had been in the anterior chamber twenty-six years. The lens had been thus displaced by a blow received on the eye from the branch of a tree. Nor has Beer ever yet seen a case, in which a cataract of a semi-firm consistence was dissolved and absorbed. (*Von den Augenkr. B.* 2, *p.* 363.) Had Beer confined his statements to what happens to certain cataracts, on which depression, or reclination, strictly so called, had been practised, I should have been disposed to accede to the general assertion, respecting the great length of time, which a firm, or tough capsular cataract remains in the vitreous humor undissolved, and unabsorbed. But, if he mean, that the same thing is generally the case with cataracts broken piecemeal, and placed in the aqueous humor, we know, that such a representation is contradicted by the experience of an infinite number of the highest authorities in surgery. Nay, notwithstanding the case adduced of a bony lens having remained in the aqueous humor twenty-six years, I am disposed to think, that Beer himself does not intend to question the absorption of the fragments of cataracts in the aqueous humor, particularly as at p. 357, B. 2, he sanctions pushing the fragments of semi-firm cataracts through the pupil into the anterior chamber, where, he confesses, that *they are soon absorbed.*

Beer thinks, that, in general, depression and reclination are indicated only in cases, in which extraction is absolutely impracticable, or attended with too great difficulty, as will be better understood when this operation is considered. As examples of this kind, Beer specifies an extensive adhesion of the iris to the cornea; a very flat cornea, and, of course, so small an anterior chamber, that an incision of proper size in the cornea cannot be made; a broad arcus senilis; an habitually contracted pupil (incapable of being artificially dilated;) an eye much sunk in the orbit, with a small fissure between the eye-lids; eyes affected with incessant convulsive motions; a partial adhesion of the cataract to the uvea; unappeasable timidity in the patient; and an impossibility of managing him during and after the operation, in consequence of his childhood or stupidity.

With regard to the question, whether depression, or reclination, should be preferred, Beer is of opinion, that the first method is indicated only when the dimensions of the cataract are small, and consequently, when there is room enough for it to be placed below the pupil, without the ciliary processes being torn from the annulus ciliaris. Such cases are the *dry siliquose cataract*, (the *primary membranous cataract*, of Scarpa,) when perfectly free from adhesions to the uvea; the true *lenticular secondary cataract*, produced by the small but firm fragments of the lens having been left, or risen again; and the genuine *secondary membranous*, or *capsular* cataract. On the other hand, reclination is to be preferred, when, together with the above objections to extraction, the surgeon has to deal with a fully formed, very *hard lenticular*, or *capsulo-lenticular cataract*; or with a case of the latter kind, complicated with partial adhesions to the uvea; or when the case is a *secondary capsular cataract*, similarly circumstanced; a *secondary cataract of lymph*; a *gypsum-cataract*; or there is reason to apprehend a considerable tendency in the blood-vessels of the interior of the eye to become varicose. *(Lehre von den Augenkr. B.* 2, *p.* 365.)

The manner of operating with the needle upon the congenital cataracts of children, will be hereafter explained.

EXTRACTION OF THE CATARACT.

From some passages in the works of Rhazes, Haly, and Avicenna, specified by Mr. Guthrie, it is sufficiently clear, that the practice of opening the cornea for the removal of cataracts was not unknown to the ancients. Rhazes says, that, about the end of the first century, Antyllus opened the cornea, and drew the cataract out of the eye with a fine needle, in which practice he was followed by Lathyrion. However, while doubts were entertained, respecting the true seat of the cataract, it is hardly to be supposed, that this mode of treatment could have been frequently adopted; but, as soon as it was fully proved, that the true cataract was an opacity of the crystalline lens; that the loss of sight would not be occasioned by the removal of this body; that the cornea might be divided without danger; and that the aqueous humor would be quickly regenerated; the mode of cure, by extracting the cataract out of the eye, would naturally present itself. *(Wenzel.)*

Freytag is perhaps the first in modern times, who made an attempt to extract the cataract: this was about the close of the 17th century. After him, Lotterius, of Turin, performed the operation. But, nobody has so strong a claim as M. Daviel to the honor of bringing the merits of the practice before the public, and he not only adopted it himself, but published the first good description of it. *(Sur une Nouvelle Méthode de guérir la Cataracte par l'Extraction du Cristallin,* 1747. *Also Mémoires de l'Acad. Royale de Chirurgie, T.* 2, *4to.* 1753.) Two cases in which the cataract had accidentally slipped through the pupil into the anterior chamber, whence they were extracted in the years 1707 and 1708 by M. M. Mery and Petit, as related by St. Yves, seem to have had considerable influence in bringing about the regular performance of this method of removing the cataract; for, they served as an encouragement to Daviel, by whom the practice was completely established. The operation was afterwards brought considerably nearer to perfection by the ingenuity and industry of Wenzel. *(Brambilla, Instrumentarium Chir. Austriacum,* 1782, *p.* 71.)

Indeed, with the valuable instructions, which Ware and Beer have still more recently furnished, the extraction of the cataract may now be regarded as brought to the highest state of improvement. According to Beer, it admits of division into three stages, the first of which, as in depression and reclination, is the most important, because, unless it be performed exactly as it ought to be, the operation will be very liable to fail, and it is exceedingly difficult to make amends for any fault committed in this early part of the proceedings. The first stage consists in making an effectual opening in the cornea with a suitable knife. The second, in dividing the anterior layer of the capsule, which, says Beer, should not be merely punctured, or torn with a bluntish instrument, but cut with a sharp two-edged lance-pointed needle, and, as much as possible, annihilated. In the third stage, the expulsion of the cataract from the eye is effected either by the well-regulated action of the eye-ball itself, or by the assistance of art. But, as Beer remarks, they who have learned the manner of effectually and skilfully cutting the cornea, will frequently have the pleasure to find the two last stages beneficially converted into one, and the operation in general soon and expeditiously completed. *(Von den Augenkr. B.* 2, *p.* 366.)

The knives, used by Richter, Wenzel, Ware, and Beer, are all of them more or less different; but, they agree in the common quality of completely filling up the wound, as it is extended, so that none of the vitreous humor can escape before the division of the cornea is finished.

Wenzel's knife resembles the common lancet employed in bleeding, excepting that its blade is a little longer, and not quite so broad. Its edges are straight, and the blade is an inch and a half (eighteen lines) long, and a quarter of an inch (three lines) broad, in the widest part of it, which is at the base. From this part it gradually becomes narrower towards the point; so that this breadth of a quarter of an inch extends only to the space of about one-third of an inch from the base; and, for the space of half an inch from the point, it is no more than one-eighth of an inch broad.

The knife, employed by the late Mr. Ware, is, in regard to its dimensions, not unlike that employed by Wenzel. The principal difference is, that Mr. Ware's knife is less spear-pointed; in consequence of which, when this latter instrument has transfixed the cornea, its lower, or cutting edge will sooner pass below the inferior margin of the pupil, than the knife used by Wenzel. On this account, Mr. Ware believed, that the iris would be less likely to be entangled under the knife, which he recommended, than under Wenzel's, when the instrument begins to cut its way downwards, and the aqueous humor is discharged. Mr. Ware particularly advises great care to be taken to let the knife increase gradually in thickness from the point to the handle; by which means, if it be conducted steadily through the cornea, it will be next to an impossibility, that any part of the aqueous humor can escape, before the section is begun downwards; and, consequently, during this time, the cornea will preserve its due convexity. But, if the blade should not increase in thickness from the point; or if it be incurvated much in its back, or edge, the aqueous humor will unavoidably escape, before the puncture is completed; and the iris, being brought under the edge of the knife, will be in great danger of being wounded by it. But, a better knife, than any other which has yet been proposed, is that employed by Beer, a representation of which I have given in Vol. 1, of the *First Lines of Surgery*, plate 7, fig. 3. The sentiments of Richter, Scarpa, Beer, and others, about the position of the patient in the operation and the mode of fixing the eye, have been already noticed in a foregoing section.

The operator is to sit in front of the patient, but upon a considerably higher stool, or chair, than the latter, as already explained, and his legs are to be placed on each side of the patient, and his right foot sufficiently raised by a stool for his elbow to rest upon his knee, whilst the knife is on a level with the patient's eye. (See *Guthrie's Operative Surgery of the Eye, p.* 295.)

When the right eye is to be operated upon, and the operation is to be done according to the preceding directions, the surgeon must of course use his left-hand; but if he be not an ambidexter, "the patient must be placed on his back on a table, or on a mattress, or a firm bedstead with a head, so that the operator can stand behind without inconvenience. The head being supported on a cushion, the operator raises the upper eyelid himself, and fixes the eyeball, whilst an assistant depresses the lower lid, if necessary, the incision is then to be made with the same precaution, as in the other method, the knife being held with its edges towards the thumb, and the little finger towards the temple, instead of the cheek. The division of the cornea upwards in this manner is the operation generally preferred by Mr. Alexander for both eyes, when not specially contra-indicated. (*Guthrie, p.* 318.)

Baron Wenzel, fearful of the bad consequences of undue pressure, made no endeavour to fix the eye at all at the period of cutting the cornea.

The late Mr. Ware did not approve of this plan of leaving the eye unfixed. The danger likely to arise from undue pressure, he observes, can only take place, after the instrument has made an opening into the eye; but, the pressure, which he recommended, is to be removed the instant the knife is carried through the cornea, and before any attempt is made to divide this tunic downwards. To understand this subject better, however, the reader should know, that Mr. Ware divided the incision of the cornea into two distinct processes; the first of which may be called *punctuation*, and the second *section*. So long, says Mr. Ware, as the knife fills up the aperture, in which it is inserted, that is, until it has passed through both sides of the cornea, and its extremity has advanced some way beyond this tunic, the aqueous humor cannot be discharged, and pressure may be continued with safety. The punctuation of the cornea being completed, the purpose of pressure is fully answered; and, if such pressure be continued, when the section of the cornea begins, instead of being useful, it will be hurtful. To avoid all bad effects, Mr. Ware recommends the cornea to be cut in the following way.

The operator is to place the fore and middle fingers of the left hand, upon the tunica conjunctiva, just below, and a little on the inside of the cornea. At the same time, the assistant, who supports the head, is to apply one, or, if the eye projects sufficiently, two of his fingers, upon the conjunctiva, a little on the inside and above the cornea. The fingers of the operator and assistant, thus opposed to each other, will fix the eye, and prevent the lids from closing. The point of the knife is to enter the outside of the cornea, a little above its transverse diameter, and just before its connexion with the sclerotica. Thus introduced, it is to be pushed on slowly, but steadily, without the least intermission, and in a straight direction, with its blade parallel to the iris, so as to pierce the cornea towards the inner angle of the eye, on the side, opposite to that, which it first entered, and till about one-third part of it is seen to emerge beyond the inner margin of the cornea. When the knife has reached so far, the punctuation is completed. The broad part of the blade is now between the cornea and the iris, and its cutting edge below the pupil, which of course is out of all danger of being wounded. As every degree of pressure must now be taken off the eyeball, the fingers, both of the operator and his assistant, are instantly to be removed from this part, and shifted to the eyelids. These are to be kept asunder by gently pressing them against the edges of the orbit; and the eye is to be left entirely to the guidance of the knife, by which, says Mr. Ware, it may be raised, depressed, or drawn to either side, as may be found necessary. The aqueous humor being now partly, if not entirely evacuated, and the cornea of course rendered flaccid, the edge of the blade is to be pressed slowly downward, till it has cut its way out, and separated a little more than half the cornea from the sclerotica, following the semicircular direction, marked out by the attachment of the one to the other. (*Ware.*)

In the eyes of some persons, the iris is so convex, that it is almost impossible to complete the section of the cornea, without entangling the iris under the edge of the knife, unless the cornea be gently rubbed downward with the finger; one of the most important directions, according to Mr. Ware, in Wenzel's whole book.

If the edge of the knife should incline too much forward, and its direction be not altered, the incision in the cornea will be too small, and terminate almost opposite the pupil. In this case, there will be great difficulty in extracting the cataract, and the cicatrix afterwards may obstruct sight. If, on the contrary, the edge of the instrument be inclined too much backward, and its direction be not changed, the incision will approach too near the part where the iris and sclerotica unite, and there will be great danger of wounding them. These accidents may be prevented by gently rolling the instrument between the fingers, until the blade takes the proper direction. (*Wenzel.*)

The late Mr. Ware had seen operators, through a fear of wounding the iris, introduce and bring out the instrument at a considerable distance before the union of the cornea and sclerotica; in consequence of which, the incision from one side of the cornea to the other was made too small for the easy extraction of the cataract, although from above downward, it was fully large enough for this purpose. Mr. Ware also sometimes observed, that though the punctuation of the cornea, from side to side, had been properly conducted, and its section, afterwards, to all appearance, effectually completed, yet, on account of the frictions, employed to disengage the iris from the edge of the instrument, the knife, in cutting downward, was carried between the layers of the cornea, and, consequently, though the incision appeared externally, to be of its proper size; internally, it was much too small for the cataract to be easily extracted. In this case, the incision must be enlarged, by means of a pair of curved blunt-pointed scissars, which should be introduced at the part where the knife first entered the cornea. (*Ware.*)

Beer subdivides the first stage of this operation into four, each of which, he says, claims the utmost attention, if it be wished to make the incision in the cornea in every respect proper: the first is the introduction of the knife through the cornea into the anterior chamber; the second is directing the knife towards the place where its point is to be brought out again; the third is bringing out the point, and guiding the knife in continuing the incision in the cornea; and the fourth is the finishing of that incision. As Beer states, a completely well made incision in the cornea, must, in the first place, be of sufficient size, to let the cataract escape from the eye without the slightest impediment; and it will be large enough, if care be taken to open one half of the cornea near its edge. Secondly, it must be of a proper shape, its margin not being triangular, nor notched, but evenly rounded. In general, says Beer, no greater disadvantage can happen, than that of having too small an incision in the cornea; for, even when the cataract is pressed out of such an opening, portions of it are always left behind, which afterwards cannot be extracted without trouble; and though the sight may be at the moment restored, it will be fortunate, if the eye be not afterwards spoiled by the effects of inflammation. When the incision is triangular, or notched, its edges cannot be put smoothly together so as to be healed by the first intention, which, however, is highly necessary, and the consequence is a white, ugly scar, which is slowly produced with inflammation, and forms a greater or lesser permanent impediment to vision downwards, though the patient be capable of seeing the smallest objects, which are straight before him.

According to Beer, when the knife is to be introduced, its point should enter the cornea, about one-eighth of a line from its edge, and one-fourth of a line above its transverse diameter, directed obliquely towards the iris, with its edge turned downwards, by which means, the point will pass immediately into the anterior chamber. As soon as it has arrived there, which is indicated partly by its bright extremity being seen within the space in question, and partly by the *tactus eruditus*, such a direction is to be given to it, that its point may project from the place of its entrance nearly in a direct line towards the intended place of its exit out of the cornea, but a little higher; while the posterior surface of the blade is to be conveyed across the anterior chamber exactly parallel to the iris. The knife is to be cautiously pushed on, neither too quickly, nor too slowly, with its point continually directed somewhat upwards above the part, where it is to pass out again, until the point arrives near the inner edge of the cornea; but, in the transverse passage of the knife, its edge should not be suffered either to go nearer to, or further from, the iris, as every turn of the blade backwards, or forwards, opens the upper angle of the wound, when the aqueous humor immediately escapes, and the iris not only falls close against the posterior surface of the blade, but, sometimes even under the edge, so as to throw the young operator into the greatest embarrassment. If the point of the knife has now been favourably brought out, the surgeon is to continue to push it on, without pressing it downwards, or making a sawing motion with it, until the last stage of the operation, viz. that in which the incision is finished. However, as soon as the point of the knife has passed out of the cornea, and reached the inner canthus, attention must be paid, first, to that part of the blade, which is yet in the anterior chamber, so that the iris may not fall under its edge, and the knife may not take an erroneous direction; secondly, to the point of the knife, which continually projects more and more, so that the inner canthus may not be wounded, which accident, though trivial in itself, would make the unprepared patient suddenly and involuntarily draw back his head. The only way of preventing this injury, says Beer, is regularly to incline the handle more backwards and downwards, in proportion as the point passes further out of the anterior chamber. Thirdly, at the period, when the last piece of the cornea is to be cut, the knife should be pushed on very slowly, for otherwise the lens, and with it a part of the vitreous humor may be discharged, as now the muscles of the eye are acting, and compressing this organ, with the greatest force, and in old persons especially, the loose conjunctiva, after the cornea is cut through, comes against the knife, and is apt to be wounded. At the time, when the operator finishes the incision in the cornea, the assistant is to let the upper eyelid cover the eye and a few seconds are to be allowed for the patient to recover from his fright.

In the second stage of the operation, Beer directs the assistant again steadily to hold the patient's head in the same manner, as during the cutting of the cornea; but, the upper eyelid, he says, must be carefully and effectually raised, without touching the eye-ball in the least, or letting the ends of the fingers project beyond the edge of the tarsus. The operator is to depress the lower eyelid with his fore-finger, which is not to be removed away from the eye, but gently applied to the lower part of it with the intervention of the eyelid, by which means, the cataract-lance, or capsule-needle, may be more readily and easily introduced under the flap of the cornea into the pupil, while the gentle pressure, and the projection of the cataract thereby produced, considerably enlarge the pupil, and facilitate the proper division of the capsule. In order to complete the latter object, the surgeon introduces one of the sharp edges of the capsule-needle, with the point directed towards the inner canthus, between the cornea and the iris, the wound in the former of these membranes being opened as little as possible, lest the atmospheric air enter the eye, a circumstance, of which Beer entertains great apprehension. After the capsule-needle has been cautiously passed to the inferior margin of the pupil, its lower sharp edge is to be applied to the capsule of the lens with its point directly upwards, and one of its flat surfaces towards the inner; and the other, towards the outer canthus. The operator is now strictly to cut through the capsule, by making at small distances from one another repeated perpendicular strokes with the edge of the needle. Then the handle of the instrument is to be half turned round on its axis, and similar strokes are to be made with its edge in a somewhat oblique direction, by which means, the anterior layer of the capsule will be cut into many squarish fragments, some of which, in the third stage of the operation, are taken out of the eye together with the cataract, and the risk of a secondary cataract of the anterior layer of the capsule is in a great measure removed. When the capsule-needle has done its business, it is to be withdrawn from the eye in the same position in which it was introduced, and the second stage of the operation is thus finished. (*Beer, B. 2, p.* 369.)

I believe no better instructions than the foregoing, can be delivered, respecting the most advantageous method of dividing the capsule. They are infinitely better, than those given by Wenzel and Ware. As soon as the point of the cornea knife had arrived opposite the pupil, Wenzel used to incline it gently backward, and thus puncture the capsule; but, Mr. Ware very properly objected to this plan, which, however it might serve to exhibit the dexterity of the operator, was attended with no advantage to the patient, and could not be so efficient and safe as the mode of making the division of the capsule a distinct part of the operation.

Indeed, Wenzel himself did not recommend opening the capsule of the crystalline in this way, when the pupil was much contracted, and the muscles of the eye and eyelids easily thrown into convulsions, or when the posterior chamber was large.

For dividing the capsule after the division of the cornea, Wenzel and his father used to employ a flat needle, one line, that is, one-twelfth part of an inch, in diameter, having its cutting extremity a little incurvated. This needle, which they advised to be made of nealed gold, in order that its pliability may allow the operator to bend it in different directions, as occasion requires, is fixed in a handle, two inches and a half in length, and similar to that of the cornea knife. At the other extremity of the same handle a small curette, or scoop, is fixed, made also of nealed gold, which is of use for extracting the cataract.

The late Mr. Ware's method of opening the capsule will be hereafter noticed.

When the incision in the cornea has been completed, and the capsule effectually divided, the cataract, as Beer observes, advances into the pupil immediately behind the capsule-needle, and, if there be the least action in the eye itself, it is generally at once discharged. Under these very favourable circumstances, however, it sometimes happens, that a portion of the gelatinous or scabrous surface of the cataract is detached at the margin of the pupil, as the opaque body is passing out, and, therefore, in the second stage of the operation, Beer recommends having Daviel's scoop always ready, which is to be substituted for the capsule-needle, and employed for preventing the loose fragments from falling back into the posterior chamber in the following manner: as soon as the operator remarks, that, in the passage of the cataract out of the pupil, a portion of it will be scraped off by the edge of that opening, he should introduce the scoop at the lower and outer edge of the cataract upwards, between the cornea and the iris, so as to be able to keep the part of the cataract, which is ready to break off, close up behind the rest of it, and bring the whole out of the eye.

But, says Beer, when the third stage of the operation, viz, the removal of the cataract from the eye, cannot be so readily accomplished, a circumstance, not always owing to an imperfection in the incision in the cornea, or in the division of the capsule, but sometimes proceeding from a want of proper action in the eye itself; the operator, if he feels convinced that the fault does not lie in the first or second stage of the operation, (in which case, it would be necessary to endeavour to rectify what is wrong) should assist in promoting the discharge of the cataract. There are two manners of doing this, and it is not a matter of indifference, which is selected: for, the second should be adopted only, when the first will not answer. Hence, says Beer, the operator, like a skilful accoucheur, must first trust to the action of the organ itself, which he should in a certain degree excite, and not proceed immediately to the use of a scoop, hook, or forceps. The eye is to be suffered to turn quickly a few times upwards, and in general, during these movements, the surgeon will perceive, that the lower edge of the cataract advances further through the pupil, and at length, slips out of the eye, without the aid of instruments. If at this period, a portion of the cataract were found to be likely to break off, the employment of Daviel's scoop, in the way already explained, would be proper. On the other hand, if, during the protracted movements of the eye upwards, this organ evince little energy of its own, the cataract will not enter the pupil, or scarcely do so, much less pass out of the eye, and the operator is under the necessity of resorting to manual assistance, and with the end of the finger, used for keeping the lower eyelid depressed, he is gently to press the lid against the lower part of the eye-ball. Such pressure should be gradually increased, until the greatest diameter of the cataract has passed into the pupil, at which moment, the pressure must not be discontinued, before the cataract is completely out of the eye, which object may be promoted by supporting the lower part of the lens with Daviel's scoop, and then the pressure is to be diminished in the same gradual way, in which it has been previously augmented. Immediately the cataract is completely out of the eye, and the surgeon has paid due attention to the removal of any fragments left behind, the assistant is to let the upper eyelid descend, the patient is to be desired to keep both his eyes shut and perfectly still, and his head and eyes are to be covered with a clean white piece of linen, so that the effect of the light may be moderated.

When the patient has recovered from the alarm, which, according to Beer, the passage of the cataract outwards, especially when it is large and firm, always produces in a greater or lesser degree, he is to be placed with his back towards the window, and the linen is to be raised a little from the eye, which is to be very slowly opened, while the other eye, which has not been operated upon, is to be kept well covered. Beer says, that the patient should then be shown some objects, not of a shining, or very bright description, at different distances; and, if he is able to see them plainly, the surgeon may proceed to apply the dressings without delay.

Beer confesses, that, if possible, it would be better to dispense altogether with making any trials of the power of the eye, which has just been operated upon, because such attempts must tend to increase the subsequent inflammation in the organ; yet, he is of opinion, that these trials of the eyesight are necessary after extraction of the cataract. First, because the capability of seeing immediately is a thing always expected by the patient and his friends, and leaving them in ignorance on this point, would keep up an anxiety, likely to have a bad effect in rendering the ophthalmy more severe. Secondly, Beer urges, as a stronger motive for the custom, the circumstance of the patient seeing, when his eye is first opened, all, even the smallest objects, though he suddenly loses the faculty of distinguishing them at all, or sees them very obscurely; and, now, if he be half turned with his face towards the window, one will find in the pupil, which directly after the passage of the cataract was perfectly clear, some soft or firm fragments of the lens, which are first dislodged from within the capsule by the variations in the eye, produced by the inspection of different objects at different distances, and which, without these trials of vision, would be long in being loosened by the aqueous humor, and might form a secondary lenticular cataract; which will not now be the case, as the surgeon can and ought at once to remove them. (*Lehre von den Augenkr.* 2 *B. p.* 373.)

The preceding mode of operating, as Beer observes, will not answer for every case of cataract, adapted to extraction; but, the plan sometimes requires to be modified according to circumstances. Thus, according to the same writer, when the eye is very prominent, and particularly when at the same time the fissure of the eyelids is extremely narrow, the incision in the cornea must not be made horizontally, but obliquely outwards; for otherwise the edge of the lower eyelid will retard the healing of the wound, and an ugly cicatrix, more or less injurious to the eyesight, be the consequence.

When the cataract is of middling consistence, neither very hard, nor soft, Beer assures us, that the attempt ought to be made to extract the cataract and the capsule together. (*Methode den grauen Staar sammt der Kapsel auszuziehen, &c. Wien.* 1799.) In such a case, he says, the experiment will mostly succeed, if properly conducted, and, if it should not, it causes not the slightest detriment to the eye, nor the least obstacle to the effectual completion of the operation. The capsule-needle is to be introduced into the pupil, as in the second stage of the operation, and its point is then to be slowly pushed, as far as its greatest diameter, into the centre of the lens, so that one surface of the needle may be upwards, the other downwards; one of its cutting edges turned towards the inner canthus, the other towards the outer one. And now the needle, with the impaled cataract, is to have sudden, but short perpendicular jerks communicated to it, by which means, the upper and lower connexions of the capsule with the neighbouring textures will be in part loosened. The needle is next to be suddenly rotated, without withdrawing it from the cataract, so that one of its flat surfaces may face the inner canthus, the other, the outer one; and one of its edges may be turned upwards, the other, downwards; and then the short sudden jerks of the needle in the horizontal direction may be repeated for the purpose of breaking, as much as possible, the lateral connexions of the capsule. Lastly, the capsule needle is to be quickly withdrawn from the eye, when it is mostly followed by the lens and the capsule, or the cataract comes away fixed on the point of the instrument, at which moment the pupil becomes perfectly clear and black. When the cataract does not follow the withdrawing of the needle, the surgeon is to proceed with the usual cautions to the third stage of the operation. Great as the advantage would always be of extracting the cataract, together with its capsule, it is plain, that the attempt is not practicable when the case is a very hard lenticular cataract, because the capsule-needle cannot be effectually introduced into the body of such a lens, situated upon the yielding vitreous humor. Nor would the plan answer, if the cataract were very soft, as the movements of the needle in it could have no effect in breaking the connexions of the capsule. Mr. Lawrence has often expressed to me his decided opinion, that the foregoing method will rarely succeed, and ought not to be attempted; which is also Mr. Guthrie's judgment. (*Operative Surgery of the Eye, p.* 308.)

In the case described by Beer under the name of *encysted cataract*, the capsule must not be opened; but after properly opening the cornea, if the cataract does not escape of itself at this moment from the eye, the operator must immediately introduce the small cataract-tenaculum, with its point turned downwards, between the cornea and the iris, into the pupil. The cataract should then be firmly taken hold of with the hook, and slowly and steadily drawn out of the eye with its thick, tough capsule. Beer says, that extraction should be performed in the same way in the dry siliquose capsulo-lenticular cataract of children and adults, except that, in all these cases, a fine, elastic, sharp, silver, or golden spatula, fixed at the lower part of Daviel's curette or scoop, should be ready at hand to assist in separating the cataract from the vitreous humor, immediately the opaque substance is disposed to pass out of the eye. Also in the completely fluid cataract, when the capsule is partially opaque and thickened, a circumstance easily known by appearances, the same mode of extraction must be attempted. But, if the hook should tear its way out, and the capsule empty itself, the extraction must be performed altogether with the forceps. The latter instrument is to be cautiously introduced in the same manner as the capsule-needle, into the pupil, one of the largest and thickest portions of the capsule is then to be taken hold of, and suddenly drawn out towards the opposite side, by which means, generally the whole anterior layer, and sometimes also the posterior layer, of the capsule will be detached, and the pupil immediately cleared. On the contrary, in what Beer has called the *bar cataract*, which, he says, is seldom fit for an operation, as soon as the cornea has been opened, the bar must first be separated, by means of the capsule-needle, from the uvea, in whatever way is found most practicable, and then it is to be extracted with the small cataract-tenaculum, or teeth forceps; when this has been done, the cataract itself must be taken out of the eye in the same manner as the encysted cataract. (*B.* 2, *p.* 377.)

When extraction has been completed, the next object is to dress the eye: while the patient turns his eye upwards, the lower eyelid is to be drawn downwards from the eye with the forefinger, and steadily held so, until the patient has shut his eye as much as possible.

Mr. Ware found, that a dossil of lint, steeped in plain water, or brandy and water, and covered with the spermaceti, or saturnine cerate, and removed once every day, is the most easy and convenient dressing, that can be applied after the operation. The cerate over the lint prevents the latter, when impregnated with the discharge, from becoming stiff, and irritating the lids. Mr. Ware thought the mode of applying the compress and bandage over the eye, a circumstance of no small importance, because, if too loose, the dressings are very apt to slip off, and, consequently, to press unequally and injuriously on the eye; and if too tight, the undue pressure will excite pain and inflammation, and even force out some of the vitreous humor. Mr. Ware's compress is made of soft linen, folded, two or three times, wide enough to cover both eyes, and sufficiently long to extend from the upper part of the forehead to the lower part of the nose. This he pins at the top of the patient's night-cap; and its lower part, which is divided in the middle, to allow the nose to come through it, he lays loosely over the eyes. The bandage, also made of old linen, and as broad as six fingers, he carries round the head over the compress, and pins to the side of the night-cap moderately tight. A slip of linen is afterwards carried under the chin, and pinned at each end to the side of the bandage, so as to prevent it from slipping upwards. (*Ware.*) Mr. Guthrie recommends an elastic net work nightcap which fits the head closely, to be put on, and a piece of roller to be fastened by its middle to the centre of the cap behind. "A small piece of lint, on which some ung. cetacei has been spread, is to be applied over the closed eyelids, a compress of fine linen is to be placed over it, and another over the opposite eye, when each end of the roller is to be brought forwards, made to secure the compress of its own side, and then passed over to the other." (*Operative Surgery of the Eye, p.* 314.)

Beer recommends the patient to lie upon his back, with his head not too low, and in a chamber which is not too light, and to remain in this way at least until the wound in the cornea is closed. As, during the first two days after the operation, the doubled piece of linen, which Beer places over the eye, is repeatedly wet through with the discharged aqueous humor, it is to be changed several times a day. He also enjoins the observance of every thing, which has been already pointed out as proper after depression and reclination; and, in particular, while the wound in the cornea is not firmly healed, and the eye cannot be kept open, the patient must refrain from taking snuff and smoking tobacco. According to the same author, no thoughts should be entertained of opening the eye again, till two, or three days after the discharge of the aqueous humor has completely ceased; a circumstance always indicated by slight prickings in the eye itself, by a burning, though not very severe, pain, attending the escape of that fluid from the inner canthus, and in irritable, nervous, debilitated subjects, even by the sensation of transient luminous appearances. Therefore, Beer says, the eye should seldom be opened before the 5th, or 6th day. When this is first done, the light should be very moderate, and the patient placed with his back towards it, all unnecessary lateral light being kept from the eye by the linen attached to the forehead, while the daily trials of the newly recovered powers of the eye should be made with the utmost caution. On the 8th, 9th, or, at latest, on the 10th day, Beer recommends leaving the eye open, but screened above by a green eye-shade, in a half darkened chamber; and the patient is afterwards to be treated, until his eye is perfectly well, according to the rules already laid down as proper to be observed after couching. And, especially when the patient has had cataracts in both eyes, Beer thinks it as well to apprize him, in order to prevent unnecessary alarm, that, upon first going out into the open air, particularly in the evening, he will be for some moments almost blinded, and then begin to see again, but every object will now appear covered with a white, shining circle, which at length goes off; though, in the open air, it will sometimes continue for several days. (*B.* 2, *p.* 380.)

A few hours after the operation, Mr. Guthrie always bleeds the patient, whether pain come on, or not; and if it continue, or afterwards take place, he repeats the evacuation. In another few hours, if no amendment occur, he has recourse even to a third bleeding. For the first 24 hours, he does not wish the patient to be disturbed with purgative medicines, so as to produce any risk of the edges of the cornea being displaced; but, after this period, he exhibits saline aperients, and, when much inflammation is expected, he prescribes calomel combined with opiate confection; and, if the inflammation continue, he gives two grains of calomel with $\frac{1}{4}$ or $\frac{1}{2}$ of a grain of opium, three or four times in the course of 24 hours, so as to affect the system, and prevent the bad consequences of the inflammation of the iris and internal parts of the eye. (See *Guthrie's Operative Surgery of the Eye*, *p*. 315, 316.)

The late Mr. Ware published an inquiry into the causes preventing the success of extraction of the cataract.

The first, which he considers, is making the incision through the cornea too small. In this circumstance a degree of violence will be required to bring the cataract through the wound; and, if the cataract be not altered in its figure, the wound will be forcibly dilated, and the edge of the iris compressed between the cornea and the cataract. In this way, either some of its fibres may be ruptured, or it may be otherwise so much injured as to excite a considerable degree of inflammation, and even induce, in the end, a closure of the pupil.

This accident may arise from the operator's cutting the cornea, without being able to see exactly the position of this membrane, in consequence of the eye having turned inward, owing to its not being properly fixed. The fault may also proceed from the incision having been begun below the transverse diameter of the cornea. In this manner, nine-sixteenths, or rather more than half of the circumference of this membrane, will not be divided ; which extent the incision ought always to occupy, in order to allow the cataract to be extracted with facility.

When however the cornea is remarkably flat, and the iris projects unusually forward in the anterior chamber, Mr. Ware recommends including only one-third of the cornea in the first incision, and afterwards enlarging the aperture, on the outer side, by means of curved scissars.

Taking care to fix the eye in Mr. Ware's way, is represented by this author as being of great consequence in hindering the wound in the cornea from being made too small.

Whenever the wound in the cornea is made too small, it should always be enlarged before proceeding further in the operation ; and, according to Mr. Ware, this can be best accomplished with a pair of curved blunt-pointed scissars, on the outer side of the cornea, where the knife first made its entrance.

For doing this, Beer recommends the use of Daviel's scissars, which are to be introduced with their concavity towards the operator, and their point directed towards the pupil. Beer also introduces the point of the inner blade into the middle of the wound of the cornea, under the flap already made, and passes it somewhat higher than the place to which it is necessary to enlarge the incision. Then he first conveys the instrument to the inner or outer angle of the wound, where the dilatation is to be made, keeping the blade, which is within the cornea, not parallel to the iris, but in an oblique position with respect to it, for otherwise the best scissars will fail to make a clear division. The scissars also must not be opened more than is absolutely necessary, and they should be very quickly shut, and in such a manner, that the outer blade ought only to move towards that within the cornea, lest the eye suffer injury. Beer says, that it is hardly ever necessary to enlarge the incision in the cornea at both its angles; and, in these cases, he confesses, that all idea of shaping the wound altogether as it ought to be, must be renounced. (*Lehre von den Augenkr. B.* 2, *p* 382.)

Wounding the iris with the cornea-knife, is the second accident which Mr. Ware considers. The principal cause seems to him to be a discharge of the aqueous humor, before the knife has passed through the cornea low enough to hinder the lower part of the iris, which forms the inferior rim of the pupil, from getting beneath the edge of the instrument. According to Mr. Ware, the escape of the aqueous humor may be owing to some inaccuracy in the shape of the knife, or unsteadiness in introducing it. The falling of the lower part of the iris under the edge of the knife, Mr. Ware believes, cannot always be prevented by the utmost skill, or precaution of the operator. Happily, however, says he, we have been taught, that the iris may be reinstated, after it has been thus displaced, and without suffering any injury, by making gentle frictions on the cornea, with the point of the finger.

By unsteadiness in passing the knife, Mr. Ware means, that the knife may not only be suffered to make a punctuation through this tunic, but, that its edge may, at the same time, be unintentionally pressed downward, so as to make an incision likewise; in consequence of which downward motion of the knife, an aperture must unavoidably be left in the cornea, through which the aqueous humor will escape. If the cornea knife increase through its whole length, both in width and thickness, and if it be merely pushed through the cornea, no space will be left, through which any fluid can escape.

According to Beer, the escape of the aqueous humor, as the knife passes across the anterior chamber, may happen with, or without any fault on the part of the operator, and the iris fall not merely against the posterior surface of the knife, but even project under its edge, and over its back. When this happens, Beer joins Ware in recommending the end of the middle finger, situated at the inner canthus, to be gently pressed without delay upon that part of the cornea, which is in front of the knife, and, at the moment when this is done, the iris will recede from the edge of the instrument, and the operator, by being very quick, may proceed again without any risk of injuring that part of the eye. But, if the iris should be found to project again above and below the knife immediately the point of the finger is removed from the cornea, such removal should not be made, and the knife be boldly pushed on until its point pierces the other side of the cornea; or, if the point has already passed some way out of the cornea towards the inner canthus, the blade is to be pushed on so far, that no protrusion of the iris is possible. For, says Beer, while the finger continues to make gentle pressure upon the cornea, the iris will not fall under the knife. Should the eye chance to withdraw itself from the knife, after this has penetrated the anterior chamber; a circumstance, which may easily happen in restless timid patients, the greater part or the whole of the aqueous humor is immediately discharged, and the iris comes in contact with the empty cornea. In this case, Beer says, that the operator should find out the wound with another knife, and with a wriggling motion of the instrument, conduct it between the iris and the cornea, twisting and turning the point about until it has successfully passed beyond the external, then beyond the inner pupillary margin of the iris, and has finally come out of the cornea again. Now the incision in the cornea may be properly finished, in doing which, it is always necessary to keep the middle finger applied to this membrane, in consequence of the disposition of the iris to fall against the knife. Beer mentions it as a curious fact, that most of the patients, who are restless and unmanageable at the first introduction of the knife, and who themselves cause that disagreeable occurrence now spoken of, are, on the contrary, very quiet during the foregoing manœuvres. (*Lehre von den Augenkr. B.* 2, *p.* 381.)

The third accident, noticed by Mr. Ware, is the escape of the vitreous humor. The common occasion of this occurrence is the undue application of pressure. It may take place, either when the incision is made through the cornea, or at the time of extracting the cataract. Some eyes are subject to spasm, which renders them much more liable to this accident. To prevent it, Mr, Ware recommends every kind and degree of pressure to be taken from the eye, before the knife has completely cut its way through the cornea. And, as soon as the knife has proceeded sufficiently low to secure the iris from being wounded, the operator should not only take heed, that his own fingers do not touch the eye, but should also direct the assistant, who supports the upper lid, to remove his fingers entirely from this part. The assistant seldom need make any pressure on the globe of the eye; however, when there is room for one of his fingers to be placed on the inner and upper part of the globe, without interfering with those of the operator, the method may be followed, in order to make the eye still more fixed. But immediately the *punctuation* of the cornea is completed, the assistant's finger should always be entirely removed, both from the eyelids and eye itself.

Notwithstanding the upper lid is left thus free, there will be sufficient space between it and the lower lid, to allow the progress of the knife to be seen; and, in finishing the wound, the operator should depress the lower lid with great gentleness.

The vitreous humor may also be lost, in consequence of opening the capsule of the lens nearer the circumference, than the centre of the pupil. As the crystalline is both thinner and softer at that part, the instrument will be liable to pass through both sides of the capsule, and enter the vitreous humor. This humor having no longer any barrier to its escape, is liable to be forced out by the action of the eyelids alone; and, when pressure is afterwards made, to bring the cataract through, a much greater quantity will be lost, and the cataract, instead of coming forward, will recede from the pupil. The only way to extract it now, is, by letting the upper lid be gently raised by an assistant, (a rare instance, in which this is necessary after cutting the cornea) while the operator, either with the fore finger of the left-hand, or with the blunt end of the curette, applied beneath the incision in the cornea, prevents the cataract from sinking further. Then, with his right-hand, let him introduce a hook under the flap of the cornea, and with its point carefully entangle the cataract, and bring it away.

To prevent, however, such difficulties, Mr. Ware never attempted to puncture the capsule, until the whole pupil was in view. He was in the habit of opening the capsule with a gold-pointed needle, arched towards its extremity. Wenzel's needle, for this purpose, was flat in its extremity; Mr. Ware's pointed; and this is their only difference. The latter introduced his instrument under the flap of the cornea, with its arched part uppermost, until its point was on a level with the centre of the pupil. The end of the instrument was then turned inward, and gently rubbed on the capsule of the crystalline, until it pierced it. In a few instances, Mr. Ware found the capsule so tough, that the point of the gold needle would not enter it, and he was obliged to use a sharp steel instrument, of the same shape as that with a gold point. As already explained, Beer was much bolder with the capsule than Ware, and there can be little doubt, that both his capsule-needle and mode of using it are better, than those of Wenzel and Ware.

The vitreous humor may also be lost, at the time of extracting the cataract, and the usual cause is an undue application of pressure. All violent pressure is quite unnecessary for forcing out the cataract, when the wound in the cornea is sufficiently large. When the wound is too small, it should be enlarged as above directed. If pressure be continued at all after the cataract is extracted, the capsule of the vitreous humor will certainly be ruptured, and some of this part of the eye protrude. Pressure may even rupture the capsule of the vitreous humor, before the cataract is brought through the incision in the corner; the same consequences will ensue, and the same practice be necessary, as in the case, in which the operator has unskilfully opened the capsule of the vitreous humor with the needle, in attempting to open that of the lens.

In taking away fragments of opaque matter from the pupil, by means of the curette, great care is requisite to avoid wounding the posterior part of the capsule of the crystalline with the end of the instrument, so as to open a way for the escape of the vitreous humor.

The vitreous humor may, indeed, be forced out, after the extraction of the cataract, merely by a spasmodic action of the eyelids. On this subject, Mr. Ware, after hinting his suspicion, that, in a case of this kind, which he saw, the assistant's keeping up the lid contributed to the event, repeats his advice, "that. after the cornea has been cut, the upper eyelid should be raised solely by the fingers of the left-hand of the operator."

Mr. Ware seems to think, that more evil has resulted from the operator's being deterred, by the readiness, with which the vitreous humor continues to start out, from ascertaining, that all the fragments of the cataract are removed and that the whole of the iris has resumed its position, than from the mere loss of the vitreous humor, which is quickly regenerated.

When a portion of the vitreous humor protrudes, Beer thinks, that the safest practice is not to meddle with it, though he owns, that, in this circumstance, the wound heals slowly, and is always followed by a more or less perceptible, whitish scar, the pupil being generally drawn towards it, and deformed, while the iris and the partly emptied membrana hyaloidea become adherent to the edges of the incision in the cornea.

But, says Beer, the eye-sight will be but little, or not at all impaired, notwithstanding one-eighth or one-fourth of the vitreous humor may be lost. However, he observes, that when one-third or half of it has escaped, a good degree of vision afterwards cannot be expected; and when more than half has been lost, the operation will have a still less successful result. He states also, that, when two-thirds have been lost, though the eye may recover its natural form, the pupillary edge of the iris will remain contracted round the empty, light-grey membrana hyaloidea, which projects into the anterior chamber, consequently, the pupil will be closed, and that state of the iris ensue, which is aptly termed a *sinking of the pupil*, *subsidentia pupillæ* or *synicesis.*

Mr. Ware notices the accident of extracting only a part of the cataract, and leaving the remainder behind. He is an advocate for removing all opaque substances from the pupil, except an extreme degree of irritability, to which some eyes are subject, should render the introduction of every sort of instrument, after the cataract is extracted, difficult and dangerous. Mr. Ware usually removed opaque portions of the cataract by means of a curette; and, occasionally, when the opaque substance was large, and adherent to the capsule, he was obliged to extract it with small forceps. Before finishing the operation, Mr. Ware approves of always rubbing the end of the finger gently on the fore part of the eye, over the eyelids; which proceeding tends to bring into view any opaque matter, which may previously lie behind the iris. Mr. Ware relates a case, proving, that such opacities, as cannot be removed in the operation, are capable of being absorbed.

When, notwithstanding the observance of the directions laid down by Beer, as explained in the previous columns, some of the pultaceous, or scabrous surface of the cataract is detached, and continues behind in the posterior chamber, Beer says, that it ought to be immediately removed, lest the patient be left with a secondary lenticular cataract, which, he observes, is not always so certain of being dissolved and absorbed, as some imagine. The fragments may be removed in two ways; and, first, the experiment of rubbing the upper eyelid over the eye should be made, because it not unfrequently brings the remains, especially when they are gelatinous, completely through the pupil, and out of the incision in the cornea. But, if such manœuvre should not be effectual, Beer recommends cautiously introducing Daviel's curette to the outer pupillary edge of the iris, with its concavity towards the inner surface of the flap of the cornea, without raising this flap unnecessarily high, and then the operator is to endeavour to scoop out at once as much of the opaque matter as he can, and bring it to the inner surface of the cornea. He says, that it will rarely be necessary frequently to repeat the introduction of the curette. (*B.* 2, *p.* 387.)

According to Mr. Ware, an opacity of the capsule can be the only reason for removing it. The anterior part, he says, can alone become the object of the operator's attention: its posterior part is necessarily hidden, while the cataract remains in the eye, and afterwards, if discovered to be opaque, it is so closely connected with the capsule of the vitreous humor, that Mr. Ware believes it cannot be removed by any instrument, without hazarding a destructive effusion of this humor.

When, however, the opaque lens is accompanied with an opacity in the front part of the capsule, Mr. Ware recommends the following plan. After cutting the cornea, as usual, a fine pointed instrument, somewhat smaller in size than a round couching-needle, and a little bent towards the point, should be introduced under the flap of the cornea, with its bent part upward, until its point is parallel with the aperture of the pupil. The point should then be turned toward the opaque capsule, which is to be punctured by it, in a circular direction, as near to the rim of the pupil as the instrument can be applied, without hurting the iris. Sometimes, the part included within the punctures, may be extracted on the point of the instrument; and, if this cannot be done, it should be removed with a small pair of forceps. The lens, whether opapue, or transparent, should next be extracted, by making a slight pressure with the curette, either above, or below, the circumference of the cornea.

On the preceding subject, Beer remarks, that when none of the lens itself is left behind, but there is a slight degree of opacity in the anterior layer of the capsule, easily distinguishable from the cut flakes, and producing the least obstacle to vision, the opaque membrane should be taken away with the forceps, in the manner described in the preceding pages; for, otherwise a secondary capsular cataract will follow, which will become of a snow-white colour, and if only a trivial degree of iritis take place after the operation, it will become adherent to the iris, and the pupil become contracted and disfigured. (*B.* 2, *p.* 388.)

Beer does not agree with Ware in condemning all attempts to remove the posterior layer of the capsule, when found opaque, after the extraction of the lens. The case, he says, is indicated by the light-grey speckled appearance of the whole pupil, and by the patient seeing nothing at all, or objects only indistinctly in a thick mist. Beer advises a cataract-tenaculum to be passed into the pupil, in the same way as the capsule-needle is introduced in the second stage of extraction, directing its point downwards as it enters, and upwards when it is brought out again. After it has entered the pupil, it is to be made to divide and annihilate, by repeated turns of the tenaculum, the back layer of the capsule, and also the membrana hyaloidea, directly behind it, which, in such a case, is always adherent, and opaque. Of these membranes a considerable part, closely wound round the hook, may be taken out of the eye, though never without some slight loss of the vitreous humor. In cases of this kind, the patient ought to be informed, that, though his sight will be restored, a part of the cataract must be left, and will be visible behind the pupil, particularly when it is dilated; for, otherwise, suspicions may arise, that the operation has been badly done, and a relapse apprehended. (*B.* 2, *p.* 388.)

Mr. Ware has considered the bad consequences of allowing foreign bodies of any kind, after the operation, to press unequally on the globe of the eye; comprehending, under this head, the intervention of the edge of the lower eyelid between the sides of the divided cornea; the inversion of the edge of the lower eyelid; and the lodgment of one, or more, loose eyelashes on the globe of the eye.

To prevent the first accident, every operator, before applying the dressings, should carefully depress the lower eyelid; and, before he suffers it to rise again, should take care, that the flap of the cornea be accurately adjusted in its proper position; and, that the upper lid be dropped, so as completely to cover it. After this, the eyelids should not be opened again, for three or four days, that is, until there is a good reason to suppose the wound in the cornea closed. (*Ware.*)

The inversion of the lower eyelid is hurtful, in consequence of its making the eyelashes rub against the eye. These should be extracted the day before the operation. For the mode of effecting a permanent cure, see *Trichiasis.*

Besides the danger, to which the eye is exposed, from the inversion of the edge of the lid, the eye may receive injury from the improper position of the eyelashes alone; one, or more of which, during the operation, may happen to bend inwards; or, becoming loose, may afterwards insinuate themselves between the inside of the lid and the eye. An eyelash bent inward, should be rectified; if broken off and loose, it should be removed.

Lastly, Mr. Ware considers prematurely exposing the eye to a strong light. He censures the plan of opening the eyelids, within the first two or three days after the operation, because the stimulus of the light increases the ophthalmy, and the method is apt to disturb the wound in the cornea, before it is closed. Mr. Ware, however, wishes it not to be inferred, that he is an advocate for long confinement after the operation. His mode is to keep the patient wholly in bed, and to direct him to move his head as little as possible, for the first three days after the operation. During this time, a dossil of wet lint is kept on his eyes, covered with a saturnine plaster, compress, and bandage, as already described. The dressing is renewed once every day, and the outsides of the eyelids washed with warm water in winter, and cold in summer. At each time of dressing, the skin of the lower lid is drawn gently down, to prevent any tendency to an inversion. Animal food is prohibited, and the patient enjoined not to talk much. On the fourth day, he is permitted to sit up, for two or three hours, and, if he has had no stool since the operation, a mild opening medicine is now administered. On the fifth, the time of his sitting up is lengthened, and, presuming that the wound in the cornea is now closed, Mr. Ware usually examines the state of the eye. After this, no dressings need be applied in the day-time, care being taken to defend it from a strong light, by a paste-board hood, or shade, and by darkening the room, so that no inconvenience is felt. The patient may now also look, for a short time, at large objects. The following part of the treatment need interfere very little with the wishes of the patient, unless unexpected accidents occur. (*Ware.*)

As Beer observes, if the patient be very restless, make frequent attempts to open his eye in the least, and partly lie upon the eye, or if in changing the compresses the greatest caution be not used, the eye will perhaps be roughly pressed upon, and the iris protrude between the displaced and half-opened edges of the incision in the cornea, to which it will become adherent during a slow and very seldom violent inflammation. From the moment, when the iris thus interposes itself between the sides of the wound, the aqueous humor begins to collect, and at length pushes the iris considerably forwards. In this case, Beer recommends carefully opening the eye in a very moderate light, and adopting the expedients formerly mentioned, for the purpose of making the iris recede. The dressings should be re-applied, and the eye kept closed and very quiet for at least eight or ten days, so as to hinder a recurrence of this disagreeable accident. But, if the iris should be already adherent to the edges of the wound in the cornea, the eye incapable of bearing light, and the aqueous humor more or less accumulated in the anterior chamber, Beer says, every thing must be left to time, while the eye is kept lightly covered for about a fortnight, and the existing inflammation properly treated. Then, if the protrusion, or staphyloma of the iris should not be diminished, by the means calculated for lessening the inflammation, caustic, or the knife must be employed. (*Beer, B.* 2, *p.* 391.) The same causes, which have been above specified, as conducive to a protrusion of the iris, may also produce a discharge of the vitreous humor.

The following observations by Beer are interesting: when the dressings have been unskilfully applied; when the incision in the cornea has been made horizontally upon a large prominent eye; when the fissure of the eyelids is exceedingly narrow; or the patient is restless; a proper cicatrization of the wound in the cornea may not follow. Though the aqueous humor may collect in the anterior chamber, the partially united lamellæ of the cornea may be incapable of duly resisting the distention of that fluid, and consequently protrude in the form of a light-grey, semi-transparent, oval vesicle, extending nearly the whole length of the wound in the cornea, and being most prominent in the centre. The patient complains of an annoying sense of pressure in the eye, as in cases of protrusion of the iris; but the discharge of the aqueous humor has completely stopped, and therefore, the anterior chamber presents its natural appearance, and the pupil its regular round shape, though the edges of the wound in the cornea are whitish and swollen. This case was formerly regarded as a prolapsus of the membrane of the aqueous humor; but, Beer considers it as a sort of hernia of the cornea, termed *ceratocele.* Merely puncturing, or cutting away the cyst is of no service; for, though the aqueous humor immediately flows out, the wound soon closes again, and the tumor re-appears, attended also with some risk of the iris falling into the cyst, and becoming adherent to it. Effectual relief cannot be obtained, unless the tumor be removed with Daviel's scissars, as close as possible to the wound; the dressings skilfully arranged; and the eye kept closed and quiet for eight days, or a fortnight. In such a case, a whitish scar is always permanently left. (*Beer, B.* 2, *p.* 393.)

Beer observes, that when the pupil contracts very considerably after the incision in the cornea is made, and the cataract at the same time remains at some distance from the uvea, too small an opening has generally been made, and it ought to be enlarged. But, if the cataract cannot be forced through the pupil, without making pressure on the lower part of the eyeball, and the closure of the pupil should still continue, the circumstance proceeds from the loss of the aqueous humor, and the second stage of extraction must be deferred a little while, until the pupil dilates again, and the operation must then be finished in a very moderate light. (Also *Guthrie's Operative Surgery of the Eye, p.* 305.)

When in the second stage of the operation, the anterior layer of the capsule has been properly divided, and yet the cataract will not pass into the pupil, though the eye itself acts with energy, Beer says, that it is indispensably necessary to make pressure upon the lower part of the eyeball, as already advised, and to continue it, either until the cataract with its lowermost edge effectually projects through the pupil and out of the eye, or until it is moved so far directly upwards, (without entering the pupil) that its lower margin is brought into view, and quite a black semilunar interspace is seen between it and the inferior pupillary edge of the iris. At this moment the operator, without increasing the pressure of the finger on the eyeball, lest the vitreous humor burst, and a great part of it be lost, and without lessening the pressure, lest the cataract sink back into the eye, should introduce Daviel's curette into the above interspace, with its hollow surface applied against the back surface of the cataract, which is to be gently pushed out of the eye. In doing this, Beer owns that a small part of the vitreous humor is almost always lost, but the quantity is not at all comparable to what is lost, when the hyaloid membrane gives way before Daviel's curette is introduced, which can then only be passed into the eye through the protruded vitreous humor for the purpose of pushing out the cataract.

Beer notices the occasional protrusion of the iris, in the third stage of the operation, more or less between the edges of the incision in the cornea, immediately after the exit of the cataract. Here, says Beer, the iris should be reduced without the least delay, and the pupil, which is completely oval, made round again; a thing, which the operator may easily perform, by applying his hand flat upon the patient's forehead, letting the latter shut his eye, rubbing the upper eyelid quickly, yet gently with the thumb, and then suddenly opening the eye, by which means, a moderate light will at once strike it, and produce an expansion of the iris.

In all patients, who have been operated upon for cataracts, the edges of the eyelids become glued together with mucus on the first night after the operation; yet, according to Beer, in individuals particularly subject to copious secretions of mucus, it is not unusual for the puncta lachrymalia and lachrymal ducts to be blocked up with thickened mucus, whereby the tears are prevented from duly passing down into the nose, so that from time to time they are discharged from the inner angle of the eye, and collect under the eyelids. In this case the patient soon begins to complain of a violent, continual, and increasing sense of pressure on the eye, and the upper eyelid swells, unattended with any redness. Irritable persons also experience a stupefying dull headach. These inconveniences may be immediately removed by clearing away the mucus with a little lukewarm milk from the inner canthus, and letting a stream of clean water fall over the cheek. Care must also be taken to hinder a recurrence of the circumstance, and to remove it, if it should happen.

The inflammation, consequent to extraction, chiefly affects the iris and neighbouring textures. Beer refers its origin principally to the entrance of air into the interior of the eye; which, owing to the size of the wound, he says, is not entirely to be prevented. But, another cause is the introduction of different instruments into the eye, and hence, the inflammation is generally severe, when it has been necessary to remove fragments of the cataract with Daviel's curette, or to take away the capsule with forceps, or destroy it with the tenaculum-needle. However, Beer is of opinion, that a surgeon, who knows how to operate well in every mode, will not find the inflammation, under these circumstances, more violent after extraction, than other methods, and therefore, he thinks, that, when no considerable impediment exists, it should be preferred. Beer, who considers extraction as a radical mode of removing a cataract, thinks, that when there are no great and insurmountable obstacles to its performance, and the operator can execute it as well as all other methods, and with the requisite skill, it ought to be preferred But, when he is deficient in skill, he is himself the greatest impediment to the success of the operation. The particular cases, in which the methods of depression and reclination are indicated, have been already specified, and in these, of course, extraction is not advantageous. There are also some examples, as Beer remarks, in which the latter operation must be hazardous for a beginner, and therefore, in respect to such an operator by no means eligible, as in cases of *bar-cataract*, and *capsulo-lenticular cataracts with a cyst of purulent matter*. (*Beer, B.* 2, *p.* 396.)

OF KERATONYXIS.

Gleize having commenced an operation, by extraction, was prevented from completing it by a sudden movement of the patient's head: instead of enlarging the opening in the cornea with scissors, he introduced a needle through it, and depressed the lens. This case led to the invention of the new method of operating by *keratonyxis*, as it is now termed, a description of which Gleize published in 1786. Gleize's method was simplified by Conradi, who merely opened the cornea and capsule of the lens with a lance-shaped knife, and left the removal of the cataract to be effected by the absorbents. Several improvements were subsequently made in this method by Dr. H. Buchorn, who first gave it the name of *Keratonyxis* (See *this word*), and adopted the practice of dividing the lens, as well as the capsule, and of bringing the fragments forward into the anterior chamber. About the same time, Mr. Saunders, in England, perfected a similar operation, and applied it particularly to congenital cataracts. (See *Guthrie's Operative Surgery of the Eye, p.* 331, 332.)

This operation requires the pupil to be first artificially dilated. The belladonna (says Mr. Guthrie) should be applied the day before, and on the morning of the operation, in order that the pupil may be completely dilated, and a few drops of a solution, in the proportion of five grains of the extract to a drachm of water, should be dropped into the eye, half an hour before its commencement, so as to prevent a contraction of the pupil during the operation. (*Op. cit. p.* 333.) Keratonyxis admits of being divided into two stages; first, the introduction of the needle through the cornea and pupil as far as the cataract; and, secondly, the breaking of the lens to pieces, and the division and laceration of its capsule. For these purposes, Beer prefers a common, straight, spear-shaped, sharp-edged couching-needle to any curved one, however fine it may be made; first, because it pierces the cornea with greater facility; secondly, because both a soft cataract and the capsule can be more effectually cut with it, a larger opening being made, through which the aqueous humor may flow over the fragments of the lens, and the dissolution of the cataract be thus rendered more certain; whereas, with a curved needle, Beer says, the lens can only be disturbed, and the capsule torn, under which circumstances, inflammation and a secondary capsular cataract are likely to be produced. He directs the instrument to be introduced either at the lower, or at the external part of the cornea, one line and a half from its margin, the point being directed obliquely towards the pupil, and the capsule is to be effectually cut by moving the extremity of the needle laterally in various ways; and, above all things, it is necessary at the time of breaking the lens piecemeal, not to let the instrument continue always within this body, but, at every stroke, to lift it completely out of the lens and capsule, and then introduce it into them again in different directions.

As Beer observes, this method of operating must soon have been found as little adapted to all cataracts, as any other mode; for, otherwise, the suggestion would not have been made to practise *reclination* through the cornea. To this form of reclination, however, Beer adduces great objections; for, he says, that, in this manner, either the cataract cannot be properly turned, if the iris be duly spared; but it will continue to lie obliquely, being always quite evident below the pupil, and very apt to rise again from the slightest cause; or it is indeed depressed far enough towards the bottom of the eye, but, however much the pupil may be artificially dilated, the pupillary edge of the iris is more or less injured, especially with the convexity of a curved needle. In addition to these considerations, Beer urges against this method all the objections, which apply to the practice of reclination through the sclerotica.

After the lens and capsule have been effectually cut in pieces, the same light mode of dressing and the same after treatment are proper, which are adopted in cases of depression and reclination. Beer also particularly objects to any trials being immediately made of the eyesight. At the same time, he assures us, that he has not met with any of the instances, so frequently mentioned in books, of persons, on whom keratonyxis has been done seeing perfectly well, and having quite a clear pupil in a few days: under the most favourable circumstances, several weeks, and sometimes as many months, elapsed, before the pupil became quite transparent.

According to Beer, keratonyxis is not liable to many accidents. Sometimes, says he, the artificially dilated pupil contracts, as soon as the needle has pierced the cornea, and reached the cataract: in this circumstance, the operator must wait quietly, until the pupil gradually expands again, a change, which may be promoted by screening the eye with the hand. If the operation were to be continued without delay, either the pupillary edge of the iris would be seriously and dangerously hurt by the needle, or the cataract could not be effectually divided. When, contrary to expectation, the nucleus of the cataract is too hard to be broken piecemeal, reclination and depression should be done through the cornea, as well as circumstances will allow, and these objects can be more easily effected with a part. than with the whole, of the lens. When the lens is found completely fluid, but the capsule opaque only at some points, Beer, with the view of preventing a secondary capsular cataract, recommends cutting the membrane in all directions, and annihilating it as much as possible. Keratonyxis may be followed by the same evils, which occasionally take place after depression and reclination, and which will require similar treatment. But, according to Beer's experience, one of the most frequent consequences is a secondary capsular cataract, which often ensues even though the pupil was quite clear at the time of the operation, and though it may not quite blind the patient, it considerably lessens his power of vision, and renders the operation very incomplete.

When the sole object of keratonyxis is to break and cut the cataract and its capsule piecemeal, and the fragments are to be left to dissolve and be absorbed, the operation can be indicated only where this division, breaking, dissolution, and absorption of the cataract, can be successfully wrought. Hence, Beer sets down the method as not calculated for firm, hard, lenticular cataracts; nor for those which are softish and scabrous only upon their surface; and, he says, that it is not suited for capsulo-lenticular cataracts, nor for any cases, termed false cataracts, which are of a membranous nature. Keratonyxis, he observes, may be expected to answer only in fluid or gelatinous cataracts, when the capsule is either little or not at all opaque and thickened, and of course can be easily opened and cut to pieces, as in the case described under the name of encysted cataract. For the above reasons, the method is well adapted for children and young subjects, in whom the origin and general complications of a cataract involve the case in suspicious circumstances.

After keratonyxis, the dilatation of the pupil should be kept up, by means of belladonna, until all symptoms of inflammation have subsided. (See *Guthrie's Operative Surgery of the Eye*, p. 336.)

Langenbeck, who has practised keratonyxis to a considerable extent, and uses the curved, two-edged, lancet shaped needle, thinks extraction preferable to it only when the whole cataract can be brought out at once, by means of gentle pressure on the eye, and with the aid of Daviel's curette, as in the case of a firm cataract; while he represents keratonyxis as most advantageous, where, by the manœuvre of opening the capsule, the mass of the cataract would be so divided by the instrument as not to admit of being extracted altogether; but, would require the use of a scoop, forceps, or hook for bringing out the fragments, as in examples of soft, milky, and capsular cataracts. Langenbeck also urges, as a reason against extracting soft cataracts, their greater size, whereby in their passage through the pupil in an entire state, they may injure the iris. (*Neue Bibliothek für die Chir.* 1. *B. p.* 461.) Valuable information on keratonyxis has been published by the same author in the 4th vol. of his first Bibliothek, in the 1st vol. of his new Bibl. p. 1, &c. 1815; and in a tract entitled "*Prüfung der Keratonyxis einer Methode den grauen Staar durch die Hornhaut zu recliniren, oder zuzerstuckeln nebst erläuternden Operations geschichten. Göttingen.* 1811. See also *Conradi in Arnemanns Magazin, B.* 1, *p.* 95, 1791. *Gleize Nouvelle Obs. Pratique sur les Maladies de l'Œil, p.* 118, 1812. *G. H. Buchorn's Diss. de Keratonyxide; Halæ,* 1806. *Die Keratonyxis, &c.* 1811.

OF THE CONGENITAL CATARACT, AND OPERATING UPON CHILDREN.

I shall not stop here to inquire, whether the expression *congenital cataract* is generally used with strict propriety; but, it is worth noticing, that the term is reprobated by Beer as being in general incorrectly applied.

So much has been already said in a preceding section of this article, concerning the propriety and striking advantages of operating for the cataracts of children, that to expatiate further upon this point would be a mere waste of time.

We have noticed the case, which Scarpa terms the *primary membranous cataract,* and which is mentioned by that distinguished professor, as being met with in children, or young people, under the age of twenty, the substance of the crystalline itself being almost entirely absorbed, while the capsule is left in an opaque state, including, at most, only a small nucleus, not larger than a pin's head. This disease is described by Scarpa as being exceedingly rare, and characterised by a certain transparency, and similitude to a cobweb; by a whitish opaque point, either at its centre, or circumference; and by a streaked and reticulated appearance. Now, this example, which is represented by Scarpa, as being rare, appears, from the experience of Mr. Saunders, to be by no means uncommon, since, at the London Infirmary for diseases of the eye, it was found, that the majority of congenital cataracts were capsular, or membranous. This last statement is also at variance with that of the late Mr. Gibson, who has asserted, that, in infants, the cataract is generally fluid. (*Edinb. Med. and Surgical Journal, Vol.* 7, *p.* 397.) Mr. Ware also asserts, that, in children, born with cataracts, the crystalline humor has generally, if not always, been found either in a soft, or fluid state. (*Obs. on the Cataract, and Gutta Serena, Vol.* 2, *p.* 380.) We learn from Mr. Saunders's publication, that, in the congenital cataract, after the crystalline lens is converted into an opaque substance, it is gradually absorbed; and, in proportion to the progress of absorption, the anterior lamella of the capsule approaches the posterior, until they form one membrane, which is white, opaque, and very elastic. This process is commonly completed long before the eighth year, and the operator will now find a substance, which he will in vain endeavour either to extract or depress. But, there is one form of the congenital cataract, in which the absorption of the lens does not proceed, viz. when the centre of the crystalline is opaque, and its circumference is perfectly transparent. Should the capsule and lens be penetrated, however, with any instrument, the opacity soon becomes complete, and from this moment, the substance of the lens begins to be absorbed.

The experience of Mr. Saunders proves, that, in the congenital cataract, the lens may be either solid, soft, or fluid, but, that more frequently it is partially, or completely absorbed, and the cataract is capsular.

The circumstance of Mr. Gibson's never having met with a simple membranous cataract in an infant, a fact so much at variance with Mr. Saunders's account, is conceived by Mr. Guthrie to admit of satisfactory explanation by the inference, that Mr. Gibson, in Manchester, probably saw all the children there with congenital cataract soon after they were born, and before the absorption of the lens had proceeded far; while a great number of Mr. Saunders's congenital cases were brought to him in London from distant places, and not seen by him till the children were older, and the disease had made greater progress. (*Operative Surgery of the Eye, p.* 359.) Indeed, Mr. Gibson states himself, that simple membranous cataracts are by no means uncommon at the age of eight or ten, as well as in adults, who have been born blind. (See *Edinb. Med. and Surg. Journ. Vol.* 8, *p.* 399.)

The following table of forty-four cases is given in Mr. Saunders's work, for the purpose of showing in what proportion each species of cataract has been found to prevail in congenital cases.

Solid opaque lens, with or without opacity of the capsule. Three single, two double cataracts	5
Solid lens, opaque in the centre, transparent in the circumference, with capsule in the same state. Five double	5
Soft opaque lens, with, or without opacity of the capsule. Two single, two double ..	4
Soft opaque lens, with solid nucleus. One single, two double	3
Soft opaque lens, with dotted capsule, the spots white, the spaces transparent. Two double	2
Fluid cataract, with opacity of the capsule. Two single	2
Fluid cataract, with opacity of the capsule, and closed pupil. Two double	2

Opaque and thickened capsule; the lens being completely absorbed, or the remains of it being thin and squamose. Six single, twelve double	18
Opaque and thickened capsule, with only a very small nucleus of the lens unabsorbed in the centre. Two single	2
Opaque and thickened capsule in the centre, remains of the lens in the circumference. One double	1

Here the corresponding character of congenital cataracts in the eyes of each individual is exhibited by the number of double cases, and we are informed, that the same character was preserved in the cataracts of several children of the same family. (*Saunders on Diseases of the Eye, Edit. by Dr. Farre, p.* 135, 136.)

The congenital cataract appears frequently to afflict several children of the same parents. In the course of the present article, I have already had occasion to advert to two striking examples of this fact. The first is related by Mr. Lucas, who attended five children of a clergyman at Leaven, near Beverley, all born with cataracts. (See *Med. Obs. and Inquiries, Vol.* 6.) The second is mentioned by Mr. Gibson, who, some years ago, saw five, or six children, the families of two sisters, who were all totally blind, and in an idiotic state, having cataracts accompanied with amaurosis. (*Edinb. Med. and Surgical Journal, Vol.* 8, *p.* 398.) Several instances occurred to the late Mr. Saunders. In one family, two brothers were thus afflicted. In a second family, two brothers, twins, became blind with cataracts at the age of twenty-one months, each within a few days of the other. It is remarkable, that the four cataracts had precisely the same character. In a third family, a brother and two sisters were born with this disease. The eldest sister was affected with it only in one eye, the brother and youngest sister in both eyes. In a fourth family, three brothers and a sister had all congenital cataracts. (*Saunders on the Diseases of the Eye, p.* 134, 135.)

Children with congenital cataracts possess various degrees of vision; but, when they are totally blind, their eyes not being attracted by external objects, volition is not exercised over the muscles of these organs, which roll about with an irregular, rapid, and trembling motion.

I shall now proceed to speak of the manner of operating upon children. Until the time of Mr. Pott, the intention of surgeons, in couching, or depressing the cataract, (as indeed the expression itself implies) was to push the opaque crystalline downward, away from the pupil. Mr. Pott, conscious that the cataract often existed in a fluid, or soft state, was aware that it could not then be depressed; and, therefore, in such cases, he recommended using the couching needle for the express purpose of breaking down the cataract, and of making a large aperture in the capsule, so that the aqueous humor, which he believed to be a solvent for the opaque crystalline, might come into immediate contact with this body. This operation, subsequently to Mr. Pott, has been strongly and ably recommended by Mr. Hey, of Leeds, and Professor Scarpa, of Pavia. In the cases of children, it even received the approbation of the late Mr. Ware. (*On the Operation of Puncturing the Capsule of the Crystalline Humor, p.* 9.)

But, notwithstanding the utility and efficacy of lacerating the front layer of the crystalline capsule had been so much insisted upon by Scarpa and others, their observations were confined to the cataract in the adult subject, and, before the example set by the late Mr. Saunders, no one (excepting, perhaps, Mr. Gibson of Manchester) ventured to apply, as a regular and successful practice, such an operation to the eyes of infants and children. Indeed, it seems highly probable, that even Mr. Gibson himself would have remained silent upon the subject, had not his attention been roused by the reports of the London Institution for curing diseases of the eye, which reports, he says, were dispersed and exhibited in the public news rooms of Manchester. For the creation and perfection of this beneficial practice, therefore, I am disposed to give the memory of Mr. Saunders great honour. The propriety of operating for the cataracts of children had long ago been insisted upon by a few writers, and the attempt even now and then made; but, the method never gained any ground, until Mr. Saunders led the way.

It only remains for me to describe the plans of operating, as executed by Mr. Saunders, Mr. Gibson, and Mr. Ware.

The principle, on which Mr. Saunders proceeded in his operations on the congenital cataract, was founded on the opinion, that the only obstacle to the absorption of the opaque lens is the capsule; and that as the latter also is most generally opaque, "the business of art is to effect a permanent aperture in the centre of this membrane. This applies to every case of congenital cataract which can occur." Mr. Saunders used to overcome the difficulty of operating upon children, by fixing the eyeball with Pellier's elevator, having the patient held by four or five assistants, dilating the pupil with belladonna, and employing a very slender needle, armed with a cutting edge from its shoulders to its point, and furnished with a very sharp point, calculated to penetrate with the utmost facility.

Before the operation, the extract of belladonna, diluted with water to the consistence of cream, is to be dropped into the eye, or, to avoid irritation, the extract itself may be smeared in considerable quantity, over the eyelid and brow. In less than an hour, if there be no adhesions, it produces a full dilatation of the pupil, exposing to view nearly the whole anterior surface of the cataract. The application should then be washed from the appendages of the eye.

In using the needle, Mr. Saunders most carefully abstained from doing any injury to the vitreous humor, or its capsule, and it was an essential point with him to avoid displacing the lens. In directing the extremity of the instrument to the centre of the capsule, he passed it either through the cornea, near the edge of this membrane, (the operation now called *keratonyxis*,) or through the sclerotica, a little way behind the iris. By the first, which is called the *anterior* operation, Mr. Saunders conceived, that less injury would be inflicted, and less irritation excited, than by introducing the needle behind the iris, through all the tunics of the eye. In every case, the first thing aimed at was the permanent destruction of the central portion of the capsule to an extent equal to that of the natural size of the pupil. If the capsule contained an opaque lens, Mr. Saunders used next to sink the needle gently into the body of the crystalline, and moderately open its texture; cautiously observing not to move the lens at all out of its natural situation.

When the case was a fluid cataract. Mr. Saunders was content in the first operation with simply lacerating the centre of the capsule, being desirous of avoiding to increase the irritation following the diffusion of the matter of the cataract in the aqueous humor.

When the cataract was entirely capsular, Mr. Saunders acted with rather more freedom, as he entertained in this case less fear of inflammation: but, in other respects, he proceeded with the same objects in view, which have been already related, and of which the principal consisted in effecting a permanent aperture in the centre of the capsule, without detaching this membrane at its circumference; for then the pupil would have been more or less covered by it, and the operation imperfect, "because this thickened capsule is never absorbed, and the pendulous flap is incapable of presenting a sufficient resistance to the needle to admit of being removed by a second operation." (*P.* 145.)

I have already explained, that Mr. Saunders found, that the greatest success attended the operation between the ages of eighteen months and four years. One operation frequently accomplished a cure; as many as five were seldom requisite.

The only particularity, in Mr. Saunders's treatment of the eye after the operation, was that of applying the belladonna externally, for the purpose of making the pupil remain dilated, till the inflammation had ceased, so as to keep the edge of the iris from contracting adhesions with the margin of the torn capsule. This last practice is found to be so important, that it is never neglected by any good operator of the present day. In leaving this part of the subject, I must advise every surgeon to read the interesting account of Mr. Saunders's practice, published by his friend and colleague, Dr. Farre. Many minute particulars will be found in this work, highly worthy of the practitioner's attention and imitation.

Mr. Gibson appears to have been unacquainted with the usefulness of the extract of belladonna in preparing the eye for the operation. A few hours before operating, he was in the habit of ordering an opiate, sufficient to produce a considerable degree of drowsiness, so that the infant generally allowed its eyelids to be opened, and properly secured without resistance, and was little inclined to offer any impediment to the introduction of the couching needle; but, on the contrary, presented the sclerotica to view, naturally turning up the white of its eye. If the infant was more than a year old, and whenever it was necessary, Mr. Gibson used to introduce its body and arms into a kind of sack, open at both ends, and furnished with strings to draw round the neck, and tie sufficiently tight round the legs, so that its hands were effectually secured, and the assistants had only to steady its body, and fix its head, whilst the child was laid on a table, upon a pillow. Mr. Gibson never found it necessary to use a speculum, having uniformly experienced, that, after the couching needle was introduced, he had no difficulty in commanding the eye, aided by a slight degree of pressure upon the eye-ball with the index and middle fingers of his left-hand, which were employed in depressing the lower eyelid. He admits, however, that the speculum can easily be applied, if an operator prefer it. He generally used Scarpa's needle, because, in infants, the free rupture of the capsule of the lens ought commonly to be aimed at, in order that the milky cataract may escape, and mix with the aqueous humor; or, if the cataract be soft, that the aqueous humor may be freely admitted to its pulpy substance which has been previously broken down with the needle. He thinks, that no peculiarity is necessary in depressing the hard cataract of infants. Before Scarpa's needle was known in this country, Mr. Gibson used Mr. Hey's, which was generally effectual, and, as he conceives, possesses the recommendation of being less liable to have its point entangled in the iris. He says, that, when a milky cataract has been thus evacuated, it renders the aqueous humor turbid; but, that, within the space of two days, the eye generally acquires its natural transparency, and vision commences. When the capsule and substance of the soft cataract have been broken down, and the aqueous humor has come into contact with the lens, the solution and disappearance of the cataract, in all the cases, upon which Mr. Gibson has operated, have uniformly taken place, in a short time. (See *Edinb. Med. and Surgical Journal*, *Vol.* 8, *p.* 398, 399.)

For the purpose of fixing the eye, Mr. Ware considered Pellier's elevator requisite in operating upon infants. When the patient, however, had advanced beyond the age of infancy, Mr. Ware sometimes fixed the eye by means of the fingers alone. For the purpose of puncturing the capsule, and breaking down the cataract, this gentleman gave the preference to an instrument, which resembles one recommended by Cheselden, for the purpose of making an artificial pupil; but, it is somewhat narrower. Its blade indeed is so narrow, that it nearly resembles a needle. Its extremity is pointed, and it cuts on one side for the space of about the eighth of an inch, the other side being blunt. It is perfectly straight; is an inch long in the blade; and forms a complete wedge through its whole length. Upon one side of the handle is a coloured spot, by attending to which, the operator may always ascertain the position of the instrument in the eye.

Mr. Ware dilated the pupil with the extractum belladonnæ, softened with a little water, and applied about half an hour before the time of operating. He believed, that, in operating upon infants, the surgeon might perform the operation with more composure, if the patient were laid upon a table, with the head properly raised on a pillow. The bent end of Pellier's elevator should be introduced under the upper eyelid, and the instrument committed to the care of an assistant. If the right eye is to undergo the operation, and the surgeon operate with his right hand, he must of course sit or stand behind the patient; and, in this case, he will himself manage the speculum with his left hand. The eye being thus fixed, Mr. Ware passed the point of the narrow-bladed knife above mentioned through the sclerotica, on the side next to the temple, about the eighth of an inch from the union of that membrane to the cornea, the blunt edge being turned downwards. The instrument was pushed forwards in the same direction, until its point had nearly reached the centre of the crystalline. The point was then brought forwards, until it had passed through the opaque crystalline and its capsule, and was plainly visible in the anterior chamber. If the cataract was fluid, and the anterior chamber became immediately filled with the opaque matter, Mr. Ware deemed it advisable to withdraw the instrument, and defer further measures until the matter was absorbed, which absorption usually took place in the course of a few days, and sometimes of a few hours. If no visible change were produced in the pupil, the point and cutting edge of the instrument were applied in different directions, so as to divide both the opaque crystalline and its capsule into small portions, and, if possible, bring them forwards into the anterior chamber. This may require the instrument to be kept in the eye for a minute or two; but, if the operator preserve his steadiness, he may continue it there a much longer time without doing the least injury to the iris, or to any other part. If the cataract be found of a firm consistence, (though this rarely happens in young persons,) it may be advisable to depress it below the pupil; and in such a case particular care should be taken to perforate largely the posterior part of the capsule, and to withdraw the instrument immediately after the cataract has been depressed, in order to hinder it from rising again. If the opacity be in the capsule, the instrument will not act so easily upon it as it does on the opaque crystalline; but, notwithstanding this, the capsule as well as the crystalline, may be divided by it into larger or smaller portions, which, when thus divided, will be softened by the action of the aqueous humor; and though in the first operation on such case, says Mr. Ware, it may not be possible to remove the opacity, yet, on the second or third attempt, the divided portions may be brought forwards into the anterior chamber, in which place, they will then be gradually absorbed, and soon disappear. After the operation, Mr. Ware seldom found it necessary to take away blood from children, or persons under the age of twenty. He continued a cooling antiphlogistic treatment a few days. After this, if any opaque matter remained, he expedited its absorption by dropping a small portion of powdered sugar into the eye once or twice a day. When, at the end of a week or ten days, the inflammation was over, and the pupil obstructed with opaque matter, Mr. Ware advised a repetition of the operation. After a similar interval, the operation, he says, may be requisite again. In most cases, Mr. Ware was obliged to operate twice; in a few instances, once proved sufficient; and only in three, out of the last twenty, did he find it necessary to operate a fourth time. (*On the Operation of Puncturing the Capsule of the Crystalline Humor.*)

I think any impartial man, who considers the practice of the three preceding operators, will find great cause to admire the superior gentleness and skill, which predominate in the operations of the late Mr. Saunders. For my own part, I am so fully convinced of the mischief, which has been done to the eyes, by the rash boldness, awkwardness, and unsteadiness of numerous operators, that, it appears to me, the inculcation of gentleness and forbearance in all operations for the cataract, is the bounden duty of every man, who has occasion to write upon the subject. Great manual skill, and invariable gentleness, indeed, seem to me to have had more share in rendering Mr. Saunders's operations successful, than any particularity either in his method, or his instrument. I have no hesitation in declaring my own partiality to the principles, on which his practice was founded, and my belief, that they are well calculated to improve most materially this interesting branch of surgery. In conclusion, I shall mention Mr. Guthrie's general opinion, respecting the kinds of operation suited for the three classes of cataracts, into which he arranges them for the consideration of this important point: the *hard* admit only of extraction, or displacement; the *soft* seldom of displacement, or of extraction, but usually of division; the *capsular*, neither of displacement, extraction, nor division, purely considered as such, but by laceration, and removal of the opaque body from the axis of vision by different operations, which, although they may partake of the nature of all, are yet not precisely either. All intermediate states of disease, such, for instance, as the caseous and fluid cataracts, admit of some slight deviations from these rules, but are still regulated by the same principles. (*Operative Surgery of the Eye, p.* 365.)

With respect to extraction, also, it deserves careful recollection, that it is a method, which, though the cataract may be of a hard consistence, is often prohibited by various unfavourable circumstances, which I have taken notice of in the foregoing pages. Consult *P. Brisseau, Nouvelles Obs. sur la Cataracte, proposées à l'Acad. des Sciences,* 1705. *Tournay,* 1706. *Ant. Maitre Jan, Traité des Maladies de l'Œil,* 4*to. Paris,* 1707. *Charles de St.* Y*ves, Nouveau Traité des Maladies des Yeux,* 12*mo. Paris,* 1722. *J. H. Freytag, De Cataracta, Argent.* 1721. *A. Petit, Lettre, dans laquelle il démontre que le Crystallin est fort près de l'Uvée, et rapporte de nouvelles Preuves, qui concernent l'Opération de la Cataracte.* (*Haller, Disp. Chir.* 5, 570.) *L. Heister, De Cataracta, &c. tract. Alt.* 1713; *Vindiciæ de Cataracta, &c., Alt.* 1713; *and Apologia et Uberior illustratio Systematis sui de Cataracta, Glaucomate, et Amaurosi,* 12*mo. Altorf.* 1717. *Pott's Remarks on the Cataract, Vol.* 3, *of his Chirurgical Works. Daviel sur une Nouvelle Méthode de Guérir la Cataracte par l'Extraction du Crystallin,* 1747; *and in Mem. de l'Acad. de Chirurgie, T.* 5, *p.* 369, *Edit.* 12*mo. A. Bischoff, A Treatise on the Extraction of the Cataract,* 8*vo. Lond.* 1793. *Wenzel's Treatise*

on the Cataract, by Ware, 8vo. Lond. 1791. *W. H. J. Buchhorn, Die Keratonyxis, Eine neue gefahrlosere Methode den grauen Staar zu operiren, &c. 8vo. Halæ Magd.* 1811. *Richter's Treatise on the Extraction of the Cataract, Transl. 8vo. Lond.* 1791; *and Anfangsgr. der Wundarzneykunst, B.* 3. *Jon. Wathen, A Diss. on the Theory and Cure of the Cataract, in which the Practice of Extraction is supported, &c. 8vo.* 1785. *Ph. F. Walther, Abhandlungen, &c. Landshut,* 1810. *Also in Quarterly Journ. of Foreign Med. No.* 6. *Kupfer, Diss. de Utilitate Belladonnæ in sananda constrictione nimia iridis; Erlangæ,* 1803. *Himley, Opthalmologische, Bibl.* 1, *B.* 2, *No.* 3. *the Use of Hyosciamus for dilating the Pupil proposed. J. Wathen, A New, &c. Method of Curing the Fistula Lachrymalis, &c. with an Appendix on the Treatment after the operation for the Cataract, 8vo. Lond.* 1792. *J. A. Schmidt in Abhandlungen der K. K. Josephs Acad.* 2. *B. p.* 209, 273, *& Ueber Nachstaar und Iritis nach Staaroperationen, 4to. Wien.* 1801; *one of the most valuable Works ever published on Diseases of the Eye. Ware's Chirurgical Observations on the Eye,* 2 *Vol. Edit.* 3. *Scarpa's Observations on the Principal Diseases of the Eyes, Edit.* 2. *Hey's Practical Observations in Surgery, Edit.* 2. *G. Ch. Conradi Bemerkungen über einige Gegenstände des Grauen Staars, Leipz.* 1791; *and in Arnemann's Magazin, B.* 1. *Saunders on Diseases of the Eye, by Farre, Edit.* 3. *G. J. Beer, Practische Beobachtungen über den grauen Staar, &c. Wien.* 1791. *Methode den grauen Staar sammnt der Kapsel auszuziehen, Wien. 8vo.* 1799; *Lehré von Den Augenkr. B.* 2. *Wien.* 1817. *Karl. Aug. Wienhold's Anleitung zur Reclination des Grauen Staars mit der Kapsel,* 1809. *Gibson's Practical Observations on the Formation of an Artificial Pupil, and Remarks on the Extraction of Soft Cataracts, &c. 8vo. Lond.* 1811. *C. J. M. Langenbeck, Prüfung der Keratonyxis, einer Methode den grauen Staar durch die Hornhaut zu recliniren oder zu zerstuckeln nebst erläuternden operation geschichten, 8vo. Gött.* 1811; *and several Papers in his Bibliothek of later date. B. Travers in Medico-Chir. Trans. Vol.* 4 *and* 5; *and A Synopsis of the Diseases of the Eye, 8vo. Lond.* 1802, *and later Editions. J. Wardrop, Essays on the Morbid Anatomy of the Human Eye,* 2 *Vol. 8vo. Lond.* 1818. *J. Vetch, A Practical Treatise on the Diseases of the Eye, p.* 109, *&c. 8vo. Lond.* 1820. *Gleize, Nouvelles Obs. Pratiques sur les Maladies de l'Œil,* 1812. *Demours, Traité des Maladies des Yeux. Andrew Smith, in Edinb. Med. & Surg. Journ. Vol.* 19, *p.* 13. *John Stevenson, On the Advantage of an Early Operation for the Different Species of Cataract, Edinb. Med. J. Vol.* 19, *p.* 513. *Also his Treatise on the Nature, &c. of Cataract, 8vo.* 1824. *Wenlz. Ueber den Zustand. der Augenheitkunde in Frankreich, nebst Kritischen Bemerkungen über denselben in Deutschland, Nürnberg,* 1815. *Also Quarterly Journ. of Foreign Med. No.* 4. *Sir W. Adams on the Diseases of the Eye,* 1812. *New Operations for the Cataract,* 1817, *and his later Work. G. J. Guthrie, Lectures on the Operative Surgery of the Eye, 8vo. Lond.* 1823.

CATHETER. (from *καθιημι*, to thrust into.) A tube which is introduced through the urethra into the bladder, for the purpose of drawing off the urine. (See *Urine, Retention of.*) Of course, there are two kinds of catheters; one, intended for the male, the other, for the female urethra. With respect to catheters, three things are to be considered: 1st, the instrument itself; 2d, the manner of introducing it; and 3d, the conduct to be pursued after its introduction.

Catheters were anciently composed of copper: Celsus knew of no other kind. As these, however, had the inconvenience of becoming incrusted with verdigrise, they at length fell into disuse, and others, made of silver, were substituted for them. This change, which was made as early as the time of the Arabian practitioners, still receives the approbation of the best modern surgeons. The common catheter is a silver tube, of such a diameter as will allow it to be introduced with ease into the urethra, and of various figures and lengths, according as it is intended for the young or adult, the male or female, subject. For an adult female subject, it should be about six inches long; and, for young girls, four or five. For men, the length ought to be from ten inches and a half to eleven inches. But, as the instrument need not enter far into the bladder, Mr. John Bell's advice to avoid too great a length, merits observance. (*Principles of Surgery, Vol.* 2, *p.* 193.) As the urethra in some instances is narrow, and, in others wide, surgeons should be furnished with catheters of different diameters. The choice of the instrument, in respect to its width, is likewise determined very much by the nature of the disease of the urethra. (*Langenbeck, Bibl. B.* 1, *p.* 1177.) For a woman, the diameter ought to be at least two lines; and, for girls, a line and a half. For male adult subjects, Desault recommends the thickness of two lines and one-third; and, for boys, that of a line and a half. In general, whenever the urethra is pervious, it is better to follow the advice of Desault, and employ a largish catheter, which will enter the passage more easily, and not be entangled in the folds of the membranous lining of the canal, while it will afford a more ready outlet for the urine. On the other hand, small catheters should be preferred, when there are obstructions in the passage. Catheters also differ in shape: those which Desault used for male subjects, had only a slight curvature of one third of their length; a curvature, which began insensibly from their straight part, and was continued to the very end of their beaks. The curvature was also regular, so as to form the segment of a circle six French inches in diameter. As the course of the urethra in the male subject is regular, the caprice evinced by surgeons in the different curvatures of their catheters, cannot be founded on any correct anatomical principles, and the bend of the instrument, (at least for subjects of the same age and stature,) should generally not vary at all, but be strictly adapted, as Langenbeck remarks, to the natural track of the urethra. (*Bibl.* 1, *p.* 1177.) The female catheter, however, has only a slight curvature towards its beak; a shape adapted to the direction of the meatus urinarius. Desault also improved silver catheters, by causing them to be made with elliptical openings, or eyes, at the sides of the beak, with rounded edges, instead of the longitudinal slits previously in use, in which the lining of the urethra was frequently entangled, pinched, and lacerated, so that acute pain and profuse hemorrhage were the consequences. With the view of preventing these evils, he also filled up the openings with lard. (See *Œuvres Chir. de Desault, T.* 3, *p.* 118.)

Besides silver, or inflexible catheters, surgeons now frequently employ flexible ones, made of elastic gum. These last, indeed, are of so much importance, that they may be said to constitute one of the greatest improvements in modern surgery. I shall not here inquire, whether they were first invented by Theden, Pickel of Wurzburg, or Bernard of Paris: this is a point, which the Germans and French must settle themselves. Imperfect attempts had been made by others at earlier periods to invent catheters, possessing the property of flexibility. Van Helmont proposed the use of catheters, made of horn; but, this substance was found to be too stiff, and to be very quickly coated with depositions from the urine. Fabricius ab Aquapendente employed leather catheters, which were objectionable, inasmuch as they were soon softened by the urine and mucus of the urethra, when they shrivelled, and became impervious. Other flexible catheters were also formerly tried, composed of spiral springs of silver-wire, covered with the skins of particular animals. These last, however, were very quickly spoiled by putrefaction; and when left in the urethra any considerable time, the beak sometimes entirely separated from the rest of the instrument, and was left behind in the bladder.

The elastic gum-catheters, now in use, are liable to none of the preceding inconveniences: they are formed of silk tubes, woven for the purpose, and covered with a coat of elastic gum; they are sufficiently flexible to accommodate themselves to the different curvatures of the urethra; they are not softened by the urine; and they constantly remain with their cavity unobliterated. Their smooth and polished surface makes them continue a long while free from incrustations deposited from the urine. Sometimes, they are introduced with a stilet, or wire, which is passed into their canal, in order to give them a certain curvature, and a greater degree of firmness; but, in general, it is withdrawn as soon as the tube is in the bladder.

Elastic catheters are less irritating to the urethra, and less apt to become covered with calculous incrustations, than silver tubes: they can also be frequently introduced, when a metallic one will not pass.

The selection of good bougies and catheters, especially in operations upon the male subject, is a business of the first-rate importance, for, by employing such as are diposed to break, " many a practitioner has doomed his patient to years of dreadful, and, perhaps, hopeless suffering, and brought down irreparable disgrace upon his own head." *(Med. Chir. Journ. Vol.* 5, *p.* 75.) M. Nicod, in performing the operation of lithotomy upon a male, found the stone, which was very brittle, one inch and a half long, and eight or nine lines thick, traversed in the direction of its greater diameter, by a piece of elastic gum catheter, which had acted as a nucleus for the deposition of calcareous matter. (See *Obs. sur le danger d'employer de mauvaises sondes de gomme elastique; Journ. de Médecine, par Leroux, Oct.* 1816.)

The best elastic catheters used to be fabricated at Paris, by Bernard. At the present time, the best maker in France is Feburier, orfêvre, in the Rue du Bac, No. 51, at Paris; but the elastic gum catheters now made in London are in some respects better than French, being generally much smoother and more regular, though I believe our smallest size is not yet so small, as what Feburier makes. The gum catheters are made at Paris of twelve different sizes, which correspond to twelve holes in a plate of brass. " Each catheter, therefore, (says a late intelligent visitor to that capital) has its size designated by its number, which greatly facilitates the ascertaining of the progress of the case towards a cure. Numbers 1 and 2 are smaller than can be procured in England, and are so slender, that I thought there might be danger of their breaking, until I was convinced by seeing the method of making them, that there is no reason for fearing any such thing. A firm tissue of silk is woven upon a brass stilet, of the size of the cavity of the instrument to be made. In weaving this tissue, the orifice or eye is left, and the whole therefore consists of one entire thread. The successive layers of varnish are deposited on the outer surface of the silken tissue, their number depending on the size of the instrument; and each coating of varnishing undergoes a long process of scouring before the next is put on, for which purpose women are employed by Feburier." (See *Sketches of the Medical Schools of Paris, by J. Cross,* 1815, *p.* 122-123.)

According to this gentleman, however, the English gum catheters possess advantages: " they retain their curve better without the stilet, are less liable to crack, and have eyes more smooth and better formed." (*P.* 124.)

When the object of passing a catheter is merely to empty the bladder, without any design of leaving the instrument afterwards in the passage, Langenbeck always prefers an inflexible one, made of silver. (*Bibl. für die Chir. B.* 1, *p.* 1176.)

Sometimes spasm about the perinæum renders the introduction of a catheter difficult. In this case, a dose of opium should be administered, before a second attempt is made. When inflammation prevails in the passage, the introduction may often be facilitated by a previous bleeding.

The operation of introducing the catheter may be performed, either when the patient is standing up, sitting, or lying down, which last posture is the most favourable. In order to pass a catheter with ease and dexterity, the following circumstances must be observed: the instrument must be of suitable shape and size; a just idea of the perineum and curvature of the urethra must be entertained; the catheter must be introduced with the greatest care and delicacy; and the relaxation of the abdominal muscles has been insisted upon, (*Langenbeck, Bibl.* 1, *p.* 1177,) though, I confess, that it does not appear to me, how this circumstance is of importance.

One of the most important maxims is, never to force forward the instrument, when it is stopped by any obstacle. If there are no strictures, the stoppage of the catheter is always owing to one of the following circumstances. Its beak may be pushed against the os pubis. This chiefly occurs when the handle of the instrument is prematurely depressed. Here the employment of force can obviously do no good, and may be productive of serious mischief. The beak of the catheter may take a wrong direction, and push against the side of the urethra, especially at its membranous part, which it may dilate into a kind of pouch. In this circumstance, if force were exerted, it would certainly lacerate the urethra, and occasion a false passage. The end of the catheter may be entangled in a fold of the lining of the urethra, and here force would be equally wrong. Lastly, the point of the instrument may be stopped by the prostrate gland, in which case force can be of no service, and may do great harm. Hence, it is always proper to withdraw the instrument a little, and then push it on gently in a different position.

There are two methods of introducing a male catheter, viz. with the concavity turned towards the abdomen; or with the concavity directed downwards in the first stage of the operation. Of course, the latter plan requires the instrument to be turned, so as to place its concavity upwards, as soon as the beak has arrived in the perineum; and hence, the French surgeons call this method the "tour de maître."

The operation may be divided into three stages. In the first, the catheter passes, in the male subject, that portion of the urethra which is surrounded by the corpus spongiosum; in the second, it passes the membranous part of the canal, situated between the bulb and the prostate gland; and in the third, it enters the gland, and the neck of the bladder.

In the first stage, little trouble is usually experienced; for the canal is here so supported by the surrounding corpus spongiosum, that it cannot easily be pushed into the form of a pouch, in which the end of the instrument can be entangled.

When the catheter is to be introduced with its concavity towards the abdomen, and the patient is in the recumbent posture, the thighs are to be separated, and the legs moderately bent. The surgeon is to draw back the prepuce, and to hold the penis between the thumb and fore-finger of his left-hand, which are to be applied on each side of the corona glandis, and not at all to the under surface of the penis, so as to avoid pressing upon the commencement of the urethra. After the catheter has been well oiled, its handle is to be held between the thumb and fore-finger of the right hand, and to rest with the back of the little finger upon the patient's abdomen, in the vicinity of the navel. Now, while the handle is parallel to the axis of the body, the beak is to be introduced into the urethra; the penis being extended, and drawn forwards, as it were, over the instrument, while the latter is gently pushed on, until its beak has reached the arch of the pubes. When the penis cannot be drawn further over the catheter, the beak has arrived in this situation, where it stops in front of the arch, and is pressing against the posterior side of the urethra. At this particular moment, the handle is to be depressed towards the patient's thighs, and the manœuvre well managed, generally directs the end of the catheter at once through the prostatic portion of the urethra into the cavity of the bladder. In short, as soon as the beak of the instrument has passed under the arch of the pubes, and the surgeon very slowly brings the handle forwards, or downwards, the beak is elevated, and glides into the bladder. In this stage of the operation, the penis must be allowed to sink down, and not be kept tense, as this would only render the passage of the instrument more difficult.

The operation, however, is not always successfully accomplished in this manner. The beak of the catheter may be stopped by the os pubis; it may take a wrong direction, so as to push the membranous part of the urethra to one side or the other; or it may be stopped by a fold of the lining of the passage.

The first kind of impediment is best avoided, by not depressing the handle of the catheter too soon; that is, before the point has passed beyond the arch of the pubes. When the membranous part of the urethra is pushed to one side or the other, the instrument ought to be withdrawn a little, and then pushed gently on in a different direction; but, if this expedient is unavailing, the index finger of the left hand may be introduced into the rectum, for the purpose of supporting the membranous part of the urethra, and guiding the extremity of the catheter. The passage of the catheter through the membranous part of the urethra, and especially the attempt to hit the entrance of the prostate, are the most difficult things in the operation, and also the only ones attended with risk of mischief, which is frequently produced by rough, unskilful surgeons, when they use violence, and rupture this yielding weak portion of the canal.

When the prostate gland is enlarged, the urethra makes a more sudden turn upwards, just as it approaches the bladder, than is natural. The end of the catheter, therefore, should be more bent upward, than in other cases.

In the third stage of the operation, the beak of the instrument has to pass the prostate gland and neck of the bladder. The principal obstacles to its passage, in this situation, arise from spasm of the neck of the bladder, and muscles in the perineum, and from the instrument being pushed against the prostate gland, instead of into the continuation of the urethra through it. The first impediment may generally be obviated by waiting a few moments, and gently rubbing the perineum, before attempting to push the catheter further into the passage. The hindrance, caused by the prostate, is best eluded by using an instrument, the point of which is more curved, than its other part. Sometimes the surgeon himself presses the prostate towards the os pubis, by means of his finger in the rectum, and thus prevents the passage of the catheter, by increasing the sudden curvature at this part of the urethra. Hence, as Richter observes, it is a very important maxim, never to introduce the finger so far into the rectum, as to press on the prostate gland itself.

When the catheter has turned round the pubes, and is just about to enter the neck of the bladder, is the critical moment, at which may be seen, whether a surgeon can or cannot manage the operation with skill; for, if he knows how to pass the instrument, he suddenly, but not violently, changes its direction. He depresses the handle with a particular kind of address, and raises the point, which, as if it had suddenly surmounted some obstacle, starts into the neck of the bladder, and the urine bursts out in a jet from the mouth of the catheter.

They, who are unskilful, press the tube forward, and persist, as they first began, in drawing up the penis, on the supposition that by stretching this part they lengthen the urethra, and make it straight, whereas they elongate only that part of the canal, along which the catheter has already passed. (*John Bell's Principles of Surgery, Vol.* 2, *p.* 213.)

When the catheter is to be introduced with its concavity downwards, or by the "tour de maître," the beak is to be passed into the urethra, and the penis drawn over it, as it were, as in the foregoing method. In other words, the instrument, well oiled, is to be introduced, with its convexity uppermost, as far as it can be, without using force. As soon, however, as the end of the catheter has reached the point, at which the canal begins to form a curve under the pubes, the surgeon is to make the penis and the instrument perform a semicircular movement, by inclining them towards the right groin, and then towards the abdomen. In the execution of this manœuvre, care is to be taken to keep the beak of the catheter stationary, so that it may be the centre of the movement, and simply revolve upon itself. This part of the operation, the object of which is to turn the concavity of the catheter upwards, ought to be done very slowly, a large sweep being made with the handle, while particular care is taken not to retract, nor move the beak from its position. The handle is then to be depressed, and the operation finished exactly in the same manner, as when the first plan is pursued. As Desault properly observes, the only circumstance, in which the two methods differ, is, that, in one, the same thing is performed by two movements, which is done in the other by one; so that the operation is rendered more difficult and painful. Hence, many judicious modern surgeons never practise the "tour de maître," except when their patients are very corpulent, or placed in the position usually chosen for lithotomy, when other modes of introducing the catheter would be less convenient.

The depth to which the catheter has entered, the cessation of any feeling of resistance to the motions of the beak, when revolved upon its axis, and the issue of the urine, are the circumstances, by which the surgeon knows, that the instrument has passed into the bladder.

According to the experience of Desault, the practice of gradually letting out a part of the urine, after the catheter has been introduced, is by no means advantageous. He also disapproves of running into the opposite extreme, that is to say, of letting the urine flow out of the catheter, as fast as it is secreted; for, then, the bladder is kept constantly relaxed, and the detrusor muscle will not be likely to recover its tone. When the bladder is continually empty, it is liable to come into contact with the end of the catheter; a circumstance, which has sometimes caused considerable irritation, pain, and even ulceration of that viscus. Besides these inconveniences, there are some others; the catheter is sooner obstructed with mucus, and covered with incrustations, than when it is closed with the stilet. The patients are likewise obliged to remain in bed, where they are either wet with their urine, or compelled to have incessantly a pot for its reception. The best practice, therefore, seems to be that of letting out all the urine, as soon as the catheter is introduced, and then closing the instrument, until the bladder has become moderately distended again; for, experience proves, that such moderate distention and relaxation of the muscular fibres of the bladder, alternately kept up, have the same good effects upon that organ, as moderate exercise has upon other parts of the body. When a catheter is to be left in the urethra, it should always be properly fixed with a narrow piece of tape, or else it is apt to slip out, or even pass too far into the passage. For this purpose, some surgeons use cotton-thread, which they fasten to the rings, or round the external end of the catheter. The two extremities of the thread are then carried some way along the dorsum of the penis, when they are tied together, and afterwards conveyed in opposite directions round the part, till they meet underneath it, where they are tied in a bow. When a silver catheter is employed, a tape, or narrow riband, is passed through each of the rings, and conveyed to each side of the pelvis, where it is fastened to a circular bandage. Mr. Hunter remarks, that the common bag-truss for the scrotum answers extremely well, when two or three rings are fixed on each side of it along the side of the scrotum, and the ring of the cannula is fastened to any of them with a piece of tape. (*On the Venereal Disease, Ed.* 2, *p.* 159.) He also notices another method: when the catheter (says he) is fairly in the bladder, the outer end is rather inclined downwards, nearly in a line with the body. To keep it in this position, we may take the common strap, or belt part of a bag-truss, with two thigh straps, either fixed to it, or hooked to it, and coming round each thigh forwards by the side of the scrotum, to be fastened to the belt, where the ears of the bag are usually fixed. A small ring, or two, may be fixed to each strap just where it passes the scrotum, or root of the penis; and with a piece of small tape, the ends of the catheter may be fixed to those rings, which will keep it in the bladder. It seems Mr. Hunter did not, like Desault, disapprove of leaving the catheter unclosed, and he adds, therefore, "a bit of rag, about four or five inches long, with a hole at the end of it, passed over the exterior end of the catheter, and the loose end allowed to hang in a basin, placed between the thighs, will catch the water, which cannot disengage itself from the catheter, and keep the patient dry; or, if another pipe is introduced into the catheter, it will answer the same purpose." (*Op. cit. p.* 191.) The following, which is the French method of retaining the catheter in the bladder, is the most convenient with which I am acquainted: "A metallic ring, the circumference of which should be more than sufficient to encircle the penis, is to be covered with cloth, and four long pieces of tape, with the same number of short ones attached to it, This ring, enclosing the penis, is fixed against the pubes by the long pieces of tape, which, surrounding the pelvis in different directions, meet and are tied posteriorly. One of the short pieces is carried through the ring, or round the groove of the catheter, on each side, and being tied to its fellow, fixes the instrument securely in the bladder." (See *Averill's Operative Surgery, p.* 105.) But, there are numerous modes of fixing a catheter, which need not be specified; for, although they are of importance, the principles, which should be observed in adopting them, are the main things to be understood. These are, first, never to fix a catheter in such a way, that too much of the instrument projects into the cavity of the bladder; and, secondly, to be careful, that the thread, or tape, which is applied, will not chafe and irritate the parts.

Mr. Hey has offered some good practical remarks on the introduction of the catheter. If, says he, the point of the catheter be less turned than the urethra, the point will be pushed against the posterior part of the passage, instead of following the course of the canal. The posterior part of the urethra has nothing contiguous to it which can support it; and no considerable degree of force will push the point of the catheter through that part between the bladder and the rectum. If this accident is avoided, still the point will be pushed against the prostate, and cannot enter the bladder. Mr. Hey tells us, that the truth of this is illustrated, by the assistance which is derived, whenever the catheter stops at the prostate, from elevating the point of the instrument with a finger introduced in the rectum.

Mr. Hey takes notice of the impropriety of pushing forwards the point of the catheter, before its handle is sufficiently depressed, as the point would move in a horizontal direction, and be likely to rupture the posterior side of the urethra.

The difficulty arising from the inflamed and dry state of the passage, (which difficulty I should conceive can never be great), Mr. Hey says, may be obviated by the previous introduction of a bougie, well covered with lard.

In order to pass the catheter, Mr. Hey places his patient on a bed, in a recumbent posture, his breech advancing to, or projecting a little beyond the edge of the bed. If the patient's feet cannot rest upon the floor, Mr. Hey supports the right leg by a stool, or by the hand of an assistant. The patient's head and shoulders are elevated by pillows; but the lower part of the abdomen is left in a horizontal position. Mr. Hey commonly introduces the catheter with its convexity towards the abdomen, and having gently pushed down the point of the instrument, till it becomes stopped by the curvature of the urethra, under the symphysis pubis, he turns the handle towards the navel, pressing at the same time its point. In making the turn, he sometimes keeps the handle at the same distance from the patient's abdomen, and sometimes makes it gradually recede; but, in either method, he avoids pushing forwards the point of the catheter any farther than is necessary, to carry it just beyond the angle of the symphysis pubis. When he feels that the point is beyond that part, he pulls the catheter gently towards him, hooking, as it were, the point of the instrument upon the pubes. He then depresses the handle, making it describe a portion of a circle, the centre of which is the angle of the pubis. When the handle of the catheter is brought into a horizontal position, with the concave side of the instrument upwards, he pushes forwards the point, keeping it close to the interior surface of the symphysis pubis; for when passing in this direction, it will not hitch upon the prostate gland, nor injure the membranous part of the urethra.

If the surgeon uses a flexible catheter, covered with elastic gum, it is of great consequence to have the stilet made of some firm metallic substance, and of a proper thickness. Mr. Hey always makes use of brass wire for the purpose. If the stilet is too slender, the catheter will not preserve the same curvature during the operation; and it will be difficult to make the point pass upwards behind the symphysis pubis in a proper direction. If the stilet is too thick, it is withdrawn with difficulty.

When the stilet is of a proper thickness, this instrument has one advantage over the silver catheter, which is, that its curvature may be increased while it is in the urethra, which is often of great use, when the point approaches the prostate gland. In all cases, where an elastic gum-catheter is preferred, care must be taken, that it does not pass unnecessarily far into the bladder; and, if it be too long, a part of it ought to be cut off, or a shorter one employed.

When the proper manœuvres with a silver catheter do not succeed, the surgeon must change it, taking a bigger or more slender one, with a greater or less curve, according to such observations as he may have made in his first attempt. But, if the catheter has been of a good form or commodious size, yet has not passed easily, he should, instead of choosing a rigid catheter of another size or form, take a flexible one for his second attempt. The flexible catheter is generally slender, and of sufficient length, and its shape may be accommodated to all occasions, and to all forms of the urethra; for, having a stiff wire, we can give that wire, either before or after it has passed into the catheter, whatever shape we please; and what is of still greater importance, we can introduce the instrument without, or with the wire, as circumstances may require; or what is more advantageous, we can introduce the wire particularly so as not quite to reach the point of the catheter, but only to within two inches or a little more of this part, by which contrivance the point, if previously warmed, and wrought in the hand, has so much elasticity, that it follows the precise curve of the urethra, and yet has sufficient rigidity to surmount any slight resistance. If this too fail, and especially, if there be the slightest reason to suspect, that the resistance is not merely spasmodic, but arises from stricture near the neck of the bladder in a young man, or swelling of the prostate in an old one, we may take a small bougie, turn up the extremity of it with the finger and thumb, so as to make it incline towards the pubes, and allowing no time for the wax to be softened, pass it quickly down to the obstruction, turn it with a vertical or twisting motion, and make it enter the constricted part. On withdrawing it in about ten minutes or a quarter of an hour, the urine generally escapes, or the catheter may now be introduced. (*John Bell's Principles of Surgery, Vol. 2, p.* 215.)

Mr. Hey found, that, in withdrawing the stilet of an elastic gum catheter, the instrument becomes more curved; and he availed himself of this information, by withdrawing the stilet, as he introduced the catheter beyond the arch of the pubes, by which artifice the point was raised in the due direction. He says, you may sometimes, though not always, succeed in introducing an elastic gum catheter, by using one which has acquired a considerable degree of curvature and firmness, by having had a curved stilet kept in it a long while. Introduce this without the stilet, with its concavity towards the abdomen, taking care not to push on the point of the instrument, after it has reached the symphysis pubis, until its handle is depressed into a horizontal position.

When it is necessary to draw off the urine frequently, and the surgeon cannot attend often enough for this purpose, a catheter must be left in the urethra, till an attendant, or the patient himself, has learnt the mode of introducing the instrument.

Mr. Hey imputes the formation of a false passage, or the rupture of the membranous part of the urethra, generally to the method of pushing forwards the catheter, before its handle has been depressed. In this manner, the course of the instrument crosses that of the urethra, and the point of the catheter, pressing against the posterior side of the membranous part of the urethra, is easily forced through the coats of that canal. The want of due curvature in the catheter, and of sufficient bluntness in its point, greatly contribute to facilitate this injury. In this case, the point of the instrument passes more readily into the wound, than onward along the urethra against the symphysis pubis. Without this pressure, the point is apt to recede, and not readily enter the membranous part of the urethra.

Mr. Hey surmounted a difficulty of this kind, by bending upwards the point of a silver catheter, so as to keep it more closely in contact with the anterior part of the urethra, and thereby pass over the wound made in the posterior side of the canal. In the instance alluded to, as it was necessary to leave an elastic gum catheter in the urethra, Mr. Hey procured some brass wire of a proper thickness, with which he made a stilet, and, having given it the same curvature as that of the silver catheter, he introduced it about four hours after the preceding operation, and fixed it by tying it to a bag truss. Mr. Hey sometimes succeeded by partly withdrawing the stilet, at the moment when he wished to increase the curvature of the catheter.

In an instance, in which the urethra had suffered a violent contusion, Mr. Hey drew off the urine with a silver catheter of unusual thickness, after he had failed with instruments of a smaller bore. He suspected, that the urethra was ruptured, and was obliged to raise the point of the catheter by a finger introduced into the rectum, and to use bleeding, purgatives, the warm bath and opium, before it could be made to pass. The elastic gum catheter was afterwards employed. It is an unsettled point, whether it is best to leave the catheter in the urethra, until the power of expelling the urine is regained, or to draw off the urine twice a day, and withdraw the catheter after each operation. Mr. Hey thinks that no general rule can be laid down; some patients cannot bear the catheter to remain introduced; others seem to suffer no inconvenience from it. On the whole, however, Mr. Hey commonly prefers removing the catheter. In this manner, he is of opinion, that the power of expelling the urine again is soonest acquired.

The preceding question is often determined by the nature of the disease, and, as Mr. Hunter observes, in cases of debility of the bladder, and where a catheter passes with difficulty, or with great uncertainty, as well as in other instances, in which it must be used frequently, and for a length of time, it will be necessary to keep it introduced, so as to allow the water to pass freely through it. (*On the Venereal Disease, Edit.* 2, *p.* 191.)

In France, a conical silver catheter (*sonde conique*) is frequently employed in difficult cases by Boyer, Roux, &c. This instrument has a very slight curvature, and an extremity almost pointed. By force, regularly applied, it is introduced into the bladder in spite of all opposition. Care is taken to keep it in the centre of the passage, and the direction of its point is judged of by the position of the lateral rings. The rule mentioned by Roux, for commencing the great depression of the outer extremity of the instrument, is when, by the finger in the rectum, the point can be felt to have reached the apex of the prostate. (See *Sketches of the Medical Schools of Paris, by J. Cross, p.* 112.) In bad cases, the conical catheter is usually allowed to remain introduced three or four days, and on being withdrawn, a small flexible gum-catheter generally admits of being used.

The forcible manner, in which the French surgeons employ the conical silver catheter, must often do great and dangerous mischief. Thus, in two examples, which were witnessed and examined by Roux himself after the decease of the patients, a false passage had been made, no flexible gum catheter could be passed, the urine was effused in the cellular membrane, and the parts were gangrenous. (See *p.* 116 *of the above Work.*) According to the observation of Mr. Cross, the French surgeons employ the conical silver catheter with too little discrimination, and "in their practice they seem to make no nice distinctions between impediments to the flow of urine from spasm, irritable and inflamed state of the canal, disease of the prostate gland, and cartilaginous stricture of long duration. If the conical catheter be admissible at all, it is in the last of these cases, particularly, when combined with fistula in perinæo; and here all surgeons, who are familiar with the treatment of diseases of the urethra, occasionally use means, which approach very closely to the *forcing* method of the French. I have heard of instances, in which John Hunter employed great force with the silver catheter, and overcame the obstruction. I have seen Mr. Pearson, (who generally treats strictures as mildly, and, I need hardly say, as successfully as any man) take a steel sound, and pass it gradually and forcibly on into the bladder, at the same time feeling his way, as it were, by keeping one finger in the rectum: the relief of the patient, and the ultimate cure of the disease, were the results of this practice." (*P.* 118.) It appears further, that the conical silver catheter has been used by Sir A. Cooper. Without altogether condemning the occasional employment of this instrument, I perfectly coincide with Mr. Cross, that it is one, with which young men, of little caution and no experience, may do more harm in the first few cases they meet with, than the rest of their life will afford them opportunities of doing good.

Mr. Hunter refers to instances, in which the common catheter had been pushed through the projecting part of the prostate gland into the bladder, and the water then drawn off; but, "in one patient, the blood from the wound passed into the bladder, and increased the quantity of matter in it. The use of the catheter was attempted a second time; but, not succeeding, I was sent for. I passed the catheter till it came to the stop, and then suspecting, that this part of the prostate projected forwards, I introduced my finger into the anus, and found that gland very much enlarged. By depressing the handle of the catheter, which of course raised the point, it passed over the projection; but, unfortunately the blood had coagulated in the bladder, which filled up the holes in the catheter, so that I was obliged to withdraw it, and clear it repeatedly. This I practised several days; but, suspecting that the coagulum must in the end kill, I proposed cutting him (the patient) for the stone; but he died before it could be conveniently done, and the dissection, after death, explained the case," &c. (*On the Venereal Disease, Ed.* 2, *p.* 172.)

To one acquainted with anatomy, the introduction of the female catheter is exceedingly simple. From motives of delicacy to the sex, the instrument should always be passed without any exposure. The surgeon should hold the catheter in his right hand, while he introduces the fore-finger of his left hand between the nymphæ, so as to feel upon the upper surface of the passage the little papilla, which surrounds, and denotes to the touch, the precise situation of the orifice of the meatus urinarius. Holding the concavity of the catheter forward, the surgeon, guided by the fore-finger of his left hand, is then to introduce the instrument upward into the bladder. A female catheter should always be furnished with some contrivance for preventing its slipping completely into the bladder: the following case, mentioned in a respectable periodical work, fully proves the truth of this remark:

Some years ago, a surgeon, practising in the country, was required to introduce the catheter for a lady labouring under retention of urine. During the operation he was observed to exhibit signs of confusion, and to quit his patient in considerable embarrassment. The same day he abruptly left his home, and was never seen afterwards. The lady passed several years of dreadful suffering, attributed by herself and the professional gentleman, on whom the treatment of the case devolved, to aggravation of the original complaint. At length an abscess presented itself in the sacral region, and the surgeon punctured it, when his instrument came in contact with some unusually hard substance imbedded in the centre of the abscess. With a pair of forceps, he now extracted to his utter astonishment a blackened female catheter. From this period, the lady's sufferings all terminated. A similar accident nearly happened in the practice of another gentleman. (See *Urine, Retention of.*) See *Medico-Chir. Journ. Vol.* 5, *p.* 75, *Lond.* 1818. *J. Hunter, Treatise on the Venereal Disease, Ed.* 2, *in various places. Hey's Practical Observations in Surgery, Ed.* 3. *John Bell's Principles, Vol.* 2. *Ware on the Catheter. Sketches of the Medical Schools of Paris, by J. Cross, p.* 111, *&c. Jos. M'Sweeny, Observations on the Catheter, Edinb. Med. and Surgical Journ. No.* 58, *p.* 52. *Richter's Anfangsgr. der Wundarzneykunst. Rees's Cyclopædia, Art. Catheter. Langenbeck,* 1 *Bibl, für die Chir. B.* 1. *p.* 1175, 12*mo. Gött.* 1806. *Desault, Œuvres Chir. T.* 3. *The Observations on the Catheter, by Desault, Richter, J. Hunter, and Hey, are the best, with which I am acquainted.*

CATLING, often spelt in surgical books, *catlin*, is a long, narrow, double-edged, sharp-pointed, straight knife, which is chiefly used in amputations of the leg and fore-arm, for dividing the interosseous ligaments and the muscles, &c. situated between the two bones. The catling is frequently made two wide and large, so that it cannot execute its office with the right degree of ease.

CAUSTICS. (from καιω, to burn.) Medicines, which destroy parts by burning, or chemically decomposing them.

The potassa fusa, the potassa cum calce, the antimonium muriatum, the argenti nitras, the hydrargyri nitrico-oxydum, the acidum sulphuricum, and the cupri sulphas, are the caustics in most frequent use.

CAUTERY. (from καιω, to burn.) Cauteries are of two kinds, viz. *actual* and *potential.* By the first term, is implied a heated iron; by the second, surgeons understand any caustic application.

The high opinion, which the ancients entertained of the efficacy of the actual cautery, may be well conceived from the following passage. "Quoscumque morbos medicamenta non sanant, ferrum sanat; quos ferrum non sanat ignis sanat; quos vero ignis non sanat, insanabiles existimare opportet." (*Hipp. Sect.* 8, *Aph.* 6.) The actual cautery has been employed for the stoppage of bleeding, where the vessels could neither be tied, nor compressed. It has been also employed for the destruction of carcinomatous tumors and ulcers; fistulæ; polypi, and a variety of fungous diseases. Whoever looks over the writings of Hippocrates, will discover, that the actual cautery was a principal means of relief in several chronic affections, as dropsies, diseased joints, &c.

In modern times, the actual cautery has been more and more relinquished, in proportion as surgery has attained a higher state of improvement. On the continent, however, it still retains advocates. In France, all the professors recommend and employ it in particular cases. Hospital gangrene, a peculiar disorder, much more frequently seen in foreign and military hospitals, than in the charitable institutions for the reception of the sick poor in England, is said to be little affected by any internal remedies. "Vegetable and diluted mineral acids are the local means employed with effect in mild cases. I have (says Mr. Cross) already alluded to a case of Pelletan's, where carbon was applied, and the progress of the disease impeded. But, the actual cautery is the only means, that has been found effectual, in stopping the fatal progress of bad cases of hospital ulcer, and the iron is applied red hot, so as to produce an eschar on every point of the surface of the sore." (See *Sketches of the Medical Schools of Paris, by J. Cross, p.* 84, and the article *Hospital Gangrene.*)

Desault often employed the actual cautery to destroy fungous tumors of the antrum. (See *Antrum.*) The same practice is still followed by Pelletan and other eminent surgeons in France. Mr. Cross saw it adopted in one such case with good effect. (*P.* 86.) That part of the fungus, which can be cut away, is to be so removed, and the deeper portion, out of the reach of the knife, is to be cauterized. If there be any case in surgery, justifying the use of a red hot iron, it is a fungus of the antrum. But, even in this instance, I should prefer any other certain mode of destroying the root of the disease.

CERATOTOME. (from κερας, a horn, and τεμνω, to cut.) The name given by Wenzel to the knife, with which he divided the cornea, or horny coat of the eye.

CERATUM CALAMINÆ. (L.) A good simple dressing.

CERATUM CANTHARIDIS. (L.) Lately called the cerate of lyttæ, was once much used for stimulating blistered surfaces, in order to maintain a discharge. The ceratum sabinæ, however, which answers much better, and is not attended with danger of bringing on strangury, inflammation of the bladder, &c., has almost superseded the ceratum cantharidis.

CERATUM CETACEI. (L.) The spermaceti cerate. A mild, unirritating salve, for common purposes.

CERATUM CONII. ℞. *Unguenti Conii* lbj. (See *Unguentum.*) *Cetacei* ℥ij. *Ceræ Albæ,* ℥iij. M. One of the formulæ at St. Bartholomew's Hospital, occasionally applied to cancerous, scrofulous, phagedenic, and other inveterate sores.

CERATUM HYDRARGYRI SUBMURIATIS. ℞. *Hydrarg. submuriatis,* ʒi. *Cerati Lapid. Calamin.* ℥ss. M. Some practitioners are partial to this as a dressing for chancres.

CERATUM PLUMBI ACETATIS. (L.) An eligible, mildly astringent, unirritating salve.

CERATUM PLUMBI COMPOSITUM. (L.) An excellent, unirritating, gently astringent salve, for common purposes.

CERATUM SABINÆ. 4. ℞. *Sabinæ Foliorum recentium contusorum,* lbj. *Ceræ Floræ,* lbss. *Adipis præparatæ,* lbij. Mix the savin with the melted wax and hog's lard, and strain the composition.

The common application for keeping open blisters, on the plan recommended by Mr. Crowther. (See *Blisters.*)

CERATUM SAPONIS. ℞. *Plumbi oxydi semivitrei, lib.* j. *Aceti cong.* j. *Saponis unc.* viij. *Olei olivæ, Ceræ flavæ, sing. lib.* j.

The *soap cerate* of St. Bartholomew's Hospital. In preparing it, the utmost caution must be used. The three first ingredients are to be mixed together and boiled gently till all the moisture is evaporated; after which, the wax and oil, previously melted together, must be added. The whole composition, from first to last, must be incessantly and effectually stirred, without which the whole will be spoiled. This formula was introduced into practice by Mr. Pott, and is found to be a very convenient application for fractures, and sometimes a good dressing for ulcers; being of a convenient degree of adhesiveness, and at the same time possessing the usual properties of a saturnine remedy.

In applying this cerate, spread on linen, to fractures of the leg or arm, one caution is necessary to be observed, namely, that it be in two distinct pieces; for if, in one piece, the limb be encircled by it, and the ends overlap each other, it will form a very inconvenient and partial constriction of the fractured part, in consequence of the subsequent tumefaction. (*Pharm. Chirurg.*)

CERU'MEN AURIS. A degree of deafness is frequently produced by the lodgment of hard dry pellets of this substance in the meatus auditorius. The best plan, in such cases, is to syringe the ear with warm water, which should be injected with moderate force.

In some instances, deafness seems to depend on a defective secretion of the cerumen, and a consequent dryness of the meatus. Here, a drop or two of sweet oil may now and then be introduced into the ear, and fomentations applied.

CERUSSA ACETATA. Sugar of lead. Acetite of lead. This preparation, which is now named by the college *plumbi superacetas,* is well known as an ingredient in a variety of lotions and collyria. It has the qualities of preparations of lead in general, being highly useful for diminishing inflammation.

CHALAZIUM. (from χαλαζα, a hailstone.) A little tubercle on the eyelid, which has been whimsically supposed to resemble a hailstone. When the hordeolum or stye does not suppurate, but changes into a hard fleshy tumor, it receives this appellation. (See *Hordeolum.*)

CHAMOMILE. The flowers, which are bitter and aromatic, are used in surgery, for making fomentations.

CHANCRE. (from καρκινος, *cancer venereus.*) A sore which arises from the direct application of the venereal poison to any part of the body. Of course it almost always occurs on the genitals. Such venereal sores, as break out from a general contamination of the system, in consequence of absorption, never have the term *chancre* applied to them. (For an account of the nature and treatment of chancres, see *Venereal Disease.*)

CHEMOSIS. (from χαινω, to gape.) When ophthalmy or inflammation of the eye, is exceedingly violent, it frequently happens, that one or more vessels become ruptured on the side next the eyeball, and a quantity of blood is infused into the cellular membrane, which connects the conjunctiva with the anterior hemisphere of the eye. Hence, the conjunctiva becomes gradually elevated upon the eyeball, and projects towards the eyelids, so as to conceal within it the cornea, which appears as if it were depressed. (*Scarpa.*) In this way, the middle of the eye assumes the appearance of a gap, or aperture.

According to the late Mr. Ware, when blood is extravasated under the tunica conjunctiva, there cannot be an easier or more effectual remedy than æther. A few drops are to be poured into the palm of the hand, and diffused over it, which may be immediately done by pressing the other hand against it. The hand is then to be applied to the eye, and kept close to it, while the spirit is evaporating. By this means, the action of the absorbent vessels for the dispersion of the blood is excited, and quickened.

In a few instances of chemosis, in which the swelling and inflammation of the conjunctiva have been great, the same author found the following application particularly beneficial, after free evacuations: ℞. *Interiorum foliorum recentium Lactucæ Sissilis*, ℥iij. *Coque cum Aq. Pur.* ℥ss. *In balneo mariæ pro semihora; tunc exprimatur succus, et applicetur paululum ad oculos et ad palpebras, sæpe in die.* (*Ware.*)

Ophthalmy, attended with chemosis, demands the most rigorous employment of the antiphlogistic treatment. Both general and topical bleeding should be speedily and copiously put in practice, with due regard, however, to the age and strength of the patient. Leeches should be applied to the vicinity of the eyelids, or, what is preferable, the temporal artery should be opened. When chemosis is very considerable, the distention of the conjunctiva may be relieved by making an incision in it, near its junction with the cornea. (See *Ophthalmy.*)

CHEVASTER or **Cheva'stre.** A double headed roller, the middle of which was applied to the chin; the bandage then crossed at the top of the head, and passed on each side to the nape of the neck, where it crossed again. It was next carried up to the top of the head, and so on, till all the roller was exhausted.

CHIA'STRE. A bandage for stopping hemorrhage from the temporal artery. It is double headed, about an inch and a half wide, and four ells long. Its middle is applied to the opposite side of the head: the bandage is carried round to the bleeding temple, and there made to cross over a compress on the wound. The roller is then continued over the coronal suture, and under the chin, care being taken to make the bandage cross upon the compress. In this way, the rest of it is applied round the head.

CHILBLAINS are the effect of inflammation, arising from cold. A chilblain, in its mildest form, is attended with a moderate redness of the skin, a sensation of heat and itching, and more or less swelling, which symptoms, after a time, spontaneously disappear. The intolerable itching and sense of tingling, accompanying the inflammation of the milder description of chilblains, are observed to be seriously aggravated by exposure to heat. In a more violent degree, the swelling is larger, redder, and sometimes of a dark blue colour; and the heat, itching, and pain, are so excessive, that the patient cannot use the part. In the third degree, small vesicles arise upon the tumor, which burst and leave excoriations. These often change into ill-conditioned sores, which sometimes penetrate even as deeply as the bone, discharge a thin ichorous matter, and generally prove very obstinate. As Dr. John Thomson has remarked, "when the serum contained in the vesications is let out by a small opening, a portion of new cuticle is usually formed to supply the place of that, which has been separated; but, when the inflammation is severe, and the affection neglected, or improperly treated, the parts, which are the seat of vesication, are liable to pass into the state of vitiated ulcers. In this state, they yield a thin, ichorous, or sanious discharge, and are in general brought, only after a long time, and with much difficulty, to a healthy suppuration. In neglected cases, these ulcers not unfrequently become covered with foul sloughs. Ulceration often supervenes, and the soft parts, covering the bones, are destroyed." (*On Inflammation, p.* 638.) The worst stage of chilblains is attended with sloughing.

Chilblains are particularly apt to occur in persons, who are in the habit of going immediately to the fire, when they come home in winter with their fingers and toes very cold; they are also frequent in persons, who often go suddenly into the cold, while very warm. Hence, the disease most commonly affects parts of the body, which are peculiarly exposed to these sudden transitions; for instance, the nose, ears, lips, toes, heels, and fingers. Richter remarks, that they are still more frequently occasioned, when the part, suddenly exposed to cold, is in a moist perspiring state, as well as warm. Young subjects are much more liable to this troublesome complaint than adults; and females brought up in a delicate manner, are generally more afflicted, than the other sex.

The most likely plan of preventing chilblains is to accustom the skin to moderate friction; to avoid hot rooms and making the parts too warm; to adapt the quantity and kind of clothing to the state of the constitution, so as to avoid extremes, both in summer and winter; to wash the parts frequently with cold water; to take regular exercise in the open air in all weathers; and to take particular care not to go suddenly into a warm room, or very near the fire, out of the cold air.

Although chilblains of the milder kinds are only local inflammations, yet they have some peculiarity in them; for they are not most benefited by the same antiphlogistic applications, which are most effectual in the relief of inflammation in general.

One of the best modes of curing chilblains of the milder kind is to rub them with snow, or ice-cold water, or to bathe them in the latter, several times a day, keeping them immersed each time, till the pain and itching abate. After the parts have been rubbed or bathed in this way, they should be well dried with a towel, and covered with flannel or leather socks.

This plan is perhaps as good a one as any; but it is not that which is always congenial to the feelings and caprice of patients; and with the constitutions of some it may even disagree. In such cases, the parts affected may be rubbed with spirit of wine, linimentum saponis, tinctura myrrhæ, or a strong solution of alum, or vinegar. A mixture of oleum terebinthinæ and balsamum copaivæ, in equal parts, is a celebrated application. A mixture of two parts of camphorated spirit of wine, and one of the liquor plumbi subacetatis has also been praised. Mr. Wardrop speaks highly of one part of the tincture of cantharides, with six of the soap liniment. (*Medico-Chir. Trans. Vol.* 5, *p.* 142.)

With respect to vesications, "their occurrence is always hastened, and the inflammation, upon which they depend, greatly aggravated by the action of external heat; and, hence, the propriety of continuing cold applications to frost-bitten parts, so long as their temperature continues above the natural standard, or the inflammation excited seems to retain an acute character. From the tendency, which the inflammation excited, has to pass into gangrene, the more stimulating applications, such as spirit of wine, diluted ammonia, or oil of turpentine may be required. But, should these applications prove too stimulating, their strength may be weakened by additions of greater or less portions of the linimentum ex aqua calcis." (*Thomson on Inflammation, p.* 648.)

When chilblains suppurate and ulcerate, they require stimulating dressings, such as lint dipped in a mixture of the liquor plumbi, subacetatis dilutus, and liquor calcis; tinctura myrrhæ, or warm vinegar. If a salve be employed, one which contains the hydrargyri nitrico-oxydum is best. Ulcers of this kind frequently require to be touched with the nitrate of silver, or dressed with a solution of it.

Chilblains, attended with sloughing, should be poulticed, till the dead parts are detached. The sores should then be first dressed with some mildly stimulating ointment, such as the unguentum resinæ flavæ. With this, in a day or two, a little of the hydrargyri nitrico oxydum may be mixed; but the surgeon should not venture on the employment of very irritating applications, till he sees what the parts will bear, and whether such will be requisite at all; for, were he too bold, immediately he leaves off the poultices, he might bring on sloughing again.

The reader may find a long list of applications for chilblains in Rees's Cyclopædia, article Chilblains. See also Richter's Anfangsgr. der Wundarzn. B. 1. *Thomson's Lectures on Inflammation, p.* 637, *&c. Lassus, Pathologie Chirurg. T.* 2, *p.* 388, *&c. Léveillé Nouvelle Doctrine Chir. T.* 4, *p.* 352, *&c. Callisen's Systema Chirurgiæ Hodiernæ, Vol.* 1, *p.* 304, *&c. Edit.* 1798. *Pearson's Principles of Surgery, p.* 153, *&c. Edit.* 1808.

CHIMNEY-SWEEPER'S CANCER.—See *Scrotum.*

CHORDEE. (French, from χορδη, a cord.) When inflammation is not confined merely to the surface of the urethra, but affects the corpus spongiosum, it produces in it an extravasation of coagulable lymph, as in the adhesive inflammation, which, uniting the cells together, destroys the power of distention of the corpus spongiosum urethræ, and makes it unequal in this respect to the corpora cavernosa penis, and therefore a curvature takes place at the time of an erection, which is called a *chordee.* The curvature is generally in the lower part of the penis. When the chordee is violent, the inner membrane of the urethra is so much upon the stretch, that it may be torn, and a profuse bleeding from the urethra excited, that often relieves the patient, and even sometimes proves a cure.

This is the *inflammatory* chordee; there is another kind, which has been named *spasmodic.*

In the beginning of the inflammatory chordee, bleeding from the arm is often of service; but it is more immediately useful to take blood from the part itself by leeches; for, we often find, that when a vessel gives way, and bleeds a good deal, the patient is greatly relieved. Exposing the penis to the steam of hot water frequently gives great relief. Poultices have also beneficial effects; and both fomentations and poultices will often do most good when they contain camphor. Opium, given internally, is of singular service; and if it be joined with camphor, the effect will be still greater.

When the chordee continues after all inflammation has terminated, no evacuations are required; for the consequences of the inflammation will gradually cease on the absorption of the extravasated coagulating lymph. Mercurial ointment, rubbed on the part, will considerably promote this event. When the common methods of cure are unavailing, hemlock is sometimes very useful. Electricity may be of service. A chordee is often longer in going off, than any other consequence of a gonorrhæa, but, in the end, it disappears.

For bringing about the removal of the extravasated lymph, camphorated mercurial ointment is better, than the simple unguentum hydrargyri. According to Mr. Hunter, the *spasmodic chordee* is much benefited by bark. (*See his Treatise on the Venereal Disease, Ed.* 2.) The recent leaves of belladonna powdered, and made into an ointment with an equal weight of lard, and rubbed over the penis, are stated to hinder priapism, and relieve chordee more effectually, than any other application hitherto proposed. (*J. A. Paris, in Pharmacologia, Vol.* 2, *p.* 110. *Ed.* 5.)

CICATRIX. A scar: the mark left after the healing of a wound, or ulcer.

CICATRIZATION. The process by which wounds and sores heal. Granulations having been formed, the next object of nature is to cover them with skin. The parts which had receded by their natural elasticity, in consequence of the breach made in them, now begin to be brought together by the contraction of the granulations. The contraction takes place at every point, but principally from edge to edge, which brings the circumference towards the centre of the sore, which thus becomes smaller and smaller, even although little or no new skin be formed.

The contracting tendency is in some degree proportioned to the general healing disposition of the sore, and looseness of the parts. When granulations are formed upon a fixed surface, their contraction is mechanically impeded; as, for instance, on the skull, the shin, &c. Hence, in all operations on such parts, as much skin should be saved as possible.

The shape of a sore, as well as its situation, makes also a considerable difference in its readiness to heal: thus, as Sir Astley Cooper has remarked, a sore of a circular form, *cæteris paribus,* will be longer in cicatrizing, than another of much greater length, but less diameter. (*Lancet, Vol.* 1, *p.* 225.)

When there has been a loss of substance, making a hollow sore, and the contraction of the granulations has begun, and made a good deal of progress, before they have had time to rise as high as the skin, then the edges of the skin are generally drawn down, and tucked in by it, in the hollow direction of the surface of the sore.

The contraction of the granulations continues, till the healing is complete; but it is greatest at first. That there is a mechanical resistance to such contraction, is proved by the assistance, which may be given to the process by the application of a bandage.

Besides the contractile power of the granulations, there is also a similar power in the surrounding edge of the cicatrizing skin, which assists the contraction of the granulations, and is generally more considerable than that of the granulations themselves, drawing the mouth of the wound together, like a purse. The contractile power of the skin is confined principally to the very edge, where it is cicatrizing, and, as Hunter believed, to those very granulations, which have already cicatrized; for, the natural or original skin surrounding this edge does not contract, or at least not nearly so much, as appears by its having been thrown into folds and plaits, while the new skin is smooth and shining.

The uses of the contraction of granulations are various. It facilitates the healing of a sore, as there are two operations going on at the same time, viz. contraction and skinning.

It avoids the formation of much new skin, the advantage of which is evident; for it is with the skin as with all other parts of the body, viz. that such as are originally formed are much fitter for the purposes of life, than those which are newly formed, and not nearly so liable to ulceration.

When the whole surface of a sore has skinned over, the substance, the remains of the granulations, on which the new skin is formed, still continues to contract, till hardly any thing more is left than what the new skin stands upon. This is a very small part, in comparison with the first formed granulations, and it in time loses most of its apparent vessels, becoming white and ligamentous. All newly healed sores are at first redder than the common skin, but in time they become much whiter.

As the granulations contract, the surrounding old skin is stretched to cover the part, which had been deprived of skin.

When a sore begins to heal, the surrounding old skin, close to the granulations, becomes smooth, and rounded with a whitish cast, as if covered with something white. This, Mr. Hunter supposed to be a beginning cuticle, and it is as early and sure a symptom of healing as any. While the sore retains its red edge all round, for perhaps a quarter, or half an inch in breadth, we may be certain, that it is not in a healing state.

Skin is a very different substance, with respect to texture, from the granulations upon which it is formed; but it is not known, whether it is a new substance formed by the granulations, or a change in the surface of the granulations themselves.

The new skin most commonly takes its rise from the surrounding old skin, as if elongated from it; but, according to Mr. Hunter, not always. In very large sores, but principally old ulcers, in which the edges of the surrounding skin have but little tendency to contract, and the cellular membrane underneath to yield, or the old skin to become drawn over the ulcerated surface, the nearest granulations do not acquire a cicatrizing disposition. In such cases, new skin forms in different parts of the ulcer, standing on the surface of the granulations, like little islands.

This power of the centre of a sore to form new skin, however, is not universally admitted; and, while Sir Astley Cooper acknowledges the fact of insulated portions of skin being sometimes seen in the middle of sores, he maintains, that such appearance is produced in consequence of the whole of the skin not having been destroyed by ulceration, and granulations having arisen from the part of the skin, which was left. This, he says, only happens in irregularly formed sores, where, after the healing process has gone on to the centre, the sore breaks out again at the circumference. (See *Lancet*, *Vol.* 1, *p.* 225.)

Whatever change the granulations undergo to form new skin, they are generally guided to it by the surrounding skin, which gives this disposition to the surface of the adjoining granulations.

The new-formed skin is never so large as the sore was, on which it is formed, owing to the contraction of the granulations, and the yielding of the surrounding old skin. If the sore is situated where the adjoining skin is loose, as in the scrotum, then the contractile power of the granulations being quite free from obstruction, a very little new skin is formed; but if the sore is situated where the skin is fixed or tense, the new skin is nearly as large as the sore.

The new skin is at first commonly on the same level with the old. This however is not the case with scalds and burns, which frequently heal with a cicatrix, higher than the skin, although the granulations may have been kept from rising higher than this part.

The new-formed cutis is neither so yielding nor so elastic as the original is; it is also less moveable. It gradually becomes, however, more flexible and loose. At first it is very thin and tender, but it afterwards becomes firmer and thicker. It is a smooth continued skin, not formed with those insensible indentations, which are observed in the natural or original skin, and by which the latter admits of any distention, which the cellular membrane itself will allow of.

This new cutis, and indeed all the substance which had formerly been granulations, is not nearly so strong, nor endowed with such lasting and proper actions, as the originally formed parts. The living principle itself is less active; for when an old sore breaks out, it continues to yield, till almost the whole of the new-formed matter has been absorbed, or has mortified.

The young cutis is extremely full of vessels; but they afterwards disappear, and the part becomes white. Hence, the white appearance of the cicatrices, or marks of small pox.

The surrounding old skin, being drawn toward the centre by the contraction of the granulations, is thrown into loose folds, while the new skin itself seems to be upon the stretch, having a smooth shining appearance.

The new cuticle is more easily formed from the cutis, than the cutis itself from granulations. Every point of the surface of the cutis is concerned in forming cuticle, so that this is forming equally every where at once; but the formation of the cutis is principally, if not entirely, progressive from the adjoining skin.

The new cuticle is at first very thin, and rather pulpy than horny. As it becomes stronger, it looks smooth and shining, and is more transparent than the old cuticle.

The rete mucosum is later in forming than the cuticle, and, in some cases, never forms at all. In blacks who have been wounded, or blistered, the cicatrix is a considerable time before it becomes dark; and in one black, whom Mr. Hunter saw, the scar of a sore, which had been upon his leg when young, remained white when he was old. This case, however, must have been an unusual one; for, it is now ascertained, that the new skin of a negro does not become white, but is at first red, and, after a little time, turns blacker than the original skin. (*Sir A. Cooper, Lancet, Vol.* 1, *p.* 227.) According to this gentleman's observations, muscle and cartilage are the only two parts of the body incapable of being reproduced in the processes of cicatrization: when a muscle is divided, it unites by means of a tendinous substance; and, except in very young subjects, the cartilages of the ribs invariably unite with the intervention of bone. (*Hunter on the Blood, Inflammation, &c. The reader may also consult Thomson's Lectures on Inflammation, p.* 399, *&c.*)

CICUTA. See *Conium Maculatum.*

CINCHONA. As one of the designs of this dictionary is to embrace the subjects of a surgical pharmacopœia, peruvian bark, which is administered in a very great number of surgical cases, cannot be passed over in silence.

Its great repute for its virtues in stopping mortifications, and accelerating the separation of the sloughs, every person, whether of the medical profession or not, has frequently heard of. Indeed, so high is the character of the medicine, that many practitioners order it in some stage, or another, of almost every distemper, often prescribe it when it is totally useless, give it when it actually does harm, and make their patients swallow such quantities as operate perniciously, when smaller doses would effect striking benefit. Some men are credulous enough to think, that from the peruvian bark vigor and strength are directly extricated, and infused into the constitution, in exact proportion to the quantity of the medicine, which the stomach will keep down and digest.

While a doctrine of this sort prevails, we must expect to see indiscriminate and erroneous practice. The generality of diseases will always be attended with an appearance of languor and weakness, and, certainly, while there exists a supposition that a drug is at hand, possessing the quality of evolving and communicating strength, it would be absurd to fancy, that so important an article will not be largely exhibited in a multiplicity of surgical cases. I shall not presume to hazard an idea of the powers of the peruvian bark in the practice of physic; but, I have not the least doubt, that they have been unwarrantably exaggerated in surgery, so as to blind and prejudice many a practitioner of good abilities, and lead him to adopt injudicious and hurtful methods of treatment.

Under particular circumstances, bark has undoubtedly the quality of increasing the tone of the digestive organs; and, of course, whenever the indication is to strengthen the system by nourishing food, and the appetite fails, this medicine may prove of the highest utility, provided it be given in moderate doses, and it be found to agree with the stomach and bowels. But, the plan of making the patient swallow as much of it as can be got into his stomach, must, in my opinion, be invariably followed by bad, instead of good, effects. How can it be reasonably expected, that the stomach, which is already out of order, can be set right by having an immoderate quantity of any drug whatever forced into it? In fact, if the alimentary canal were in a healthy state, must not such practice be likely to throw it into a disordered condition?

Bark is an excellent medicine, when judiciously administered; but, like every other good medicine, in bad hands, it may be the means of producing the worst consequences. How much good does mercury effect in an infinite number of surgical diseases, when prescribed by a surgeon of understanding; what a poison it becomes under the direction of an ignorant practitioner! With respect to cases of mortification, bark is often most strongly indicated, when the sloughing is not surrounded with active inflammation, when the patient is debilitated, and his stomach cannot take nutritious food. I have always regarded the notion of giving bark, as a specific for gangrene, as totally unfounded and absurd. I have watched its effects in these cases, and could never discern, that it had the least peculiar power of operating directly upon the parts, which are distempered. Whatever good it does, is by its improving the tone of the digestive organs, and making them more capable of conveying nourishment, and, of course, strength into the constitution.

I should feel myself guilty of a degree of presumption in speaking thus freely upon this subject, were not my sentiments in some measure supported by those of certain surgical writers, the remembrance of whom will always be hailed with unfeigned veneration and esteem. Mr. Samuel Sharp was not bigoted to bark, and, while he allowed it to possess a share of efficacy, he would not admit, that it was capable of miraculously accomplishing every thing, which the ignorant or prejudiced alleged. "I know," says he, "it will be looked upon by many as a kind of scepticism, to doubt the efficacy of a remedy, so well attested by such an infinity of cases; and, yet, I shall frankly own, I have never clearly to my satisfaction, met with any evident proofs of its preference to the cordial medicines usually prescribed; though I have a long time made experiment of it with a view to search into the truth.

"Perhaps, it may seem strange, thus to dispute a doctrine established on what is called matter of fact; but, I shall here observe, that in the practice of physic and surgery, it is often exceedingly difficult to ascertain a fact. Prejudice, or want of abilities, sometimes misleads us in our judgment, where there is evidently a right and a wrong; but, in certain cases, to distinguish how far the remedy, and how far nature operate, is probably above our discernment. In gangrenes, particularly, there is frequently such a complication of unknown circumstances, as cannot but tend to deceive an unwary observer. Mortifications arising from mere cold, compression, or stricture, generally cease upon removing the cause, and are, therefore, seldom proper cases for proving the power of the bark. However, there are two kinds of gangrene, where internals have a fairer trial; those are a spreading gangrene from an internal cause, and a spreading gangrene from violent external accidents, such as gunshot wounds, compound fractures, &c. Yet, even here we cannot judge of their effect with absolute certainty; for, sometimes, a mortification from internal causes is a kind of critical disorder. There seems to be a certain portion of the body destined to perish, and no more; of this we have an infinity of examples brought into our hospitals, where the gangrene stops at a particular point, without the least assistance from art. The same thing happens in the other species of gangrene from violent accidents, where the injury appears to be communicated to a certain distance, and no farther; though, by the way, I shall remark in this place, contrary to the received opinion, that gangrenes from these accidents, (where there has been no previous straitness of bandage,) are as often fatal, as those from internal causes.

"As I have here stated the fact, we see how difficult it is to ascertain the real efficacy of this medicine; but, had bark in any degree, those wonderful effects in gangrenes, which it has in periodical complaints, its pre-eminence would no more be doubted in the one case, than in the other. What, in my judgment, seems to have raised its character so high, are the great numbers of single observations published on this subject, the authors of which not having frequent opportunities of seeing the issue of this disorder, under the use of cordials, &c. and some of them, perhaps, prejudiced with the common supposition, that every gangrene is of itself mortal, have therefore ascribed a marvellous influence to the bark, when the event has proved successful." (*Sharp's Crit. Inq. chap.* 8, *on Amputation.*)

Some further remarks on this subject will be reserved for the article *Mortification.*

According to Mr. Bromfield, bark is a specific for old ulcers, where the inflammation seems circumscribed at the distance of an inch round the sore, the surface of the ulcer looks glossy, and the discharge is extremely thin and very offensive, with little or no sleep, from the violence of the pain. He further observes, that the addition of opium, as circumstances may require, will often be found necessary. (*Chirurgical Observations and Cases*, *Vol.* 1, *p.* 132.)

Bark is given so extensively in the practice of surgery, that there are few important cases, in which in certain circumstances, and at some period or another, it is not indicated. When persons have been weakened by a course of mercury, or by the effects of any disease whatsoever, moderate doses of bark will frequently be found of great service. But, it only becomes so on the principles above suggested, and, as far as my judgment extends, this medicine should never be prescribed in any surgical cases in excessive and unreasonable quantities.

The yellow bark, or the cortex cinchonæ cordifoliæ of the new pharmacopœia, is said to possess more efficacy, than the other kinds. One desirable result, likely to arise from the complete establishment of the modern doctrine, that the virtues of the various kinds of cinchona, reside in two salifiable bases, or alkaline elements, termed *cinchonine*, and *quinine*, is that of being able to prescribe preparations, which will concentrate all the efficacy of the medicine in formulæ of moderate bulk, nor likely at least to disorder the alimentary canal by the mechanical effects of quantity.

CINNABAR ARTIFICIAL (*Hydrargyri Sulphuretum rubrum*) is chiefly employed by surgeons for fumigating venereal ulcers. An apparatus is sold in the shops for this purpose. The powder is thrown upon a heated iron, and the smoke is conducted by means of a tube to the part affected.

CIRCUMCISION. (from *circumcido*, to cut round.) The operation of cutting off a circular piece of the prepuce, sometimes practised in cases of phymosis. (See *Phymosis.*)

CIRSOCELE. (from κιρσος, a varix, and κήλη, a tumor.) Cirsocele is a varicose distention and enlargement of the spermatic vein; and whether considered on account of the pain, which it sometimes occasions, or on account of a wasting of the tesicle, which now and then follows, it may truly be called a disease. It is frequently mistaken for a descent of a small portion of omentum. The uneasiness which it occasions, is a dull kind of pain in the back, generally relieved by suspension of the scrotum. It has been fancied to resemble a collection of earth-worms; but whoever has an idea of a varicose vessel, will not stand in need of an illustration by comparison. It is most frequently confined to that part of the spermatic process, which is below the opening in the abdominal tendon; and the vessels generally become rather larger, as they approach the testis. Mr. Pott never knew any good effect from external applications of any kind.

In general the testicle is perfectly unconcerned in, and unaffected by, this disease; but it sometimes happens, that it makes its appearance very suddenly, and with acute pain, requiring rest and ease; and sometimes after such symptoms have been removed, Mr. Pott has seen the testicle so wasted as hardly to be discernible. He has also observed the same effect from the injudicious application of a truss to a true cirsocele; the vessels, by means of the pressure, became enlarged to a prodigious size, but the testicle shrunk to almost nothing. (*Pott's Works*, *Vol.* 2.)

Morgagni has remarked, that the disease is more frequent in the left, than the right spermatic cord; a circumstance, which he refers to the left spermatic vein terminating in the renal. (*De Sedibus et Caus. Morb. Epist.* 43, *art.* 34.)

Cirsocele is more frequently than any other disorder, mistaken for an omental hernia. As Sir Astley Cooper remarks, when large it dilates upon coughing; and it swells in an erect, and retires in a recumbent posture of the body. There is only one sure method of distinguishing the two complaints: place the patient in a horizontal posture, and empty the swelling by pressure upon the scrotum; then put the fingers, firmly upon the upper part of the abdominal ring, and desire the patient to rise; if it is a hernia, the tumor cannot re-appear, as long as the pressure is continued at the ring; but if a cirsocele, the swelling returns with increased size, on account of the return of blood into the abdomen being prevented by the pressure. (*A. Cooper on Inguinal Hernia.*)

Cirsocele can for the most part only be palliated, and seldom radically cured. When the complaint is attended with pain, cold saturnine, and alum, lotions may be applied to the testicle and spermatic cord. At the same time, blood should be repeatedly taken away by means of leeches; the bowels should be kept gently open; the patient should be placed in a horizontal posture; and the testicle should be supported in a bag-truss.

In general, the patient only finds it necessary to keep up the testicle with this kind of suspensory bandage.

Gooch, and other writers, have related cases of cirsocele, in which the pain was so intolerable and incurable, that nothing but castration could afford the patient any relief. (*J. A. Murray de Cirsocele, Upsal*, 1784. *Pott on Hydrocele, &c. Richter in Nov. Comment. Goett. No.* 4, *and in Obs. Chir. Fasc.* 2, *p.* 22. *Gooch, Chir. Works. Most, Diss. de Cirsocele, Halæ*, 1796.)

CIRSOPHTHALMIA. (from χιρσος, a varix, and οφθαλμος, the eye.) A general varicose affection of the blood-vessels of the eye.

CLAP. (See *Gonorrhœa.*)

COLLYRIUM ACIDI ACETICI. ℞. Aceti Distillati, ℥j. Spiritus Vini Tenuioris, ℥ss. Aq. Rosæ, ℥viij. Misce.

COLLYRIUM ALUMINIS. ℞. Aluminis purif. ℈j. Aq. rosæ, ℥vj. Misce.

COLLYRIUM AMMONIÆ ACETATÆ. ℞. Liq. ammon. acet. Aq. rosæ sing. ℥j. M.

COLLYRIUM AMMONIÆ ACETATÆ CAMPHORATUM. ℞. Collyrii ammon. acet. Misturæ camphoratæ sing. ʒij. M.

COLLYRIUM AMMONIÆ ACETATÆ OPIATUM. ℞. Collyrii ammon. acet. ℥iv. Tinct. opii. gutt. xl. M.

COLLYRIUM CUPRI SULPHATIS CAMPHORATUM. ℞. Aq. Cupri sulphatis camphoratæ, ʒij. Aq. distillatæ, ℥iv. M. Recommended by the late Mr. Ware, for the purulent ophthalmy of children.

COLLYRIUM HYDRARGYRI OXYMURIATIS. ℞. Hydrarg. oxy-muriatis, grss. Aq. distillat. ℥iv. M. This collyrium is fit to be employed, after the acute stage of ophthalmy has for some time subsided, and it will disperse many superficial opacities of the cornea.

COLLYRIUM OPIATUM. ℞. Opii Extracti gr. x. Camphoræ gr. vj. Aquæ distillatæ ferventis, ℥xii. Beat the two first ingredients together in a mortar, and mix the hot water gradually, and strain the fluid.

This collyrium is recommended in some ophthalmies, attended with great pain and swelling. (See *Wilson's Pharm. Chir. p.* 70.)

COLLYRIUM PLUMBI ACETATIS.—℞. Aquæ rosæ. ℥vj. Plumbi acetatis. ʒss. Misce: or, ℞. Aq. distillatæ, ℥iv. Liq. plumbi acetatis. gutt. x. M. This is a good application to the eyes, when one of a gently astringent, cooling quality is indicated.

COLLYRIUM ZINCI SULPHATIS.—Zinci sulphatis, gr. v. Aq. distillatæ, ℥iv. M. This is the most common collyrium of all: it may be made gradually stronger.

COLLYRIUM ZINCI SULPHATIS CUM MUCILAGINE SEMINIS CYDONII MALI. ℞. Aq. plantaginis, ℥iv. zinci sulphatis, gr. v. et mucil. sem. cydon. mal. ℥ss M. In order to check the morbid secretion from the eyelids, in cases of fistula lachrymalis, or what Scarpa calls *il flusso palpebrale puriforme*, this celebrated Professor recommends a few drops of the above collyrium to be insinuated between the eyelids and the eye.

COLPOCELE. (from κολπος, the vagina, and κηλη, a tumor.) A tumor, or hernia, situated in the vagina.

COLPOPTOSIS. (from κολπος, the vagina, and ϖιπτω, to fall down.) A bearing or falling down of the vagina. (See *Vagina, Prolapsus of.*)

COMMINUTED. (from *comminuo*, to break in pieces.) A fracture is termed *comminuted*, when the bone is broken into several pieces.

COMPRESS. (from *comprimo*, to press upon.) Folded linen, lint, or other materials, making a sort of pad, which surgeons place over those parts of the body on which they wish to make particular pressure, and for this purpose, a bandage is usually applied over the compress. Compresses are also frequently applied to prevent the ill effects, which the pressure of hard bodies, or tight bandages, would otherwise occasion.

COMPRESSION OF THE BRAIN. (See *Head, Injuries of.*)

CONCUSSION OF THE BRAIN. (See *Head, Injuries of.*)

CONDYLOMA. (from κονδυλος, a tubercle, or knot.) A small, very hard tumor. The term is generally applied to excrescences of this description about the anus. The practitioner may either destroy them with caustic, tie their base with a ligature, so as to kill them, or remove them at once with a knife: the first is generally the worst; the last the best and most speedy method.

CONIUM MACULATUM. Hemlock.—*Cicuta*. This is a medicine to which my observations in practice incline me to impute considerable efficacy in several surgical diseases. However, there is no doubt, that, when it is represented as a certain cure for cancer, and scrofula, exaggeration is employed. It is an excellent remedy for irritable painful sores of the scrofulous kind, and it will complete the cure of many ulcers, in which the venereal action has been destroyed by mercury, though the healing does not proceed in a favourable way. Hemlock is likewise beneficial to several inveterate malignant sores, particularly, some which are every now and then met with upon the tongue. It is an eligible alterative in cases of noli me tangere, porrigo, and various herpetic affections. I have seen several enlargements of the female breast give way to hemlock conjoined with calomel. Some swellings of the testes also yield to the same medicines. Hemlock certainly has not the power of curing cancer; but, its narcotic anodyne qualities tend to lessen the pain of that distemper, so as to render it by no means a contemptible remedy in that intractable kind of case.

Respecting hemlock, Mr. Pearson observes, that the extract and powder may be sometimes given with evidently good effect in spreading irritable sores; whether they are connected with the active state of the venereal virus, or whether they remain after the completion of the mercurial course; and it would seem, that the benefit, conferred by this drug, ought not to be ascribed solely to its anodyne qualities, since the same advantages cannot always be obtained by the liberal exhibition of opium, even where it does not disagree with the stomach. He states, that cicuta is almost a specific for the venereal ulcers, which attack the toes at their line of junction with the foot, and which frequently become grangrenous. Also in spreading sores, which are accompanied with great pain, and no appearance of remarkable debility, hemlock will often do more than bark, vitriol, or cordials. The common mode of exhibiting hemlock is in the form of pills, made of the extractum conii, five grains to each. However, I have always thought three grains sufficient to begin with, the dose being afterwards gradually augmented. It is curious how large a quantity may at last be taken in this manner. Mr. J. Wilson, in his Pharmacopæia Chirurgica, informs us of a remarkable case of cancerous ulcer, for which the patient took a hundred and twenty pills, each consisting of five grains of the extractum conii, in twenty-four hours, and this without any benefit being produced, or any inconvenience to the patient.

The stomach being a little disordered, and the head somewhat giddy, is a sign of the dose being sufficiently strong.

"According to some writers, but more particularly Dr. Withering, there are several ways, in which the views of a medical practitioner, in prescribing this remedy, may be frustrated. The plant chosen for preparing the extract may not be the true *conium maculatum*, which is distinguished by red spots along the stalk. It may not be gathered when in perfection, namely, when beginning to flower. The inspissation of the juice may not have been performed in a water-bath, but, for the sake of despatch, over a common fire. The leaves, of which the powder is made, may not have been cautiously dried and preserved in a well stopped bottle; or if so, may still not have been guarded from the ill effects of exposure to light. Or, lastly, the whole medicine may have suffered from the mere effects of long keeping. From any of these causes, it is evident, the powers of cicuta may have suffered; and it happens, no doubt, very frequently, that the failure of it ought, in fact, to be attributed to one or other of them." (*Pharmacopæia Chirurgica, published in* 1802, *p.* 174.)

The activity of hemlock is now found to reside in a resinous element, obtained separately, by evaporating an ethereal tincture of the leaves on the surface of water. A dose of half a grain will produce vertigo and headach. The watery extract of this plant has been proved by Orfila to have but little power. (*J. A. Paris*, *in Pharmacologia*, *Vol.* 2, *p.* 160, *Ed.* 5.)

I have sometimes prescribed as an alterative, with manifest benefit in several surgical diseases, a pill containing three grains of extractum conii, or what is preferable the dried leaves, one of hydrargyri submurias (calomel,) and one of antimonii sulphuretum præcipitatum. *F. Hoffman*, *of Hemlock*, 8*vo. Lond.* 1763. *A. Storck*, *Libellus, quo demonstratur cicutam non solum usu interno tutissimè exhiberi, sed et esse simul remedium valdè utile*, *&c.*; *Editio altera*, 8*vo. Vindob.* 1761. *Also Supplementum Necessarium de Cicuta*, 8*vo. Vindob.* 1761. *J. Pearson*, *On various Articles of the Materia Medica*, *&c.* 2*d Edit.* 8*vo. Lond.* 1807. *J. A. Paris*, *Pharmacologia*. *Ed.* 5.

CONTUSED WOUNDS. (See *Wounds*)

CONTUSION. (from *contundo*, to bruise.) A bruise.

Slight bruises seldom meet with much attention; but when they are severe, very bad consequences may ensue, and these are the more likely to occur, when such cases are not taken proper care of.

In all severe bruises besides the inflammation which the violence necessarily occasions, there is an instantaneous extravasation, in consequence of the rupture of many of the small vessels of the part. In no other way can we account for those very considerable tumors, which often rise immediately after injuries of this nature. The black and blue appearance, instantly following many bruises, can only be explained by there being an actual effusion of blood from the small arteries and veins, which have been ruptured. Even largish vessels are frequently burst in this manner, and considerable collections of blood are the consequence. Blows on the head very often cause a large effusion of blood under the scalp. I have seen many ounces thus extravasated.

Besides the rupture of an infinite number of small vessels and an extravasation of blood, which attend all bruises, in a greater or less degree, the tone of the fibres and vessels, which have suffered contusion, is considerably disordered. Nay, the violence may have been so great, that the parts are from the first deprived of vitality, and must slough.

Parts at some distance from such as are actually struck, may suffer greatly from the violence of the contusion. This effect is what the French have named a *contrecoup*.

The bad consequences of bruises are not invariably proportioned to the force which has operated; much depends on the nature and situation of the part. When a contusion takes place on a bone, which is thinly covered with soft parts, the latter always suffer very severely, in consequence of being pressed, at the time of the accident, between two hard bodies. Hence, bruises of the shin so frequently cause sloughing and troublesome sores. Contusions affecting the large joints are always serious cases; the inflammation occasioned is generally obstinate, and abscesses and other diseases, which may follow, are proper grounds for serious alarm.

In the treatment of bruises, the practitioner has three indications, which ought successively to claim his attention.

The first is to prevent and diminish the inflammation, which, from the violence done, must be expected to arise. The bruised parts should be kept perfectly at rest, and be covered with linen, constantly wet with the liquor plumbi acetatis dilutus. When muscles are bruised, they are to be kept in a relaxed position, and as quiet as possible.

If the bruise be very violent, it will be proper to apply leeches, and this repeatedly, and even in some cases particularly, when the joints are contused, to take blood from the arm. In every instance, the bowels should be kept well open with saline purgatives.

A second object in the cure of contusions, is to promote the absorption of the extravasated fluid by discutient applications. These may at once be employed in all ordinary contusions, not attended with too much violence; for then nothing is so beneficial as maintaining a continual evaporation from the bruised part, by means of the cold saturnine lotion, and, at the same time, repeatedly applying leeches. In common bruises, however, the *Lotio ammoniæ muriatæ* (see *this article*,) is an excellent discutient application; but most surgeons are in the habit of ordering liniments for all ordinary contusions, and certainly they do so much good in accelerating the absorption of the extravasated blood, that the practice is highly praiseworthy. The linimentum saponis, or the linimentum camphoræ, are as good as any that can be employed. (See *Linimentum.*)

In many cases, unattended with any threatening appearances of inflammation, but in which there is a good deal of blood and fluid extravasated, bandages act very beneficially, by the remarkable power which they have of exciting the action of the lymphatics, by means of the pressure which they produce.

A third object in the treatment of contusions, is to restore the tone of the parts. Rubbing the parts with liniments has a good deal of effect in this way. But, notwithstanding such applications, it is often observed, that bruised parts continue for a long while weak, and even swell, and become œdematous, when the patient takes exercise, or allows them to hang down, as their functions in life may require. Pumping cold water two or three times a day, on a part thus circumstanced, is the very best measure which can be adopted. A bandage should also be worn, if the situation of the part will permit. These steps, together with perseverance in the use of liniments, and in exercise gradually increased, will soon bring every thing into its natural state again.

COPPER. The subacetate and sulphate are the preparations used in surgery. The first, often called ærugo, or prepared verdigris, is occasionally employed as an escharotic. Mixed with an equal quantity of powdered lyttæ, it is sometimes applied for the removal of warts and other excrescences. At present, the old practice of destroying the surface of chancres with it, with the view of hindering the absorption of venereal matter, and rendering the exhibition of mercury needless, may be said to be completely abandoned.

CORNEA TUNICA. (from *cornu*, a horn.) The anterior transparent convex part of the eye, which in texture is tough like horn. It has a structure peculiar to itself, being composed of a number of concentric cellular lamellæ, in the cells of which is deposited a particular sort of fluid. It is covered externally by a continuation of the conjunctiva, which belongs to the class of mucous membranes; and it is lined by a membrane, the tunica humoris aquei, which seems to belong to the serous class.

FLESHY EXCRESCENCES OF THE CORNEA.

Mr. Wardrop, in his Essays on the Morbid Anatomy of the Human Eye, has published an excellent chapter on this subject. Besides pterygia, which are treated of in another part of this dictionary, Mr. Wardrop states, that the cornea is subject to two kinds of caruncles, or fleshy excrescences. One appears at birth, or soon after it, and resembles the nævi materni so frequent on the skin of various parts of the body. The second is described, as having a greater analogy to the fungi, which grow from mucous surfaces, and being in general preceded by ulceration.

Of the congenital excrescence of the cornea, Mr. Wardrop has seen two remarkable instances. The first was in a girl, eight, or ten years of age, in whose left eye there was a conical mass, the base of which grew from about two-thirds of the cornea, and a small portion of the adjoining sclerotic coat.

The second example occurred in a patient upwards of fifty years old. The tumor had been observed from birth, was about as large as a horse-bean, and only a small portion of it seemed to grow from the cornea. The other part was situated on the white of the eye, next the temporal angle of the orbit. From the middle of the excrescence, upwards of twelve long firm hairs grew, and hung over the cheek.

Mr. Wardrop acquaints us, that a similar tumor, with two hairs growing out of it, was seen at Lisbon by Dr. Barron, of St. Andrews. Mr. Crampton also mentions, that he once saw a "tuft of very strong hairs proceeding from the sclerotica." (*Essay on the Entropeon*, *p.* 7.) And De Gazelles met with an instance, in which a single hair grew from the cornea. (*Journ. de Médecine*, *Tom.* 24.) According to Mr. Wardrop, this species of excrescence of the cornea greatly resembles the spots, covered with hair, which are frequent on various parts of the surface of the body.

With regard to the second kind of tumor growing from the cornea, a fungus, proceeding from an ulcer of this part of the eye, is stated to be very uncommon. However, it is said, that when a portion of the iris protrudes through an ulcer of the cornea, the growth of a large excrescence from the projecting part is not so unusual. Of such a disease, Mr. Wardrop has cited examples from *Maitre Jean's Traité des Maladies des Yeux*, *Voigtel*, *Beer*, *and Plaichner.* Excrescences, growing from the cornea, are also quoted from the following works; *Handbuch der Pathologischen Anatomie*, *Von F. G. Voigtel*, *Halle*, 1804. *Praktische Beobachtungen über den grauen Staar und die Krankheiten der Hornhaut*, *von Joseph Beer*, *Wien*, 1791. *Plaichner's Dissertatio, de Fungo Oculi.* (See *Wardrop's Essays on the Morbid Anatomy of the Human Eye*, *Vol.* 1, *chap.* 4.) Others are likewise described by *Mery*, *in Mém. de l'Acad. des Sciences*, 1703; by *Dupré in Phil. Trans. Vol.* 19; and *Home in the same work*, *Vol.* 81.

The only treatment which excrescences of the cornea admit of, is to remove them with a scalpel and a pair of forceps, or to destroy them with caustic.

ABSCESSES OF THE CORNEA.

The following description of abscesses of the cornea, is taken from Mr. Wardrop's valuable work on the Morbid Anatomy of the Eye.

When the matter is collected between the lamellæ of the cornea, it first appears like a small spot; and, instead of resembling a speck in colour, it is of the yellow hue of common pus. As the quantity of the matter increases, this spot becomes broader, and it does not alter its situation from the position of the head. If it be situated among the external layers of the cornea, or immediately below the corneal conjunctiva, a tumor is formed anteriorly, and, if touched with the point of a probe, the contained fluid can be felt fluctuating within, or if the eye be looked at sideways, an alteration in the form of the cornea may be readily perceived.

When the matter collects between the interior lamellæ, it does not produce any evident alteration in the external form of the cornea; but, if it be touched with the point of a probe, a fluctuation can be more or less distinctly perceived, and the spot alters its form, and becomes somewhat broader.

Such collections of matter appear on every part of the cornea. Sometimes they alter their situation by degrees, and sink downwards; and sometimes they change both their situation and form. They very seldom cover more than one-fourth, or one-third of the cornea.

When the quantity of matter is small, it is often completely absorbed during the abatement of the inflammatory symptoms, and it generally leaves no vestige behind it. In other cases, the cornea is eroded externally, producing an ulcer, and subsequent opacity. In some few instances, the internal lamellæ of the cornea give way, and the matter escapes into the anterior chamber. When an artificial opening is made, the matter often does not readily flow out; and it is sometimes so tenacious, and contained in a cavity so irregular, that it neither escapes spontaneously, nor can it be evacuated by art.

It is particularly to the cases, in which matter collects between the layers of the cornea, that the terms *unguis*, and *onyx*, are applied. (See *Wardrop's Essays on the Morbid Anatomy of the Human Eye, Vol.* 1, *chap.* 6.) According to a late writer, these words should be restricted to what he names "crescentic interlamellar depositions." (*Travers's Synopsis of the Diseases of the Eye, p.* 115.) Where the cornea is affected with onyx, this gentleman commends antiphlogistic treatment. (*P.* 278.) And with respect to a large collection of matter in the cornea, whether the puriform onyx, or central abscess, he observes, that it requires "a supporting constitutional treatment, mild cathartics, and the application of blisters: calomel should be avoided, and the cornea can seldom be punctured with advantage." (*P.* 280.)

OPACITIES OF THE CORNEA.

Opacity of the cornea is one of the worst consequences of obstinate chronic ophthalmy. The term *opacity* is used, when the loss of transparency extends over the whole, or the greater part of the cornea: while other cases of a more limited kind are named *specks*. The distinction, as Beer observes, is chiefly important in respect to the prognosis. (*Lehre von den Augenkr. B.* 2, *p.* 77.)

Scarpa distinguishes the superficial and recent species of opacity from the *albugo* and *leucoma*, (see *these words*,) which are not in general attended with inflammation, assume a clear pearl colour, affect the very substance of the cornea, and form a dense speck upon this coat of the eye. The *nebula*, or slight opacity, here to be treated of, is preceded and accompanied by chronic ophthalmy; it allows the iris and pupil to be discerned through a kind of cloudiness, and consequently does not entirely bereave the patient of vision, but permits him to distinguish objects, as it were, through a mist. The nebula is an effect of protracted or ill treated chronic ophthalmy. The veins of the conjunctiva, much relaxed by the long continuance of the inflammation, become preternaturally turgid and prominent; afterwards they begin to appear irregular and knotty, first in their trunks, then in their ramifications, near the union of the cornea with the sclerotica, and lastly, in their most minute ramifications, returning from the delicate layer of the conjunctiva, spread over the cornea. It is only, however, in extreme relaxation of the veins of the conjunctiva, that these very small branches of the cornea become enlarged.

When this happens, some reddish streaks begin to be perceptible, in the interspaces of which, very soon afterwards, a thin milky albuminous fluid is effused, which dims the diaphanous state of the cornea. The whitish, delicate, superficial speck, thence resulting, forms precisely what is termed *nebula*, or the kind of opacity here to be considered. And since this extravasation may happen only at one point of the cornea, or in more places, the opacity may be in one speck, or in several distinct ones, but which altogether diminish, more or less, the transparency of this membrane.

The cloudiness of the cornea, which sometimes takes place in the inflammatory stage of violent acute ophthalmy, especially differs from the species of opacity expressed by the term *nebula*. The first is a deep extravasation of coagulating lymph in the internal cellular texture of the cornea, or else the opacity proceeds from an abscess between the layers of this membrane about to end in ulceration. On the other hand, the nebula forms slowly upon the superficies of the cornea, in long protracted chronic ophthalmy; is preceded first by a varicose enlargement of the veins in the conjunctiva, next of those in the delicate lamina of this tunic, continued over the front of the cornea; and finally it is followed by an effusion of albuminous lymph in the texture of this thin layer, expanded over the transparent part of the eye. This effusion never elevates itself in the shape of a pustule. Wherever the cornea is affected with *nebula*, the part of the conjunctiva, corresponding to it, is constantly occupied by a net-work of varicose veins, more knotty and prominent than other vessels of the same description, and though the cornea be clouded at more points than one, there are distinct corresponding fasciculi of varicose veins in the white of the eye. Scarpa injected an eye affected with chronic ophthalmy, and *nebula*, and he found that the wax easily passed, both into the enlarged veins of the conjunctiva, and those of that part of the surface of the cornea where the opacity existed; the inosculations all round the margin of the cornea were beautifully variegated, without trespassing that line, which bounds the sclerotica, except on that side, where the cornea was affected with the species of opacity.

Mr. Travers does not adopt precisely the same definition of nebula, as Scarpa; for, he describes it as a thickening of the conjunctiva, and an effusion of adhesive matter between it and the cornea, or *between the lamellæ of the latter*, commonly the product of acute strumous ophthalmy. (*Synopsis, &c. p.* 118.)

According to Scarpa, the superficial opacity, which alone he calls nebula, demands, from its very origin, active treatment; for, though at first it may only occupy a small portion of the cornea, when left to itself it advances towards the centre of this membrane, and the ramifications of the dilated veins upon this coat growing still larger, at length convert the delicate continuation of the conjunctiva upon the surface of the cornea, into a dense opaque membrane, obstructing vision.

The curative indication in this disease is to make the varicose vessels resume their natural diameters, or if that be impracticable, to cut off all communication between the trunk of the most prominent varicose veins of the conjunctiva, and the ramifications coming from the surface of the cornea, the seat of the opacity. The first mode of treatment is executed by means of topical astringents and corroborants, especially Janin's ophthalmic ointment, and *success attends it, when the opacity is in an early state, and not extensive. But when advanced to the centre of the cornea, the most infallible treatment is the excision of the fasciculus of varicose veins near their ramifications, that is, near the seat of the opacity.* By means of this excision, the blood retarded in the dilated veins of the cornea is voided; the varicose veins of the conjunctiva have an opportunity to contract and regain their tone, no longer having blood impelled into them; and the turbid secretion effused in the texture of the layer of the conjunctiva continued over the cornea, or in the cellular substance, connecting these two membranes, becomes absorbed. The celerity, with which the nebula disappears, after this operation, is surprising, commonly in twenty-four hours. The extent, to which the excision of the varicose veins of the conjunctiva must be performed, depends upon the extent of the opacity of the cornea. Thus, should there be only one set of varicose vessels, corresponding to an opacity of moderate extent, it is sufficient to cut a portion of them away. Should there appear several dim specks upon the cornea, with as many distinct sets of varicose vessels, arranged round upon the white of the eye, the surgeon must make a circular incision into the conjunctiva, near the margin of the cornea, by which he will certainly divide every plexus of varicose vessels. But let it be observed, that a simple incision through the varicose vessels is not permanently effectual in destroying all direct communication between the trunks and ramifications of these vessels upon the cornea, after such an incision made, for instance, with a lancet; though it be true that a separation of the mouths of the divided vessels follows in opposite directions, it is no less true, that in the course of a few days after the incision, the mouths of the same vessels approximate each other, and inosculate, so as to resume their former continuity. Hence, to derive from this operation all possible advantage, it is essential to extirpate with the knife a small portion of the varicose plexus, together with the adherent particle of the tunica conjunctiva.

The eyelids are to be separated from the affected eye by a skilful assistant, who is, at the same moment, to support the patient's head upon his breast. The surgeon is then to take hold of the varicose vessels, with a pair of small forceps, near the edge of the cornea, and to lift them a little up, which the lax state of the conjunctiva renders easy; then, with a pair of small curved scissars, he is to cut away the plexus of varicose vessels, together with a small piece of the conjunctiva, making the wound of a semilunar form, and as near as possible to the cornea. If it should be necessary to operate upon more than one plexus of varicose vessels, situated at some distance apart, the surgeon must elevate them one after the other with the forceps and remove them. But, when they are very close together, and occupy every side of the eye, he must make an uninterrupted circular incision in the conjunctiva, guiding it closely to the margin of the cornea all around, so as to divide with the conjunctiva, all the varicose vessels.

This being done, he may allow the cut vessels to bleed freely; even promoting the hemorrhage by fomenting the eyelids, until the blood discontinues to flow. Scarpa then covers the eye with an oval piece of the emplastrum saponis, and a retentive bandage. The eye ought not to be opened till twenty fours hours after the operation, when, usually, the opacity of the cornea will be found completely dispersed; and, during the ensuing days, the patient is to be enjoined to keep the eye shut, and covered with a bit of fine rag. A collyrium of milk and rose-water warm, may be applied two or three times a day. When the inflammation of the conjunctiva happens, about the second or third day after the operation, particularly in cases in which the incision is made all around, while the greater part of the sphere of the eye reddens, a whitish circle, in the place of the incision, forms a line of boundary to the redness which does not extend further upon the cornea This inflammation of the conjunctiva, with the aid of internal antiphlogistic remedies, and topical emollients, abates in a few days, and then pus is secreted along the track of the incision in the conjunctiva. The wound contracts, and growing smaller and smaller, soon cicatrizes. Bathing the eye with warm milk and rose-water is the only local treatment necessary in this stage of the complaint.

Thus, not only the transparency of the cornea is revived, but also the preternatural laxity of the conjunctiva is diminished, or even removed. When the conjunctiva subsequently appears yellowish and wrinkled, the use of topical astringents and corroborants, and of Janin's ophthalmic ointment, may be highly beneficial, in preventing the recurrence of the varicose state of the vessels. (*Scarpa sulle malattie degli occhi, c.* 8.)

According to the experience of Dr. Vetch, Scarpa's plan of removing the plexus of varicose vessels, together with a portion of the conjunctiva, produces no good effect, " except in cases of great relaxation of the membrane covering the eye." He asserts, that new vessels immediately appear in the room of those removed, and the good derived from the bleeding does not compensate for the irritation produced by the operation. (*A Practical Treatise on the Diseases of the Eye, p.* 86.) However, when it is reflected, that Scarpa advises this practice only for advanced cases, and particularly recommends topical astringents for the more recent stages of the disease, he nearly agrees with Dr. Vetch, as far as this point is concerned. But, Scarpa's account of the disease and its treatment is left imperfect by the omission of any notice of the connexion, frequently existing, between opacity of the cornea, and a rough scabrous granulated state of the lining of the eyelids. Yet, perhaps, Scarpa was not to be expected to treat of this combination in his chapter on nebula, because his definition of this superficial opacity will not altogether sult the affection of the same membrane, referred to in the following observations. It is remarked by Dr. Vetch, that, after the complete cessation of conjunctival ophthalmia, as far as regards that portion of the membrane, which covers the eye, the villous elongation of the vessels of the lining of the eyelids, instead of recovering their natural state, acquire a further increase of size, so as to produce a rough scabrous, or granulated surface, with a secretion of puriform matter. The irritation of this unequal surface gradually induces an inflammatory state of the sclerotic vessels, and, consequently, a greater flow of blood towards the cornea: the superficial vessels become varicose; the conjunctiva assumes a dusky and loaded appearance; and the cornea becomes opaque, not partially, but throughout the whole extent of its structure. This affection, says Dr. Vetch, is essentially different from those nebulous, or partial opacities, which take place in primary sclerotic inflammation, and which consist in slight extravasations, accompanied by intolerance of light, and in which any affection of the palpebral linings is a secondary, instead of a primary circumstance. The cornea is of the green colour, presented by a broken gun flint; and while it is sufficiently diaphanous to permit the perception of light, it is yet too opaque to allow the patient to discern external objects, except by their shades. Nor can the colour of the iris, and limits of the pupil be seen. Dr. Vetch also describes the conjunctiva as being sometimes so much relaxed, and its vessels so generally loaded, as to give it a dusky appearance similar to that of the cornea; and, in other instances, without much alteration of its thickness, or transparency, it is said to lose for a considerable extent its close attachment to the subjacent lamina of the cornea. Along with the opaque state of the cornea, there is more generally an enlargement of individual vessels, which penetrate almost to its centre, increase as they come outwards, and terminate in trunks, which run to the duplicature of the conjunctiva. Dr. Vetch represents this disease of the palpebræ as consisting at first in a highly villous state of their membranous lining. This state, if not rectified by proper treatment, gives birth to granulations, which, in time, become more deeply sulcated, hard, or warty, accompanied by an oozing of purulent matter. Dr. Vetch has explained, that the use of the actual cautery, excision, and friction, for the purpose of curing the diseased state of the eyelids, may be traced back to Hippocrates, who prefers escharotics. Dr. Vetch ascribes their first employment in these cases to St. Ives. Mr. Saunders, he observes, took an early and a just view of the relations, existing between the diseased conditions of the palpebral linings, and the opaque state of the cornea; and he succeeded in establishing the cure of the latter by the removal of the former. In short, Dr. Vetch admits, that, in the case, which more especially formed the claim of Mr. Saunders to the discovery of the nature of the disease, the practice of excision was attended with complete success. Dr. Vetch contends, however, that this method is for the most part inadequate to the cure of the disease; and that there are very few cases, in which the more certain and consistent process of gradually repressing the diseased surface by escharotic substances will not produce a more complete and permanent cure. After giving a fair trial to a great variety of escharotics, made into ointments, and applied to the inside of the upper eyelid, Dr. Vetch found the direct application of the escharotic substances themselves was preferable. When there is too much increased action in the vessels of the sclerotic coat, Dr. Vetch recommends the use of escharotics to be preceded by cupping the temples; or, where there is any risk of a slough, the application of a leech to the inside of the lower eyelid. Whatever will bring on a determination of blood to the head is to be avoided, and a low regimen observed.

The escharotics, preferred by Dr. Vetch, are the sulphate of copper and nitrate of silver, scraped in the form of a pencil, and fixed in a portcrayon. In this way, Dr. Vetch says, they should be applied, not as some have conceived, with the view of producing a slough over the whole surface, but, with great delicacy, and in so many points only, as will produce a gradual change in the condition and disposition of the part. As long as there is any secretion of pus, the above application may be materially assisted by the daily use of the undiluted liquor plumbi acetatis. When the disease resists these remedies, and its surface is hard and warty, Dr. Vetch applies to the everted surface powder of verdigris, or burnt alum, finely levigated; or even lightly touches the diseased surface with the kali purum. In employing these remedies, he enjoins confining their operation to the point of contact, so as to prevent them from hurting the eye. Hence, they are to be applied in very minute quantities with a fine camel's hair pencil, and to be washed off with an elastic gum syringe, before the eyelid is returned. Of the employment of astringent collyria, in conjunction with escharotics, Dr. Vetch disapproves. (See *A Practical Treatise on the Diseases of the Eye, p. 67, &c.)* With respect to the treatment by excision, as first practised by Mr. Saunders with scissars, and afterwards by Sir W. Adams with a knife, the principle of cure does not appear to me different from that aimed at with escharotics, unless these latter be supposed not always to destroy, but sometimes to cause an absorption of the fungous granulations. At present, the last method is considered most effectual, and, during the operation, the eyelids should be everted over a probe.

For the form of disease, termed by Mr. Travers "strumous nebula, with vessels overshooting the cornea," this gentleman recommends ptyalism. He says, that "the hydrargyrus cum creta, or oxy-muriate, in small, but frequent doses, will sometimes succeed better in this case, than the other forms of mercury, and the combination of calomel with antimony, better than that with opium." When the internal exhibition of mercury either disorders the bowels, or has no effect on the constitution, frictions are to be preferred. (*Synopsis of the Diseases of the Eye, p.* 282.) In the particular form of opacity, to which he alludes, he disapproves of dividing the vessels of the conjunctiva, before the inflammation has declined. (*P.* 285.)

From some observations, published by Mr. Wardrop, it would appear, that certain opacities of the cornea are produced by an increase in the quantity of the contents of the eyeball, and not by the deposition of an albuminous fluid in the texture of the cornea, as takes place in the common speck. He considers this fact proved by cases, in which the cornea regained its transparency the instant the aqueous humor was evacuated. Some cases are detailed by this gentleman, with the view of recommending the practice of puncturing the cornea, and discharging the aqueous humor, for the relief of the kind of opacity to which we have here alluded. (See *Med. Chir. Trans. Vol.* 4, *p.* 180, *&c.*)

For other opacities of the cornea, refer to *Albugo*, *Leucoma*, and *Staphyloma.*

ULCERS OF THE CORNEA.

An ulcer is a common consequence of the bursting of a small abscess, which not unfrequently forms beneath the delicate layer of the conjunctiva continued over the cornea, or in the very substance of the cornea itself, after violent ophthalmy. At other times, the ulcer is produced by the contact of corroding matter, or sharp-pointed bodies insinuated into the eyes, such as quick lime, pieces of glass, or iron, thorns, &c. As Dr. Vetch has observed, ulceration of the cornea is a very frequent consequence of purulent ophthalmy. The little abscess of the cornea is attended with the same symptoms, as the severe acute ophthalmy; especially with a troublesome sensation of tension in the eye, eyebrow, and nape of the neck; with ardent heat; copious secrétion of tears; aversion to light; intense redness of the conjunctiva, particularly near the point of suppuration. The inflammatory pustule, compared with similar ones, in any other part of the body, is slow in bursting after matter is formed. Scarpa deems it improper, however, to puncture the small abscess; for, though it assumes the appearance of being perfectly maturated, the matter contained in it is so tenacious, and adherent to the substance of the cornea, that not a particle issues out of the artificial aperture, and the wound exasperates the disease, increases the opacity of the cornea, and often occasions another small abscess to form in the vicinity of the first. Indeed, if the observations of Mr. Travers be correct, "the ulcer of the cornea begins, not in abscess, but, in a circumscribed deposit of lymph, or in pure ulcerative absorption without pus." (*Synopsis of the Diseases of the Eye*, *p.* 106.) And, Dr. Vetch takes notice, that the observation, with respect to fluid matter never forming in the cornea, he invariably found true in several cases, where the whole of the eyeball had been destroyed by inflammation. (*Practical Treatise on the Diseases of the Eye*, *p.* 52.) This author differs from Scarpa, however, respecting the question of opening pustules, or abscesses of the cornea; for, he remarks, that, whenever the matter, or slough is removed, the ulcer, however deep and extensive, will fill up without leucoma being the consequence. By a little address, he says, it may, in most instances, be removed in a mass upon the point of a lancet, or couching needle. (*Op. cit. p.* 50.) This remark applies both to cases, where lymph, or tenacious matter more or less protrudes, and to instances, in which it is quite confined between the lamellæ of the cornea. Scarpa thinks that the safest plan is to temporize, until the pustule spontaneously bursts, promoting it by means of frequent fomentations, bathing the eye with warm milk and water, and applying emollient poultices. The spontaneous bursting of the little abscess is usually denoted by a sudden increase of all the symptoms of ophthalmy; particularly by an intolerable burning pain at the point of the cornea, where the abscess first began, greatly increased by motion of the eye, or eyelid. The event is confirmed by ocular inspection, and at the spot where the white pustule existed, a cavity appears, as may best be seen, when the eye is viewed in the profile. Extraneous bodies in the eye, which have simply divided a part of the cornea, or lodged in it, when soon extracted, do not in general cause ulceration, as the injured part heals by the first intention. Those which destroy, or burn the surface of this membrane, or which when lodged, are not soon extracted, excite acute ophthalmy, suppuration at the injured part, and at length ulceration.

As Dr. Vetch has observed, the appearance of ulceration varies according to the degree of apostemation, or tendency towards it, in the surrounding cornea: when this part is clear, the case is doing well, but when opacity comes on, the ulcer is increasing. The soft middle lamina, he says, is destroyed with great rapidity, when the inflammation is violent, but as soon as the ulcer reaches the internal coat, its progress often proceeds no further. (*Practical Treatise on Diseases of the Eye*, *p.* 52.)

The ulcer of the cornea, as Scarpa remarks, has this, in common with all solutions of continuity in the skin, where this is delicate, tense, and endowed with exquisite sensibility, that, at its first appearance, it is of a pale ash-colour; has its edges high, and irregular; creates sharp pain; discharges, instead of pus, an acrid serum, and tends to spread widely and deeply. Such is the precise character of ulcers upon the cornea, and such is the nature of those upon the nipples of the mammæ; the glans penis; lips; apex of the tongue; the tarsi; the entrance of the meatus auditorius externus; nostrils; &c. Ulcers of this description, neglected, or ill-treated, speedily enlarge, make their way deeply, and destroy the parts in which they are situated. If they spread superficially upon the cornea, the transparency of this membrane is destroyed; if they proceed deeply, and penetrate the anterior chamber of the aqueous humor, this fluid escapes, and a fistula of the cornea may ensue; and if it should form a larger opening in it, besides the exit of the aqueous humor, it occasions another more grievous malady than the ulcer itself, namely, a prolapsus of a portion of the iris; an escape of the crystalline lens and vitreous humor; in short, a total destruction of the whole organ of sight. It is therefore of the highest importance, as soon as an ulcer appears upon the cornea, to impede its growing larger, as much as the nature of it will permit; the morbid process should be converted into a healing one, and the surgeon must exert his skill with more attention, the more extensively and deeply the ulceration has proceeded. According to Scarpa, the cicatrix of a larger ulcer impairs the texture of the cornea so much, that the injury is irreparable. Yet, Dr. Vetch assures us, that when a slough covers an ulcer of considerable extent, and is taken off with great caution, so as not to wound the inner tunic of the cornea; or when it cannot be removed, if it be slightly scarified, and divided; the cornea may recover its transparency after two-thirds of it have been in this state. (*Pract. Treatise on the Diseases of the Eye*, *p.* 51.)

They, who inculcate, that no external application can be adopted with benefit, for the cure of this disease, before the acute ophthalmy has been subdued, or, at least, diminished, are, in Scarpa's opinion, deceived. Experience teaches, that local remedies ought, in the very first instance, to be applied to the ulcer, such as are appropriate to lessen the increased morbid irritability, and stop the destructive process going on; afterwards such means should be taken, as will cure the ophthalmy, if it does not subside gradually, as the ulcer heals. It is a fact, confirmed by repeated observation, that it is the ulcer which keeps up the ophthalmy, not the ophthalmy the ulcer. The case, however, is to be excepted, in which the ulcer makes its appearance in the height of a severe ophthalmy. Here the first indication is to abate inflammation, before attempting to heal the sore.

It is true, that when the little abscess of the cornea breaks, the symptoms of acute ophthalmy are aggravated; the redness of the conjunctiva is increased, as well as the turgid state of its vessels; but it is equally certain, that it happens from no other cause, than an increased inflammation in the part, in consequence of the augmented sensibility in the ulcerated spot of the cornea. As soon as this increase of sensibility in the ulcer of the cornea ceases, or abates, in violence, the ophthalmy retreats with equal speed, and, finally, when the ulcer heals, the inflammation disappears gradually, or, at most, requires only the use of an astringent, and corroborant collyrium, for a few days. Analogous examples every day occur in practice, in ulcers of other parts, besides the cornea; particularly in little foul ulcers on the inside of the lips, on the apex of the tongue, on the nipples, on the glans penis, which, as was described above, at their first appearance, assume an ash-coloured surface, excite inflammation of the part in which they are seated, and cause a very troublesome itching and ardent heat in the part affected. To subdue this inflammation, we do nothing more, and the vulgar do the same, than repel the excessive irritability in these ulcers, and convert the ulcerative process into cicatrization: this done, the surrounding inflammation immediately disappears of itself.

Such speedy and good effects may be obtained by caustic. It immediately destroys the naked extremities of the nerves in the ulcerated part, and soon removes the diseased irritability in the part affected; it converts the ash-coloured surface of the ulcer, and the serous discharge upon it, into an eschar and scab, which, as a kind of epidermis, moderate the contact of the neighbouring parts upon the ulcer, and at length convert the process of ulceration into that of granulation and cicatrization.

For cauterizing the ulcer of the cornea, the caustic, to which Scarpa gives the preference, is the argentum nitratum. It must be scraped to a point, like a crayon pencil, and the eyelids being opened perfectly, and the upper eyelid suspended, by means of Pellier's elevator, the ulcer of the cornea is to be touched with the apex sufficiently to form an eschar. Should any of the caustic dissolve in the tears, the eye must be copiously bathed with warm milk. At the instant the caustic is applied, the patient complains of a most acute pain; but this aggravation is amply compensated, by the ease experienced a few minutes after the operation; the burning heat in the eye ceases, as it were by a charm; the eye and eyelids become capable of motion without pain; the flux of tears and the turgidity of the vessels of the conjunctiva decrease; the patient can bear a moderate light, and enjoys repose. These advantages last while the eschar adheres to the cornea.

On the separation of the eschar, sometimes at the end of two, three, or four days after the application of the caustic, the primary symptoms of the disease recur, especially the smarting and burning pain at the ulcerated part of the cornea; the effusion of tears; the restraint in moving the eye and eyelids; and the aversion to light; but all these inconveniences are less in degree than before. At their recurrence, the surgeon, without delay, must renew the application of the argentum nitratum, making a good eschar, as at first, upon the whole surface of the ulcer, which will, as before, be followed by perfect ease in the eye. The application of the caustic is, if required, to be repeated a third time, that is, if upon the separation of the eschar, the extreme irritability in the ulcer is not exhausted, and its progressive mischief checked. When the case goes on favourably, it is a constant phenomenon in the cure of this disease, that, at every separation of the eschar, the diseased sensibility of the eye is decreased; the ulcer also, abandoning its pale ash-colour, assumes a delicate fleshy tint, a certain sign that the destructive process which prevailed is turned into a healing one. The turgid state of the vessels of the conjunctiva, and the degree of ophthalmy, disappear, in proportion as the ulcer draws near to a cure. At this epoch, when the formation of granulations has begun, the surgeon would act very wrongly, were he to continue the use of the argentum nitratum; it would now re-produce pain, effusion of tears, and inflammation in the eye; and the ulcer would take on that foul ash-coloured aspect, with swelled and irregular edges, which it had in the beginning. Platner has noticed this fact. *Necesse est, ut hoc tempèratâ manu, nec crebrius fiat, ne nova inflammatio, novaque lachryma hic acriorbus concitetur. Inst. Chirurg.* § 314. As soon as ease is felt in the eye, and granulations begin to rise, whether after the first, second, or third application of the caustic, the surgeon must refrain from the use of every strong caustic, and use only the following collyrium. ℞. *Zinci Sulphatis, gr.* iv. *Aq. Rosæ*, ℥iv. *mucil. Sem. Cydon. mali* ℥ss. M. This to be used every two hours, the eye, in the intervals, being defended from the air and light, by means of a slight compress, and retentive bandage. When, besides the ulcer of the cornea, a slight relaxation of the conjunctiva remains, Janin's ointment, towards the end of the treatment, introduced between the eye and eyelids, morning and evening, proves serviceable. It must be adapted in strength and quantity to the particular sensibility of the patient.

To cure those superficial excoriations of the cornea, which make no excavation in the substance of this membrane, and which, in reality, are only a detachment of the cuticle, covering the layer of the conjunctiva continued over the cornea, the use of caustic is not requisite. The same collyrium, combined with mucilage, is sufficient. The symptoms which accompany such slight excoriations, or detachments of the cuticle, are unimportant, and when the patient takes care to bathe his eye, every two or three hours, with the solution of sulphate of zinc, and to avoid too much light, and exposure to the air, they soon get well.

According to Dr. Vetch, when the ulcerative process is likely to destroy the membrane, which lines the cornea, it can only be checked by measures, calculated to subdue the inflammation, upon which it depends. " As long, therefore, as there is an appearance of activity in the disease, or recurrence of pain, local blood-letting by cupping, or leeches, must be steadily adhered to. The indication of the ulcer healing is easily seen in the diminished activity of the inflammation, relief from pain, and the clean aspect of the ulcerated part. The injection of vegetable, tepid astringent infusions may be used, or milk and water only. When called upon in extreme cases, where the immediate perforation of the inner membrane is threatened, we may, with great propriety, resort to the operation of puncturing the cornea at a place as remote as possible from the ulcer. Next in importance to a diminution of the action, on which the ulcer depends, is the removal by scarification of any slough thrown out from its surface, or imbedded in the adjoining part of the cornea. Sometimes, but always subordinate to these indications, we may add some topical applications to the ulcer; a solution of nitrate of silver, the infusion of tobacco, or calomel, in powder, applied with a camel's hair pencil." (*Practical Treatise on Diseases of the Eye, p.* 57.) In incipient protrusions of the inner membrane of the cornea, this author decidedly condemns the use of the argentum nitratum in the free manner proposed by Scarpa; observing, that, " if the caustic touches by accident the edge of the ulcer, or any part but the apex of the projecting vesicle, it will often produce much mischief."

Thus far of ulcers of the cornea, and the best mode of curing them in ordinary cases. However, sometimes, says Scarpa, in consequence of ill-treatment, the ulcer, already very extensive, assumes the form of a fungous excrescence upon the cornea, appearing to derive its nourishment from a band of blood-vessels of the conjunctiva; and, on this account, it occasions, not unfrequently, a serious mistake in being taken for a real pterygium. Left to itself, or treated with slight astringents, it produces, in general, a loss of the whole eye. It requires the speedy adoption of some active and efficacious plan, to destroy all the fungus upon the cornea, to annihilate the vessels of the conjunctiva tending to it, and to impede the progress of ulceration. This consists first in cutting away the fungus, with a pair of small scissars, to a level with the cornea, continuing the incision far enough upon the conjunctiva, to remove, with the excrescence, that string of blood vessels, from which it seems to derive its supply. Having effected this, and allowed the blood to flow freely, Scarpa applies the argentum nitratum to all the space of the cornea, which appears to have been the seat of the fungus, so as to make a complete eschar; and if, upon its separation, the whole morbid surface should not be destroyed, he repeats the caustic until the ulcerative process changes into a healing one. To execute commodiously such a full application of the caustic, it is not in general enough to have the upper eyelid raised by an assistant, and the lower one depressed; it is also further requisite, that the operator, by means of a spatula, introduced between the upper eyelid and the eyeball, should hold the same elevated with his own left-hand, while, with the right, he applies the caustic, so as to form a strong deep eschar.

The action of the caustic cannot always be calculated with precision, and therefore a portion of the whole thickness of the cornea may be destroyed with the fungus, which never fails to be followed by a prolapsus of part of the iris, through the aperture made in the cornea. This accident may seem grievous, yet it is not irreparable, as will be shown in the article *Iris, Prolapsus of;* and when the surgeon can produce a firm cicatrix at the point, where the excrescence was situated, which prevents a re-production of the fungus, and a total destruction of the eye, he has fulfilled the indications required. (*Scarpa sulle Malattie degli Occhi.*)

In a late publication, two cases of ulcer of the cornea are recorded, which were benefited by Mr. Wardrop's operation of puncturing the cornea and discharging the aqueous humor. In the first example, there was an ulcer on the central part of the cornea, and a cluster of blood-vessels passing towards it. The whole eyeball was also much inflamed. The puncture was made at the place where the vessels passed. The patient's severe head-ach was relieved, and under the use of fomentations, and the vinous tincture of opium, all the other symptoms rapidly subsided. In the second case, there were two or three erosions, with a good deal of muddiness of the cornea, head-ach, &c. The obscurity of this membrane instantly disappeared, and the head-ach subsided, upon the aqueous humor being discharged. With the help of bleeding and fomentations, the symptoms abated, the ulcer healed in a few days, and the eye recovered. (See *Med. Chir. Trans. Vol.* 4, *p.* 186—187.)

In superficial ulcers of the cornea, attended with much inflammation of the conjunctiva, Mr. Travers recommends opium, combined so as to operate upon the skin, and keeping the bowels well open. Here he differs from Scarpa, in specifying the use of the nitrate of silver, as the best local treatment. Warm fomentations, he says, afford temporary relief, and where the inflammation of the sclerotica is intense, he advises the exhibition of mercury. (*Synopsis of the Diseases of the Eye, p.* 278.)

With regard to the treatment of indolent, and deep sloughing ulcers of the cornea, Mr. Travers praises, in addition to the employment of the nitrate of silver, the occasional use of leeches, and the administration of tonics and sedatives.

The same author has also noticed chronic interstitial ulcers, where the cornea is transparent, ' but indented, like a bonce, when struck upon a marble hearth, or pitted, according as the ulcers are diffused, or circumscribed." These are said to succeed acute inflammation, when large quantities of blood have been lost, and to occur frequently in children imperfectly nourished, or in adults, who are very debilitated. With the aid of good diet, tonics, and moderate topical stimulants, like the vinum opii, or the zinc collyrium, they become hazy, which denotes the commencement of the adhesive inflammation. (*Op. cit. p.* 117.)

OSSIFICATION OF THE CORNEA.

Mr. Wardrop has seen only one instance of ossification of the cornea; and, in that case, the whole eye was changed in its form, and the cornea had become opaque. On macerating the latter part, a piece of bone, weighing two grains, oval-shaped, hard, and with a smooth surface, was found between its lamellæ. A piece of bone was also found between the choroid coat and retina.

The same gentleman informs us, that Walter had, in his museum, a piece of cornea, taken from a man sixty years of age, containing a bony mass, which was three lines long, two broad, and weighed two grains.

In Mr. Wardrop's publication, there is also recorded a curious case, in which a portion of bone was formed, either in the substance of the cornea, or immediately behind it, and which was extracted from the eye by Mr. Anderson, surgeon at Inverary. The patient was a woman thirty-one years of age, and the formation of the bony substance, which was about half as large as a sixpence, is said to have been occasioned by a fall against the root of a tree, fifteen years before the operation, by which accident the eye was struck, though not cut. (See *Wardrop's Essays on the Morbid Anatomy of the Human Eye, Vol.* 1, *chap.* 10.)

ALTERATION IN THE FORM OF THE CORNEA.

This is the last subject which I shall take notice of in the present article. It is well known, that the convexity of the cornea varies in different persons, and in the same individual at different periods of life, this part of the eye being naturally most convex in young subjects. It appears, also, from the experiments of the late Mr. Ramsden, and those of Sir E. Home, that the sphericity of the cornea is altered according to the distance, at which objects are viewed.

Sometimes the cornea projects, or collapses, so considerably, without its transparency being affected, that sight is much impaired, or quite destroyed. The first case has been called by some authors, the *Staphyloma pellucidum;* the second *Rhytidosis.*

Leveillé, the French translator of Scarpa's book on the diseases of the eye, has described a case, in which the cornea of both eyes became of a conical form. Mr. Wardrop met with two examples of a similar disease; but only one eye was affected in each of them. In both cases, the conical figure of the cornea was very remarkable, and the apex in the cone was in the centre of the cornea. When the eye was viewed laterally, the apex resembled a piece of solid crystal, and when looked at directly opposite, it had a transparent sparkling appearance, which prevented the pupil and iris from being distinctly seen.

One of these cases occurred in a lady upwards of thirty years of age, and the changes produced in her vision were very remarkable. At the distance of an inch, or an inch and a half, she could plainly distinguish small objects, when held towards the temporal angle of the eye, although it required considerable exertion; but, the sphere of vision was very limited.

On looking through a small hole in a card, she could distinguish objects held very close to the eye, and could even read a book.

At any distance greater than two inches, vision was very indistinct; and, at a few feet, she could neither judge of the distance, nor the form of the object.

When she looked at a distant luminous body, such as a candle, it was multiplied five or six times, and all the images were more or less indistinct. She could never find any glass sufficiently concave to assist her vision. She did not remark this complaint in her eye, until she was about sixteen years of age, and she does not think it has undergone any change since that time.

In Mr. Wardrop's publication may be read a letter from Dr. Brewster, giving an explanation of the phenomena of the foregoing case.

It appears, that Mr. Phipps had opportunities of watching the progress of several cases, in which the cornea had become conical, and that he never saw the disease in persons under the age of fourteen or sixteen. The same gentleman also observed, that when the cone is once complete, the disease seldom makes any further progress, except that the apex sometimes becomes opaque.

Burgman saw a remarkable case, where the cornea of both the eyes of a person, who had been hanged, were so prodigiously extended, that they reached down to the mouth, like two horns. (*Haller, Disputationes Chirurg. Tom.* 2.) The chapter by Mr. Wardrop on the preceding subject will be found highly interesting to such as are desirous of further information concerning this curious disease of the eye. (See *Wardrop's Essays on the Morbid Anatomy of the Eye, Vol.* 1, *chap.* 13.) For information, relative to diseases of the cornea, see *M. Geiger, De Fistula Corneæ, Tub.* 1742. *C. F. Gifftheil, De Ulceribus Corneæ, Tub.* 1744. *J. W. Baury, De Maculis Corneæ, &c. Tub.* 1743. *G. H. Volger, De Maculis Corneæ, 4to. Gott.* 1778. *A. G. Richter, Anfansgr. der Wundarzn. B.* 3, *Kap.* 4, *8vo. Göt.* 1795. *Ant. Scarpa, Trattato delle Malattie degli occhi, 2 Ed. 8vo. Pavia,* 1816, *chap.* 8, 10. *J. Beer, Praktische Beobacht, über den grauen Staar, und die Krankheiten, Der Hornhaut, Wien.* 1799, *und Lehre von den Augenkr.* 2 *B. Wien.* 1817. *M. J. Chelius, Ueber die durchsichtige Hornhaut des Auges, ihre Function, und ihre Krankhaften Veränderungen. 8vo. Karsruhe,* 1818. *A. Clemens, Diss. sistens Tunicæ Corneæ et Humoris Aquei Monographiam Physiologico-pathologicam, 4to. Gott.* 1816. *J. Wardrop's Essays on the Morbid Anatomy of the Human Eye, Vol.* 1, *8vo. Edit.* 1808. *B. Travers, Synopsis of the Diseases of the Eye, 8vo. Lond.* 1820. *J. Vetch, a Practical Treatise* *on the Diseases of the Eye, 8vo. Lond.* 1820. The sections of this work on opaque cornea, and ulceration of the cornea, are highly interesting.

CORNS (*Clavi, Spinæ Pedum, Calli, Condylomata, &c.*) A corn, technically called *clavus*, from its fancied resemblance to the head of a nail, is a brawn-like hardness of the skin, with a kind of root sometimes extending deeply into the subjacent cellular substance. When this is the case, the indurated part is fixed; but while the hardness is more superficial, it is quite moveable. Some corns rise up above the level of the skin, in the manner of a flat wart. They are hard, dry, and insensible, just like the thickened cuticle, which forms on the soles of the feet, or on the hands of labouring people.

Corns are entirely owing to repeated and long continued pressure. Hence, they are most frequent in such situations as are most exposed to pressure, and where the skin is near bones, as on the toes, soles of the feet, &c. However, corns have occasionally been seen over the crista of the ilium, from the pressure of stays, and even on the ears, from the pressure of heavy ear-rings.

Corns of the feet are usually owing to tight shoes, and, consequently, they are more common in the higher classes, and in women, than other subjects. In females, indeed, the ridiculous fashion of wearing high heeled shoes, was very conducive to this affliction; for, certainly, it merits the appellation. In shoes thus made, the whole weight of the body falls principally on the toes, which become quite wedged, and dreadfully compressed in the end of the shoe.

Though some persons, who have corns, suffer very little, others occasionally endure such torture from them, that they are quite incapable of standing or walking. Doubtless the great pain proceeds from the irritation of the hard corn on the tender cutis beneath, which is frequently very much inflamed, in consequence of the pressure. It is observed, that every thing which accelerates the motion of the blood, which heats the feet, which increases the pressure of the corn on the subjacent parts, or the determination of blood to the feet, or which promotes its accumulation in them, exasperates the pain. Hence, the bad effects of warm stockings, tight shoes, exercise, long standing, drinking, &c. The pain in warm weather is always much more annoying, than in winter.

If a person merely seeks temporary relief, it may be obtained by pulling off his tight shoes, sitting down, placing his feet in a horizontal posture, and becoming a little cool; the prominent portion of the corn should be cut off, as far as it can be done, without exciting pain, or bleeding, and the feet should be bathed in warm water.

The radical cure essentially requires the avoidance of all the above causes, and, particularly, of much walking, or standing. Wide, soft shoes, should be worn. Such means are not only requisite for a radical cure, but they alone very often effect it. How many women become spontaneously free from corns in child-bed, and other confinements! Though the radical cure is so easy, few obtain it, because their perseverance ceases as soon as they experience the wished-for relief.

When business, or other circumstances, prevent the patient from adopting this plan, and oblige him to walk or stand a good deal, still it is possible to remove all pressure from the corn. For this purpose, from eight to twelve pieces of linen, smeared with an emollient ointment, and having an aperture cut in the middle, exactly adapted to the size of the corn, are to be laid over each other, and so applied to the foot, that the corn is to lie in the opening, in such a manner, that it cannot be touched by the shoe, or stocking. When the plaster has been applied some weeks, the corn commonly disappears, without any other means. Should the corn be in the sole of the foot, it is only necessary to put in the shoe a felt-sole, wherein a hole has been cut, corresponding to the situation, size, and figure, of the induration.

A corn may also be certainly, permanently, and speedily eradicated, by the following method, especially when the plaster, and felt-sole with a hole in it, are employed at the same time. The corn is to be rubbed twice a day with an emollient ointment, such as that of marshmallows, or with the volatile liniment, which is still better; and in the interim, is to be covered with a softening plaster. Every morning and evening, the foot is to be put for half an hour in warm water, and, whilst there, the corn is to be well rubbed with soap. Afterwards, all the soft, white, pulpy outside of the corn, is to be scraped off with a blunt knife; but, the scraping is to be left off, the moment the patient begins to complain of pain from it. The same treatment is to be persisted in, without interruption, until the corn is totally extirpated, which is generally effected in eight or twelve days. If left off sooner, the corn grows again.

A multitude of other remedies for curing corns are recommended. They all possess, more or less, an emollient and discutient property. The principal are green wax, soap, mercurial, and hemlock plasters, a piece of green oil-skin, &c. They are to be applied to the corn, and renewed as often as necessary. An infallible composition consists of two ounces of gum ammoniacum, the same quantity of yellow wax, and six drams of verdigrease. In a fortnight, if the corn yet remain, a fresh plaster is to be applied.

It is frequently difficult, and hazardous to cut out a corn. The whole must be completely taken away, or else it grows again; and the more frequently it is partially cut away, the quicker is its growth rendered. When the skin is moveable, and, consequently, the corn not adherent to the subjacent parts, its excision may be performed with facility and safety, but not without pain. But, in the opposite case, either leaving a piece of the corn behind, or wounding the parts beneath, can seldom be avoided. The latter circumstance may excite serious mischief.

A person, entirely cured of corns, is sure to be affected with them again, unless the above mentioned causes be carefully avoided. Some subjects are, indeed, particularly disposed to have the complaint. There are persons, who for life wear tight shoes, and take no care of their feet, and, yet, are never incommoded with corns. On the contrary, others are constantly troubled with them, though they pay attention to themselves. Many are for a time vexed with corns, and then become quite free from them, though they continue to wear the same kind of shoes and stockings.

Mr. Wardrop recommends cutting, or tearing away, as much of the corn as can be done with safety; then keeping the toe for some time in warm water; and, after the adjacent skin has been well dried, rubbing the exposed surface of the corn with the argentum nitratum, or wetting it, by the means of a camel-hair pencil, with a solution of the oxy-muriate of mercury in spirit of wine. Either of these applications, two or three times repeated, he says, will mostly effect a cure. (See *Med. Chir. Trans. Vol.* 5, *p.* 140.) However, the use of caustic for the cure of corns is not a new proposal. (See *Callisen's Sys. Chir. Hodiernæ*, *Part* 2, 200.)

The above account is chiefly taken from *Richter's Anfangsgründe der Wundarzneykunst*, *B.* 1.

COUCHING. The depression of a cataract out of the axis of sight, or the displacement, breaking and disturbance of the opaque lens in various ways with a kind of needle for these purposes, so as to bring about the dispersion and absorption of the cataract. (See *Cataract.)*

COUVRE CHEF. The name of a bandage. (See *Bandage.*)

CRANIUM. For an account of its fractures, see *Head, Injuries of.*

CREMOR LITHARGYRI ACETATI. ℞. Cremoris lactis, ℥j. Liq. Plumbi. acet. ʒj. M. Employed by Kirkland in ophthalmies, and other inflammations.

CREPITUS. The grating sensation, or noise, occasioned by the ends of a fracture, when they are moved, and rubbed against each other; one of the most positive symptoms of the existence of such an accident.

CUPRI SULPHAS (*Sulphate of Copper*) Is an escharotic, and an ingredient in several astringent fluid applications, lotions for ulcers, collyria for the eyes, and injections for the urethra.

CURVATURE OF THE SPINE. (See *Vertebræ, Disease of.)*

CYSTITOME. (from κυσις, and τεμνω, to cut.) An instrument made on the same principle as the pharyngotomus, and invented by M. de la Faye, for opening the capsule of the crystalline lens.

CYSTOCELE. (from κυσις, the bladder, and κηλη, a tumor.) A hernia, formed by a protrusion of the bladder. (See *Hernia.)*

CYSTOTOMIA. (from κυσις, the bladder, and τεμνω, to cut.) The operation of opening the bladder, for the extraction of a stone or calculus. (See *Lithotomy.*)

CUPPING. (See *Bleeding.)*

CURETTE. (French.) An instrument, shaped like a minute spoon, or scoop, invented by Daviel, and used in the extraction of the cataract, for taking away any opaque matter, which may remain behind the pupil, immediately after the crystalline has been taken out.

D.

DACRYOMA. (from δακρυω, to weep,) An impervious state of one, or both the puncta lachrymalia, preventing the tears from passing into the lachrymal sac.

DAUCUS. (See *Cataplasma Dauci.*)

DECOCTUM CHAMŒMELI. ℞. Florum Chamœmeli, ℥ss. Aquæ Distillatæ, lbj. Boil ten minutes, and strain the liquor. A common decoction for fomentations. (See *Fomentum.*)

DECOCTUM DULCAMARÆ. ℞. Dulcamaræ Caulis Concisæ unciam, Aquæ Octarium cum Semisse. Decoque ad octarium, et cola.

The decoction of bittersweet, or woody nightshade, is recommended for some cutaneous diseases, proceeding from scrofula, lepra, and lues venerea. The dose is one or two table spoonfuls, three times a day. An aromatic tincture should be added.

DECOCTUM HELLEBORI ALBI.—(Now the *Decoctum Veratri.*) ℞. Pulveris Radicis Hellebori Albi, ℥j. Aquæ Distillatæ, lbij. Spiritus Vinosi Rectificati, ℥ij. Boil the water and powder, till only one half the fluid remains, and when cold, add the spirit.

This is used as a lotion for curing psora, porrigo, and some herpetic affections.

DECOCTUM LOBELIÆ. (*Blue Cardinal Flower of Virginia.*) ℞. Radicis Lobeliæ Syphiliticæ Siccæ Manip. j. Aquæ Distillatæ, lb. xii. This is to be boiled till only four quarts remain. The lobelia once gained repute as an antivenereal, though little reliance is now put in it. The patient is at first to take half a pint twice, and afterwards four times a day. It operates, however, as a purgative, and the doses must be regulated according as the bowels appear to bear them.

DECOCTUM MEZEREI. ℞. Corticis Radicis Mezerei Recentis, ʒij. Radicis Glycirrhizæ Contusæ, ℥j. Aquæ Distillatæ, lbiij. Boil the mezereon in the water, till only two pints remain; and, when the boiling is nearly finished, add the liquorice root.

The decoction of mezereon has been much prescribed for venereal nodes and nocturnal pains in the bones, in doses of from four to eight ounces, three times a day.

DECOCTUM PAPAVERIS. ℞. Papaveris Somniferi Capsularum Concisarum, ℥iv. Aquæ, lbiv. Boil for a quarter of an hour, and strain. In cases attended with great pain and inflammation, this decoction is used as a fomenting fluid.

DECOCTUM QUERCUS, ℞. Quercûs Corticis, ℥j. Aqua, lbij. Boil down to a pint, and strain the fluid.

This decoction forms a very astringent injection, which is sometimes used for stopping gleets from the vagina. It also makes a lotion, which is of considerable use in cases of prolapsus ani. It may be applied to some slight rheumatic white swellings, which it will sometimes cure, particularly, when a little alum is put into it.

DECOCTUM SARSAPARILLÆ. ℞. Sarsaparillæ Radicis Concisæ, ℥iv. Aquæ Ferventis, lbiv. The sarsaparilla is to be macerated for four hours, near the fire, in a vessel lightly closed. The root is then to be taken out, bruised, and put into the fluid again. The maceration is to be continued two hours longer, after which the liquor is to be boiled till only two pints remain. Lastly, it is to be strained.

DECOCTUM SARSAPARILLÆ COMPOSITUM. ℞. Decocti Sarsaparillæ ferventis, lbiv. Sassafras Radicis Concisæ, Guaiaci Ligni Rasi, Glycyrrhizæ Radicis Contusæ, Singulorum, ℥j. Mezerei Radicis Corticis, ʒiij. These are to be boiled together for a quarter of an hour, and then strained.

This, and the preceding decoction of sarsaparillæ, are much prescribed in cases of venereal nodes and pains; but, while some surgeons hold them in high repute, in such cases, others entertain an opposite opinion of them They are also commonly given in several cutaneous diseases, and in scrofula.

The simple decoction is frequently directed for the restoration of the constitution after a course of mercury, sometimes mixed with an equal quantity of milk.

The common dose of both the decoctions is from four to eight ounces, three times a day.

The compound one possesses similar qualities to those of the famous Lisbon diet drink, for which it is now a common substitute

DECOCTUM ULMI. ℞. Ulmi Corticis Recentis Contus. ℥iv. Aquæ, lbiv. Boil to two pints, and then strain the liquor.

The decoction of elm bark is often prescribed in cutaneous diseases. Its operation is frequently promoted by giving with it the hydrargyri submurias.

DECOCTUM VERATRI. (See *Decoctum Hellebori Albi.*)

DEPRESSION OF THE SKULL. (See *Head, Injuries of.*)

DEPRESSION OF THE CATARACT. (See *Cataract.*)

DETERMINATION. When the blood flows into a part more rapidly and copiously than is natural, it is said, in the language of surgery, that there is a *determination* of blood to it.

DIÆRESIS. (from διαιρεω, to divide) A division of substance; a solution of continuity. This was formerly a sort of generic term, applied to every part of surgery, by which the continuity of parts was divided.

DIGESTION. (from *digero*, to dissolve.) By the *digestion* of a wound, or ulcer, the old surgeons meant bringing it into a state, in which it formed healthy pus.

DIGESTIVES. Applications which promote this object.

DIORTHROSIS. (from διορθοω, to direct.) One of the ancient divisions of surgery: it signifies the restoration of parts to their proper situations.

DIPLO'PIA. (from διπλȣς, double, and ωψ, the eye, or οπτομαι, to see.) *Visus duplicatus*, is of two kinds. For instance, the patient either sees an object double, treble, &c. only when he is looking at it with both his eyes, and, no sooner is one eye shut, than the object is seen single and right; or, else, he sees every object double, whether he surveys it with one, or both his eyes. The disorder is observed to affect persons in different degrees. Patients seldom see the two appearances, which objects present with equal distinctness; but, generally, discern one much more plainly and perfectly, than the other. The first distinct shape, which strikes the eye, is commonly that of the real object, while the second is indistinct, false, and visionary. Therefore, patients labouring under this affection, seldom make a mistake, but, almost always know which is the true and real object. However, there are cases, in which the patient sees, with equal clearness, the two appearances which things assume, so that he is incapable of distinguishing the real object from what is false and only imaginary.

The disorder is sometimes transitory and of short duration, and may be brought on in a healthy eye by some accidental cause, generally an irritation affecting the organ. Sometimes, the complaint is continual; sometimes, periodical. In particular instances, the patient only sees objects double, when he has been straining his sight for a considerable time, as, for example, when he has been reading a small print for a long while by candle-light. In this case, the disorder becomes lessened by shutting the eyes for a few moments. There are also instances, in which the objects have a double appearance only at a particular distance, and not, either when they are nearer, or further off. Sometimes the patient sees objects double only upon one side; as, for example, when he turns his eyes to the right-hand, while nothing of this sort is experienced in looking in any other direction. In certain cases, objects appear double, in whatever way the eyes are turned and directed.

The causes of double vision may be divided into four classes. Namely, the object, which the patient looks at, may be represented double upon the retina, which is the effect of the first class of causes. Or, the object may be depicted in one eye differently from what it is in the other, in regard to size, position, distance, clearness, &c.; this is the effect of the second class of causes. Or, the object may appear to one eye to be in a different place from that which it seems to the other to occupy: the effect of the third class of causes. Or, lastly, the sensibility of the optic nerves is defective, so that the image of an object, though it may appear single to one eye as well as the other, yet, in one identical situation will seem double to both of them. When the complaint originates from causes of the first and fourth class, the patient sees things double, whether he is using only one, or both eyes; but, when it proceeds from the second and third class of causes, the patient sees objects double only when he is looking at them with both eyes, and, no sooner does he shut one, than objects put on their natural, single appearance.

The following are the chief causes of the first class of a single object being depicted upon the retina as if double. 1. An unevenness of the cornea, which is divided into two, or more convex surfaces. There are cases, which shew, that such an uneven shape may actually be the cause of double vision. (*Haller, Element. Physiol. T.* 5, *p.* 85.) According to Beer, this conformation of the cornea is mostly a result of several preceding ulcers of that membrane, in which circumstance the patient sees with the affected eye not merely double, but treble, and quadruple, of which facts Beer has met with some examples. (*Lehre von den Augenkr. B.* 2, *p.* 31.) However, it must not be dissembled, that in a far greater number of instances, such unevenness of the cornea, though equally considerable, does not occasion this defect of sight. We have principally an opportunity of observing cases of this sort after the operation of extracting the cataract. Hence, it would seem, that the inequalities must be of very particular shape to produce double vision. The diagnosis of this cause is easy enough; but, the removal of it is impracticable; for, how is it possible to restore the original shape of the cornea? On this case, however, Beer delivers a more favourable prognosis, than Richter, for he states, that, when the patient is not decrepit, the double vision, from altered shape of the cornea, will gradually disappear of itself, when proper care is taken of the constitution, and in particular of the eye. (*B.* 2, *p.* 32.) 2. An inequality of the anterior surface of the crystalline lens, whereby the same is divided into several distinct surfaces, it is suggested, may also be the occasion of diplopia. Such an inequality may possibly produce the disorder; but, it is exceedingly doubtful, whether any case of this sort has ever been met with, and, as Richter properly remarks, the investigation is not worth undertaking, as the diagnosis and cure would be equally impracticable. The only possible method of cure would be the extraction, or depression, of the crystalline lens; yet, with the uncertainty respecting the nature of the cause, what man would be justified in performing an operation, in which the patient is not wholly exempt from the danger of losing his sight altogether? A double aperture in the iris, or as the case is termed, a double pupil, and a deviation of the pupil from its natural position, have been enumerated as causes of diplopia. (*Baumer in Act. Soc. Hassiac.* 1, *No.* 27.) However, Richter deems the reality of the first of these causes doubtful; for, cases have been noticed, where double vision was not the effect of there being two openings in the iris. (*Janin. Mém. sur l'Oeil.*) But, were the disorder actually to originate in this way, the experiment might be made of converting the two apertures into one.

The causes of the second class, by the effect of which the object is represented, in regard to its size, position, distance, &c. differently in one eye from what it is in the other, are for the most part rather possible, than such as have been actually observed. The causes, which make objects assume an appearance contrary to the real one, may sometimes be confined to one eye, to which, things are depicted diversely from what they are to the other healthy eye, so that the patient sees, as it were, double. Thus, for example, there may be a stronger refraction of the rays of light in one eye, than the other; the patient may be a *myops* with one eye, and a *presbyops* with the other; and then the object will seem to one eye large, to the other small; to one eye distant, to the other plainly near. This state of the sight, indeed, is said to have occurred after operating upon a cataract in one eye. (*Heuermann.*) However that this is not a common consequence of operating upon a cataract in one eye, while the other is perfect, is sufficiently clear, from what has been said upon the subject, in a foregoing part of this work. (See *Cataract.*) In particular examples, objects which are perpendicular seem to the patient to have a sloping posture. When it is considered, that only one eye is thus affected, and that to it things will appear sloping, and to the other straight, double vision must be the effect. A few remarks connected with this subject will be introduced hereafter. (See *Sight, Defects of.*)

When both eyes are so directed to an object, that it becomes situated in the axis of vision of each of these organs, such object is represented in both at the same place, that is, it is depicted upon that part of the retina, on which the axis of sight falls. Thus the object seems to both eyes to be in the same place, and, though the two organs discern the thing, it only communicates a single appearance. But, when one eye is turned to any object in a different direction from that of the other; that is to say, when one eye is turned to an object in such a way, that the object is situated in the axis of vision of this eye, while the opposite eye is so turned, that the same object is placed on one side of its axis of vision; in other words, when a person squints; the object is depicted in one eye upon a different part of the retina from what it is in the other; consequently, the object appears to the two respective organs to be differently situated, and the patient is affected with diplopia. This is the third species of this disorder, which arises from strabismus as a third kind of occasional cause. Such patients naturally see objects double only when they behold them with both eyes. A lady, whom I frequently see, is much annoyed with diplopia, the effect of deep-seated disease in the orbit, whereby the eye is forced out of its natural position.

A person, who squints, usually has one eye stronger than the other, and the weakness of one of those organs is the common cause of the strabismus. Such a person does not see objects double, because he only sees with one eye well, and with the other so faintly and imperfectly, that scarcely any impression is made. Hence, every case of strabismus is not necessarily combined with diplopia; indeed, the common kind of squinting is not joined with it. A person, affected with strabismus, only sees double, when the sight of each eye is equally strong, and when the squinting does not depend upon any weakness of one of the eyes, but, upon some other occasional causes. The principal causes of the latter sort are of a spasmodic nature, viz.: an irritation affects some muscle of the eye in such a manner, that the patient is incapacitated from moving both his eyes according to his will, and from directing them to any object, so that such object may be at once in the axis of vision of both. On this case, the observations of Sir E. Home are interesting, who has made many accurate reflections on the effect of an irregular action of the straight muscles of the eye in producing double vision. (*Phil. Trans.* 1797.)

Richter states, that, in the majority of cases, the irritation alluded to is seated in the gastric organs, though he thinks, that, any other species of irritation may operate upon the eyes in a similar manner. This kind of diplopia is frequently attendant on other spasmodic diseases as a symptom. It often accompanies hypochondriasis. Sometimes, it is the consequence of violent pain. Richter informs us, of a man, who saw double and squinted, during a severe headach. He states, that another was affected in the same way during a toothach. Sometimes, the diplopia is owing to a paralysis of one of the muscles of the eye; (*Morgagni de Sedibus et Causis Morborum, Epist.* 13, *art.* 20; *a paralysis of the abductor muscle)* sometimes, to a tumor in the orbit. The diagnosis of this kind of diplopia is free from difficulty; the patient having been affected with squinting, ever since things appeared double to him.

The views, which Sir E. Home took of diplopia from irregular action, spasm, or weakness, of any particular muscle of the eye, led him to propose a plan of treatment, the principle of which is to keep the muscle affected for a time perfectly at rest, which is easily done, by covering the eye with a bandage, and not allowing the organ to be at all employed.

The fourth class of causes are such irritations as act upon the optic nerves, changing their sensibility in such a way, that objects do not make that sort of impression upon them, which they ought to do. Thus, things sometimes have the appearance of being coloured, when they are really not so; immoveable objects seem in motion, straight objects appear oblique, and in the cases, which we are now treating of, single things seem to the eye double, treble, &c. This faulty kind of sensibility may also be produced by irritation in eyes, which are perfectly sound; but, it is most readily occasioned in eyes, which are preternaturally weak and irritable. In these, very trivial and inconsiderable irritations will often excite it. In the treatment, the common indication is to discover and remove whatever irritation conduces to this effect; but, the attempt frequently fails. In irritable eyes, the disorder is often brought on by very slight irritations, which cannot always be diminished, or removed. Here, the grand indication is to cure the weakness and irritability of the organs.

According to Richter, the fourth class of causes of diplopia is the most frequent. The irritations are of various kinds, and generally seated in the abdominal viscera. Diplopia is sometimes the consequence of inebriety, foulness of the stomach, intermitting fevers, hypochondriasis, worms, &c. However, the complaint is occasionally excited by other sorts of irritation. It has frequently followed a violent fright. It may be connected with spasmodic and painful diseases of several kinds. Severe head-achs and tooth-achs are sometimes joined with this affection of the sight. Richter mentions a boy, who, being in the woods, was struck by the bough of a tree over the eye, and, in consequence of the accident, became affected with diplopia. He informs us of a man, who rode a journey on horseback, along a snowy road on a very sun-shiny day, and was affected in the same manner. This affection of the eyes is sometimes the effect of injuries of the head. (See *Hill's Cases in Surgery, p.* 108. *Schmucker, Med. Chir. Bemerk,* 1 *B. No.* 26. *Hennen's Principles of Military Surgery, p.* 345, *Ed.* 2.) Persons, who have weak eyes, are apt to be become double-sighted, whenever they look attentively for a long while at any light shining objects. Patients in fevers are also sometimes double-sighted. (*Gooch's Cases, &c. Vol.* 2.)

The irritation, productive of diplopia, may lead to other serious complaints of the eye, when it operates with great violence. Indeed, it frequently happens, that diplopia terminates in some other disorder of the eyes, and is often the forerunner of the worst diseases of these organs, particularly the gutta serena. The difficulty or ease of the cure partly depends upon the nature of the remote cause, and partly upon the condition of the eye. Some of the causes are easy, others difficult, of removal. When the eye is very weak and irritable, the disorder frequently continues, notwithstanding the irritation has been removed. Also, when the complaint is relieved, it is exceedingly difficult to prevent a relapse, for on very irritable eyes, slight irritations, which cannot be hindered, are apt to produce a return of the affection. Therefore, the indication is to remove the existing defect of sight, and take means for the prevention of its return, or the commencement of any other. The weakness and preternatural irritability of the eye should be removed, as well as every sort of irritation, things which are often difficult of accomplishment.

The chief business of the surgeon in the treatment of this kind of diplopia, consists in endeavouring to find out and remove the irritation occasioning the disorder. The majority of such irritations are of the same nature as those, which give rise to the gutta serena. (See *Amaurosis.*) Indeed, both the complaints are often only different effects of the same cause, and of course require a similar mode of treatment. The boy, whom Richter has mentioned, as having become double-sighted in consequence of being struck over the eye with the bough of a tree, was cured by the external use of the infusum radicis valerianæ and spiritus vini crocatus, with which the eyelids and adjacent parts were rubbed several times a day. A diplopia, which followed a violent fright, was cured by valerian, preceded by a few doses of cream of tartar. The case recorded by Dr. Hennen, as proceeding from a gunshot wound of the soft parts, covering the root of the nose and right eye-brow, yielded to abstinence, occasional emetics, and cold collyria. (*Principles of Mil. Surgery, Ed.* 2, *p.* 345.) A hypochondriacal patient got rid of the disorder by means of the warm bath. A diplopia, supposed to arise from disorder of the biliary secretion, was cured by means of pills made of gum galbanum, guaiacum, rhubarb, and Venice soap, assisted with emetics and purgatives.

When the irritation, exciting the disorder, is only of temporary duration, as, for instance, looking at shining objects; when the disorder continues after the removal of the irritation; or, lastly, when the irritation cannot be well detected; the surgeon is to endeavour, by means of nervous and soothing medicines, either to remove the impression, which the irritation has left upon the nerves; or to render the nerves insensible to the continuing irritation. According to Richter, the following remedies have proved useful in cases of diplopia: hartshorn, dropped into the hand, and held before the eyes; the external use of the spiritus vini crocatus; warm bathing of the eye, particularly, in a decoction of white poppy heads; bathing the eye in cold collyria; the internal administration of bark, valerian, small doses of ipecacuanha, flowers of zinc, and oleum cajeput. In one instance, in which it was impossible to detect the cause, Richter states, that soluble tartar with ox's gall, and castoreum was found of service; that, in another similar case, rhubarb, ox's gall, and assa fœtida; and, in a third, liquor ammoniæ acetatæ with ox's gall, proved useful. This author further observes, that, in all cases, in which the particular cause of the disorder cannot be precisely determined, we may conjecture, that such cause has its seat in the abdominal viscera; and that much benefit may often be derived from mild resolvents, evacuants, and anodyne medicines.' (*Richter's Anfangsr. der Wundarzn. B.* 3, *Kap.* 15.)

According to Beer, the diplopia, which is not an effect of the continuance of another disease after inflammation of the eye, but probably depends upon injury of the retina, caused by such inflammation, usually diminishes, without the assistance of art, if the eye be not abused. (*Lehre von den Augenkr. B.* 2, *p.* 32.) *For the foregoing account of diplopia, I am chiefly indebted to Richter. See also A. Vater et J. C. Heinicke, Visus Vitia duo rarissima; alterum duplicati, alterum dimidiati, &c. Wittemb.* 1723. (*Haller Diss. ad Morb.* 1, 305.) *J. J. Klauhold de Visu duplicato*, 4to. *Argent.* 1746. *Buchner de Visione simplici et duplici*, 4to. *Argent.* 1753. *Euler, Récherches Physiques sur la diverse réfrangibilité des rayons de lumière; Mém. de l'Acad. des Sciences, &c.; Berlin, p.* 200, 1754. *Klinke de Diplopia*, 4to. *Goett.* 1774. *Sir E. Home's Obs. on the straight Muscles of the Eye, and the structure of the Cornea in Phil. Trans. for* 1797; *B. Gooch, Chir. Cases, &c. Vol.* 2, *p.* 42, *&c.* 8*vo. Lond.* 1792. *Keghellini, Lettera sopra l'offera della cista in una Donna, &c.* 8*vo. Venet.* 1749; *an instance of Diplopia from double pupil. Dict. des Sciences Méd. T.* 9, *p.* 497. *J. Wardrop, Essays on the Morbid Anatomy of the Human Eye, Vol.* 2, *p.* 216, *&c.* 8*vo. Lond.* 1818.

DIRECTOR. (from *dirigo*, to direct.) One of the most common instruments of surgery; it is long, narrow, grooved, and made of silver, in order that it may be bent into any desirable shape. Its use is to direct the knife, and protect the parts underneath from the edge or point of the latter instrument. The surgeon introduces the director under the parts, which he means to divide, and then either cuts down, along the groove of the instrument, with a common bistoury, or cuts upward with a narrow, curved, pointed bistoury, the point of which is turned upwards, which he carefully introduces along the groove. This instrument and the crooked bistoury are commonly employed for opening sinuses, for cutting fistulæ in ano, and fistulæ in other situations, and for dilating the stricture in cases of hernia.

DISLOCATION. (from *disloco*, to put out of place.) *A Luxation.* When the articular surfaces of the bones are forced out of their proper situation, the accident is termed a *dislocation* or *luxation.*

Sir Astley Cooper has justly remarked, that, of the various accidents, which happen to the body, there are few, which require more prompt assistance, or in which the reputation of the surgeon is more at stake, than cases of luxation; for, if much time be lost prior to the attempt at reduction, there is great additional difficulty in accomplishing it, and it is often entirely incapable of being effected. If it remains unknown, and consequently unreduced, the patient becomes a living memorial of the surgeon's ignorance, or inattention. Hence, this experienced surgeon forcibly inculcates the careful study of anatomy; the want of an accurate knowledge of the structure of the joints being the chief cause of the many errors, which happen in the diagnosis and treatment of dislocated bones. The following passage cannot be too deeply impressed upon the surgeon's mind: "A considerable share of anatomical knowledge is required to detect the nature of these accidents, as well as to suggest the best means of reduction; and, it is much to be lamented, that our students neglect to inform themselves sufficiently of the structure of the joints. They often dissect the muscles of a limb with great neatness and minuteness, and then throw it away, without any examination of the ligaments, the knowledge of which, in a surgical point of view, is of infinitely greater importance; and from hence arise the numerous errors of which they are guilty, when they embark in the practice of their profession; for, the injuries of the hip, elbow, and shoulder, are scarcely to be detected, but by those who possess accurate anatomical information. Even our hospital surgeons, who have neglected anatomy, mistake these accidents; for, I have known the pulleys applied to an hospital patient, in a case of a fracture of the neck of the thigh bone, which had been mistaken for a dislocation, and the patient cruelly exposed, through the surgeon's ignorance, to a violent and protracted extension. It is therefore proper, that the form of the ends of the bones, their mode of articulation, the ligaments by which they are connected, and the direction in which the larger muscles act, should be well understood." (*Surgical Essays, Part* 1, *p.* 2.)

The most important differences of luxations are,—1. With respect to the articulation, in which these accidents take place;—2. The extent of the dislocation;—3. The direction in which the bone is displaced;—4. The length of time the displacement has continued;—5. The circumstances, which accompany it, and which make the injury simple, or compound;—6. And lastly, with respect to the causes of the accident.

1. Every kind of joint is not equally liable to dislocations. Experience proves, indeed, that, in the greater part of the vertebral column, luxations are absolutely impossible, the pieces of bone being articulated by extensive, numerous surfaces, varying in their form and direction, and so tied together by many powerful, elastic means, that very little motion is allowed. Experience proves, also, that the strength of the articulations of the pelvic bones can scarcely be affected by enormous efforts, unless these bones be simultaneously fractured. Boyer has therefore set down luxations of joints with continuous surfaces as impossible. (*Traité des Maladies Chirurg. T.* 4, *p.* 17.) And, Sir A. Cooper observes, that, in the spine, the motion between any two bones is so small, that dislocations hardly ever occur, except between the first and second vertebræ, although the bones are often displaced by fracture. (*Surgical Essays, p.* 14.)

In the articulations with contiguous surfaces, the facility with which dislocations happen, depends upon the extent and variety of motion in such joints. Thus in the short bones of the carpus, and particularly of the tarsus, and at the carpal and tarsal extremities of the metacarpal and metatarsal bones, where flat broad surfaces are held together by ligaments, strong, numerous, and partly interarticular, and where only an obscure degree of motion can take place; dislocations are very unfrequent, and can only be produced by uncommon violence.

The loose joints, which admit of motion in every direction, are those, in which dislocations most frequently occur; such is that of the humerus with the scapula. On the contrary, the ginglymoid joints, which allow motion only in two directions, are, comparatively speaking, seldom dislocated. The articular surfaces of the latter are of great extent, and, consequently, the heads of the bones must be pushed a great way in order to be completely dislocated; and the ligaments are numerous and strong.

2. With respect to the extent of the dislocation, luxations are either *complete* or *incomplete*. The latter term is applied, when the articular surfaces still remain partially in contact. Incomplete dislocations only occur in ginglymoid articulations, as those of the foot, knee, and elbow. In these, the luxation is almost always incomplete; and very great violence must have operated, when they are completely dislocated. In the elbow, the dislocation is partial, with respect both to the ulna and radius. In the orbicular articulations, the luxations are almost invariably complete. However, "the os humeri sometimes rests upon the edge of the glenoid cavity, and readily returns into its socket." (*A. Cooper, Essays, Part* 1, *p.* 14.) The lower jaw is sometimes partially dislocated in a manner different from what is commonly meant by this expression, viz. one of its condyles is luxated, while the other remains in its natural situation.

As Sir A. Cooper has explained, a partial dislocation sometimes occurs at the ankle joint. "An ankle (says he) was dissected at Guy's, and given to the collection of St. Thomas's, which was partially dislocated: the end of the tibia rested still in part upon the astragalus, but a large portion of its surface was seated on the os naviculare, and the tibia, altered by this change of place, had formed two new articular surfaces, with their faces turned in opposite directions towards the two bones. The dislocation had not been reduced."

3. In the orbicular joints, the head of the bone may be dislocated at any point of their circumference; and the luxations are named accordingly *upward*, *downward*, *forward*, and *backward*. In the ginglymoid articulations, the bones may either be dislocated laterally, or forward, or backward.

4. The length of time a dislocation has existed, makes a material difference. In general, recent dislocations may be easily reduced; but, when the head of a bone has been out of its place several days, the reduction becomes exceedingly difficult, and, in older cases, very often impossible. The soft parts, and the bone itself, have acquired a certain position; the muscles have adapted themselves in length to the altered situation of the bone, to which they are attached, and, sometimes, cannot be lengthened sufficiently for it to be reduced. Indeed, I believe, that Sir Astley Cooper's statement is quite correct, that the difficulty in the reduction, arising from the muscles, is proportioned to the length of time that has elapsed from the period of the accident. (*Treatise on Dislocations, p.* 26.)

Desault and Boyer believe, that frequently the opening in the capsular ligament soon becomes closed, and hinders the return of the head of the bone into its original situation. However, with regard to the doctrine of the reduction being prevented by the capsular ligaments, it is considered by Sir Astley Cooper as destitute of foundation. (*Surgical Essays, Part* 1, *p.* 18, *and Treatise, &c. p.* 25.) Lastly, the head of the bone may become adherent to the parts on which it has been forced.

5. The difference is immense, in regard to the danger of the case, arising from the circumstance of a dislocation being attended, or unattended, with a wound, communicating, internally with the joint, and externally with the air. When there is no wound of this kind, the danger is generally trivial, and the dislocation is termed a *simple one:* when there is such a wound, together with the dislocation, the case is denominated *compound*, and is frequently accompanied with the most imminent peril. Indeed, the latter kind of accident sometimes renders amputation necessary, and, in too many instances, has a fatal termination.

6. The causes of dislocations are external and internal. A predisposition to such accidents may depend on circumstances natural, or accidental. The great latitude of motion, which the joint admits of; the little extent of the articular surfaces; the looseness and fewness of the ligaments; the lowness of one side of the articular cavity, as, at the anterior and inferior part of the acetabulum; and the shallowness of the cavity, as of that of the scapula; are natural predisposing causes of luxations.

A paralytic affection of the muscles of a joint, and a looseness of its ligaments, are also predisposing causes. When the deltoid muscle is paralytic, the mere weight of the arm has been known to cause such a lengthening of the capsular ligament of the shoulder joint, that the head of the os brachii descended two or three inches from the glenoid cavity.

Two cases, strikingly illustrative of the tendency to dislocation from a weakened, or paralytic state of the muscles, are recorded by Sir A. Cooper. The first is that of a junior officer of an India ship, who, for some trifling offence, had been placed with his foot upon a small projection on the deck, while his arm was kept forcibly drawn up to the yard-arm for an hour. "When he returned to England, he had the power of readily throwing that arm from its socket, merely by raising it towards his head; but, a very slight extension reduced it. The muscles were wasted, also, as in a case of paralysis." The other example happened in a young gentleman, troubled with a paralytic affection of his right side from dentition. "The muscles of the shoulder were wasted, and he had the power of throwing his os humeri over the posterior edge of the glenoid cavity of the scapula, from whence it became easily reduced." In these cases, no laceration of the ligaments could have occurred, and the influence of the muscles in preventing dislocation, and in impeding reduction, is exemplified. (*Surgical Essays, Part* 1, *p.* 10.) Mr.

Brindley, of Wink Hill, communicated to Sir A. Cooper an account of a dislocation of the os femoris, which the patient, a man of 50, is able to produce and reduce whenever he chooses. (*Treatise on Dislocations, Preface.*)

The looseness of the ligaments sometimes makes the occurrence of dislocations so easy, that the slightest causes produce them. Some persons cannot yawn, or laugh, without running the risk of having their lower jaw luxated. On this account, collections of fluid within the knee, causing a relaxation of the ligament of the patella, are often followed by a dislocation of that bone. And, whenever a bone has been once dislocated, it ever afterwards has a tendency to be displaced again by a slighter cause, than what was first necessary to produce the accident. This tendency, indeed, increases with every new displacement.

Diseases, which destroy the cartilages, ligaments, and articular cavities, of the bones, may give rise to a dislocation. The knee is sometimes, but not frequently, partially luxated in consequence of a white swelling; the thigh is often dislocated in consequence of the acetabulum and ligaments being destroyed by disease. Such dislocations are termed *spontaneous.*

In the anatomical collection at St. Thomas's Hospital, there is a preparation of a knee, dislocated in consequence of ulceration, and in the state of anchylosis, the leg forming a right angle with the femur directly forwards. (See *Sir A. Cooper's Surg. Essays, Part* 1, *p.* 11.)

An enarthrosis joint can only be dislocated by external violence, a blow, a fall, or the action of the muscles, when the axis of the bone is in a direction, more or less oblique, with respect to the surface, with which it is articulated.

Any external force may occasion a dislocation of ginglymoid joints, which case is generally incomplete, but, in the ball and socket articulations, the action of the muscles constantly has a share in producing the accident. So, when a person falls on his elbow, while his arm is raised outwards from his side, the force, thus applied, will undoubtedly contribute very much to push the head of the os brachii out of the glenoid cavity, at the lower and internal part. Still, the sudden action of the pectoralis major, latissimus dorsi, and teres major, which always takes place from the alarm, will also aid in pulling downward and inward the head of the bone. Under certain circumstances, the violent action of the muscles alone may produce a dislocation, without the conjoint operation of any outward force. But, when the patient is aware in time of the violence, which is about to operate, and his muscles are prepared for resistance, a dislocation cannot be produced without the greatest difficulty, (*A. Cooper, op. cit. p.* 15.) unless the posture of the member at the moment be such as to render the action of the strongest muscles conducive to the displacement, instead of preventive of it, as is frequently the case in luxations of the shoulder.

Dislocations are constantly attended with more or less laceration or elongation of the ligaments: and, in the shoulder and hip, the capsules are always torn, when the accident has been produced by violence. Some instances, in which the ligaments are only lengthened and relaxed, I have already quoted. Sometimes a dislocation is attended with a fracture: the ankle is seldom luxated, without the fibula being broken, and in dislocation at the hip, the acetabulum is also occasionally fractured. (*Sir A. Cooper, Treatise on Dislocations, &c. p.* 15.)

SYMPTOMS OF DISLOCATIONS.

As Boyer justly observes, every dislocation produces pain and incapacity in the limb; but, these are only equivocal symptoms, and cannot distinguish the case from a fracture; nor even from a simple contusion. A severe, but obtuse pain, arises from the pressure of the head of the bone upon the muscles; sometimes the pain is rendered more acute by the pressure being made upon a large nerve. (*Sir A. Cooper's Treatise, p.* 5.)

In order that a dislocation may happen, there must be a particular attitude of the limb during the action of the external violence. Indeed the displacement can hardly occur from the direct action of the cause on the articulation itself. The action of the luxating cause is the more efficient, the further it is from the joint, and the longer the lever is, which it affects. Thus, in a fall on the side, when the arm, raised considerably from the trunk, has had to sustain all the weight of the body on a point at its inner side, the probability of a dislocation is evident, and even that the head of the bone has been forced through the lower portion of the capsular ligament,

But, the symptoms, which Boyer terms positive, or actually present, are numerous and clear:

1. In dislocations of orbicular joints, and complete luxations of ginglymoid joints, the articular surfaces are not at all in contact, and the point, where the dislocated bone is lodged, cannot be upon the same level with the centre of the cavity, from which it has been forced. Hence, a change in the length of the limb. In the ginglymoid joints, such alteration can only be a shortening proportioned to the extent of the displacement; for there is then an overlapping of the bones, similar to that of the fragments of a fracture, longitudinally displaced. But in the orbicular joints, the bone may be displaced and carried above, or below, the articular cavity, so that, in the first event, a shortening, in the second, an elongation of the limb, will be produced. But, as the direction of the member is at the same time, altered, it is not always practicable to place the limbs parallel together, nor to bring them near the trunk for the purpose of judging, whether they are lengthened, or shortened. A comparison, however, made without this advantage, will generally enable the surgeon to form a correct opinion. The proper length of a dislocated limb cannot be restored, except by putting the bone back into the cavity, from which it has slipped. In general, this cannot be accomplished without considerable efforts, while a slight exertion is usually sufficient to obtain the same effect in cases, where the shortening of the limb depends upon a fracture. It is also particularly worthy of notice, that, when once the natural length of the limb has been restored in dislocations, it remains, while there are a great many fractures, in which the shortening of the member recurs after it has been made to disappear. The surgeon must also recollect, that an elonga-

tion of the limb can never happen in cases of fracture, as it does in certain dislocations.

2. In almost all complete luxations, the direction of the axis of the limb is unavoidably altered. This circumstance arises from the resistance of that portion of the articular ligaments, which has not been ruptured, as well as from the action of the muscles. In complete lateral dislocations of ginglymoid joints, the direction of the axis of the limb is not altered, on account of the total rupture of the ligaments, and even of a part of the surrounding muscles. Neither is this observable in incomplete dislocations of such articulations, on account of the extent of the articular surfaces. But, it is strongly marked in complete luxations of these joints, where the displacement has happened in the direction of the articular movements, although in cases of this description the ligaments must be totally ruptured. The muscles, which have suffered less, are in a state of extreme tension, and must necessarily alter the axis of the limb. The tension of certain muscles, and the preservation of some of the ligaments, especially in the orbicular joints, are also a cause of a rotatory movement of the dislocated limb at the moment of the displacement, and which it afterwards retains. Thus, in luxations of the thigh, the toes, and knee, are turned outward, or inward, according as the head of the thigh bone happens to be situated at the inside, or outside of the joint. These two kinds of alteration in the direction of the limb are permanent when they depend upon a dislocation; a circumstance quite different from what is observable in fractures, where the same changes occur, but can be made to cease at once without any particular effort.

3. The absolute immobility of a limb, or, at least, the inability of performing certain motions, is amongst the most characteristic symptoms of a dislocation. In some complete luxations of particular ginglymoid joints, the dislocated limb is absolutely, or very nearly incapable of any motion. Thus, in the dislocation of the fore-arm backwards, the particular disposition of the bones, and the extreme tension of the extensor and flexor muscles, confine the limb in the half bent state, and at the same time resist every spontaneous motion, and likewise almost every motion, which is communicated. In the orbicular joints, the painful tension of the muscles, which surround the luxated bone, nearly impedes all spontaneous movements, but, in general, analogous motions to that, by which the displacement was produced, can be communicated to the limb, though not without exciting pain. Thus, in the dislocation of the humerus downward, the elbow hardly admits of being put near the side, nor of being carried forward, and backward; but it can be raised up with ease. In the dislocation of the acromial end of the clavicle, the patient can bring the arm towards the trunk, separate it a little from the side, or carry it forward or backward; but he cannot raise it in a direct way. Lastly, in complete lateral dislocations of such joints, as have alternate motions, the patient has the power of performing no motion of the part; but, the complete destruction of all the means of union allows the limb to obey every species of extraneous impulse, and this symptom, which is besides never single, makes the nature of the case sufficiently manifest.

Sometimes, as Sir A. Cooper has remarked, a considerable degree of motion continues for a short time after a dislocation: thus, in a man, brought into Guy's Hospital, whose thigh bone had just been dislocated into the foramen ovale, a great mobility of the femur still remained; but, "in less than three hours, it became firmly fixed in its new situation by the contraction of the muscles." (*Surgical Essays, Part* 1, *p.* 3.)

4. In dislocations attended with elongation of the limb, the general and uniform tension of all the muscles arranged along it, gives to these organs an appearance as if they lay nearer the circumference of the bone, and the limb were smaller, than its fellow. The muscles, however, which belong to the side, from which the dislocated bone has become more distant, appear more tense than the others, and form externally a prominent line. This is very manifestly the case with the deltoid muscle, when the arm is luxated downward. On the contrary, in dislocations, where the limb is shortened, the muscles are relaxed; but, being irritated, they contract and accommodate themselves to the shortened state of the limb. Hence, the extraordinary swelling of their fleshy part, and the manifest increased diameter of the portion of the member, to which they belong We have a striking example of this in the dislocation of the thigh upward and outward, where the muscles at the inside of the limb form a distinct oblong tumor.

The parts, which surround the affected joint, also experience alterations in their form, whenever muscles, connected with the dislocated bone, occupy that situation. Thus, in dislocations of the thigh, the buttock on the same side is flattened, if the bone is carried inward; but, it is more prominent, when the thigh bone is carried outward; and its lower edge is situated higher, or lower, than in the natural state, according as the luxation may have taken place upward or downward. In the complete luxation of the fore-arm backward, the triceps is tense, and forms a cylindrical prominence, owing to the displacement of the olecranon backward, in which displacement it is obliged to participate.

5. The circumference of the joint itself presents alterations of shape well deserving attention, and, in order to judge rightly of this symptom, correct anatomical knowledge is of high importance.

The form of the joints principally depends upon the shape of the heads of the bones. Hence, the natural relation of the bones to each other cannot be altered without a change being immediately produced in the external form of the joint. The changes, which the muscles, passing over the luxated joint, at the same time undergo in their situation and direction, contribute likewise to the difference of shape, by destroying the harmony of what may be called the outlines of the limb.

When the head of a bone, articulated by enarthrosis, has slipped out of the cavity, instead of the plumpness, which previously indicated the natural relation of parts, the head of the dislocated bone may be distinguished at some surrounding point of the articulation, while at the articulation itself may be remarked a flatness, caused by one of the neighbouring muscles stretched over the articular cavity, and more deeply may be perceived the outline and depression produced by this cavity itself. The bony eminences, situated near the joint, and whose outlines were gradually effaced in the general form of the member, are rendered much more apparent by the displacement, and project, in a stronger degree, than in the natural state. On this part of the subject, Sir A. Cooper is particularly correct, when he observes, that the head of the bone can generally be felt in its new situation, excepting in some of the dislocations of the hip, and its rotation is often the best criterion of the accident. *The natural prominences of bone near the joint, either disappear, or become less conspicuous, as the trochanter at the hip-joint. Sometimes the reverse occurs; for in dislocations of the shoulder, the acromion projects more than usual.* (*Surg. Essays*, *Part* 1, *p.* 4.)

The lines, made by the contour of the limb and the natural relation of the bones, are so manifestly broken in dislocations of ginglymoid joints, that, when there is no inflammatory swelling, the case is at once manifest. More certain knowledge, however, and more correct information, respecting the kind of displacement, are to be obtained, by attentively examining the changes of position, which the bony prominences, forming the termination of the bones articulated together, have undergone, and which are the more obvious in these joints, inasmuch as they give attachment to the principal muscles. The natural relations of these processes being known, the least error of situation ought to strike the well-informed practitioner. Thus, in the elbow joint, a considerable difference in the respective height, and in the distances between the olecranon and internal and external condyles, can be easily distinguished. But, the thing is less easy, when the surrounding parts are so swelled and tense, as to make the bony projections deeper from the surface, and less obvious to examination. Even then, however, a good surgeon will at least find something to make him suspect the dislocation, and the suspicion will be confirmed when he again examines the part on the swelling beginning to subside. It is of the utmost consequence to make out, what the case is as early as possible; for, the unnatural state, in which the soft parts are placed, keeps up the swelling a long while; and if the surgeon wait till this has entirely subsided before he ascertains that the bones are luxated, he will have waited till it is too late to think of reducing them, and the patient must remain for ever afterwards deprived of the free use of his limb. (*Boyer, Traité des Maladies Chir. T.* 4, *p.* 45, *&c.*) It is not only the inflammatory swelling, which may tend to conceal the state of the ends of the bone; sometimes a quicker tumor arises from the effusion of blood in the cellular membrane, and causes an equal difficulty of feeling the exact position of the heads of the bones. (See *Treatise on Dislocation, by Sir A. Cooper*, *p.* 5.)

Dislocations are also, sometimes, attended with particular symptoms, arising altogether from the pressure caused by the head of the luxated bone on certain parts. The sternal end of the clavicle has been known to compress the trachea, and impede respiration: the head of the humerus may press upon the axillary plexus of nerves, and produce a paralytic affection of the whole arm. In one instance, cited by Sir A. Cooper, a dislocated clavicle pressed upon the œsophagus, and endangered life. (*Surg. Essays*, *Part* 1, p. 4.)

As Kirkland has observed, there are some luxations, which are far worse injuries, than fractures: of this description, are dislocations of the vertebræ, cases, which, indeed, can hardly happen without fracture, and are almost always fatal; dislocations of the long bones, with protrusion of their ends through the muscles and skin, and severe inflammation, extensive abscesses, attended with great risk of being followed by large and tedious exfoliations, and not unfrequently gangrene.

According to Sir A. Cooper, young persons are rarely subjects of dislocations from violence; but, he admits, that they do sometimes experience them, and relates an instance, which happened in a child 7 years of age. In general, their bones break, or their epiphyses give way, much more frequently than the articular surfaces are displaced. (*Surg. Essays, Part* 1, *p.* 16, *and Treatise, &c. p.* 23.) Suspected luxations of the hip in children commonly turn out to be disease of the joint, one instance of which is given by the preceding author, and an example of which I was lately consulted about myself. Also, when a dislocation of the elbow is suspected in a child, because the bone appears readily to return into its place, but directly to slip out of it again, the case, according to Sir A. Cooper, is an oblique fracture of the condyles of the humerus. Old persons are also much less liable to dislocations, than individuals of middle age: a fact, which is accounted for by the extremities of bones in old subjects being so softened, that the violence sooner breaks, than luxates them. (*A. Cooper, Treatise, &c. p.* 23.)

PROGNOSIS.

In general, every unreduced dislocation, must deprive the patient more or less completely of the use of the limb; for, nature cannot re establish the natural relations which are lost. There is indeed an effort made to restore some of the motions, and the use of the limb in a certain degree; but, it is always very imperfectly accomplished, and in the best cases, only a confined degree of motion is recovered. Nature cannot in any way alter the lengthened, or shortened state of the limb; and she can only correct in a very imperfect manner its faulty direction. There are even some cases, in which no amendment whatsoever can be effected; as, in complete dislocations of ginglymoid joints.

There are, however, a few exceptions to this general rule. The arthrodia joints are seldom extensively displaced; and as, in the natural state, their motions are very limited, the loss of these motions, in consequence of the natural relations not having been restored, is of less importance. Thus, the bones of the carpus, those of the tarsus, and the acromial end of the clavicle, may be dislocated, and be reduced either imperfectly, or not at all, without the functions of the limb, to which they belong, being materially impaired. (*Boyer, Traité des Maladies Chir. T.* 4, *p.* 54.)

Dislocations of enarthrosis joints are generally much less dangerous, than those of ginglymoid ones; for, the action of the muscles has a great share in producing the former; the violence done to the external parts is less; and the laceration of the soft parts is not so considerable. Even, in the same kind of joints, the seriousness of the case depends on the largeness of the articular surfaces, and the number and strength of the muscles and ligaments.

Dislocations of ginglymoid joints, however, are more easily reduced, than those of enarthrosis ones, the muscles of which are frequently very powerful, and capable of making great resistance to the efforts of the surgeon. This is frequently seen in luxations of the shoulder and thigh.

It may be said, however, of the luxations of enarthrosis joints, that, if they happen the most easily, they are attended with less injury; and that, although their reduction may require considerable efforts, yet it can be accomplished, and the accident leaves no ill effects. On the contrary, in dislocations of ginglymoid joints, the same reason, which renders them more unfrequent, makes them also more serious. The solidity of these joints prevents the uniting means from being destroyed, except by great violence; and the extent of the articular surfaces does not permit a considerable displacement, especially, a complete one, without extensive injury of the ligaments, and surrounding soft parts. It is for these reasons, no doubt, that compound luxations and protrusions of the heads of the bones, are most commonly seen in the ginglymoid articulations.

The more recent a luxation is, the more easy it is to reduce, and therefore, *cæteris paribus*, the less grave is the injury. In this point of view, dislocations of ginglymoid joints are the most serious, because they soon become irreducible.

Simple dislocations are much less dangerous, than those, which are complicated with contusion, the injury of a large nerve, or blood-vessel, inflammatory swelling, fracture, wound, and, especially, a protrusion of one of the articular surfaces. (*Boyer, Traité des Maladies Chir. T.* 4, *p.* 55, 56.)

Dislocations from ulceration and suppuration in joints, termed *spontaneous luxations*, cannot admit of reduction: when they arise from the hip-disease, it is not merely in consequence of the ligaments being destroyed, the brim of the acetabulum itself is often annihilated. However, there are other *spontaneous* dislocations from preternatural looseness of the ligaments, where reduction may be accomplished with the greatest facility; though the displacement generally recurs from the slightest causes.

TREATMENT OF DISLOCATIONS IN GENERAL.

Mr. Pott observes:—By what our forefathers have said on the subject of luxations, and by the descriptions and figures which they have left us of the means they used, of what they call their organs and machinemata, it is plain, that force was their object, and that whatever purposes were aimed at or executed by these instruments or machines, were aimed at and executed principally by violence. Many, or most of them, are much more calculated to pull a man's joints asunder, than to set them to rights. Hardly any of them are so contrived as to execute the purpose for which they should be used, in a manner most adapted to the nature or mechanism of the parts on which they are to operate. The force or power of some of the instruments is not always determinable, as to degree, by the operator, and consequently may do too little or too much, according to different circumstances in the case, or more or less caution or rashness in the surgeon. If in the diagnosis of these accidents, an exact knowledge of the ligaments is of the highest importance, a familiar acquaintance with the muscles is not less essential in the treatment.

In dislocations, as in fractures, says Pott, our great attention ought to be paid to the muscles belonging to the part affected. These are the moving powers, and by these the joints, as well as other moveable parts, are put into action; while the parts to be moved are in right order and disposition, their actions will be regular and just, and generally determinable by the will of the agent, (at least in what are called voluntary motions;) but when the said parts are disturbed from that order and disposition, the action or power of the muscles does not therefore cease; far from it, they still continue to exert themselves occasionally, but instead of producing regular motions, at the will of the agent, they pull and distort the parts they are attached to, and which by being displaced, cannot perform the functions for which they were designed.

"Hence principally arise the trouble and difficulty which attend the reduction of luxated joints. The mere bones composing the articulations, or the mere connecting ligaments, would in general afford very little opposition; and the replacing the dislocation would require very little trouble or force, was it not for the resistance of the muscles and tendons attached to and connected with them: for by examining the fresh joints of the human body, we shall find, that they not only are all moved by muscles and tendons, but also, that although what are called the ligaments of the joints do really connect and hold them together, in such manner as could not well be executed without them, yet in many instances, they are, when stript of all connexion, so very weak and lax, and so dilatable and distractile, that they do little more than connect the bones and retain the synovia; and that the strength, as well as the motion of the joints, depends in great measure on the muscles and tendons connected with and passing over them; and this in those articulations which are designed for the greatest quantity, as well as for celerity, of motion. Hence, it must follow, that as the figure, mobility, action, and strength of the principal joints, depend so much more on the muscles and tendons in connexion with them, than on their mere ligaments, that the former are the parts which require our first and greatest regard, these being the parts which will necessarily oppose us in our attempts for reduction, and whose resistance must be either eluded or overcome; terms of very different import, and which every practitioner ought to be well apprised of." (See *Pott's Chir. Works*, *Vol.* 1.)

That the muscles are the chief cause of resistance is strongly evinced by cases, in which the dislocation is accompanied with injury of a vital organ; for, then the bone may be reduced by a very slight force. Thus, in a man, who had an injury of his jejunum, and a dislocation of his hip, the bone was most easily replaced. (*A. Cooper*, *Surgical Essays*, *Part* 1, *p.* 20.) In short, any thing, which produces faintness or weakness, facilitates the reduction, as intoxication, nausea and sickness, paralysis, &c.

The following, which are some of the principles laid down by Mr. Pott, merit attention.—

1. Although a joint may have been luxated by means of considerable violence, it does by no means follow, that the same degree of violence is necessary for its reduction.

2. When a joint has been luxated, at least one of the bones, of which it is composed, is detained in that unnatural situation by the action of some of the muscular parts in connexion with it; which action, by the immobility of the joint, becomes as it were tonic, and is not under the direction of the will of the patient.

3. That all the force used in reducing a luxated bone, be it more or less, be it by hands, towels, ligatures, or machines, ought always to be applied to the other extremity of the said bone, and as much as possible to that only. Mr. Pott argues, that if the extending force were applied to a distant part of the limb, or to the bone below or adjoining, it would necessarily be lost in the articulation which is not luxated, owing to the yielding nature of the ligaments, and be of little or no service, in that which is dislocated. This remark, though made by Pott, and generally received as true, is very incorrect; for, it tends to state, that if you pull at the ankle, or wrist, the force does not operate on the hip, or shoulder.

4. That in the reduction of such joints, as are composed of a round head, received into a socket, such as those of the shoulder and hip, the whole body should be kept as steady as possible.

5. That in order to make use of an extending force with all possible advantage, and to excite thereby the least pain and inconvenience, it is necessary that all parts serving to the motion of the dislocated joint, or in any degree connected with it, be put into such a state as to give the smallest possible degree of resistance.

6. That in the reduction of such joints as consist of a round head, moving in an acetabulum or socket, no attempt ought to be made for replacing the said head, until it has by extension been brought forth from the place where it is, and nearly to a level with the said socket. This will show us, says Mr. Pott, a fault in the common ambi, and why that kind of ambi, which Mr. Freke called his commander, is a much better instrument than any of them, or indeed than all; because it is a lever joined to an extensor; and that capable of being used with the arm, in such position as to require the least extension, and to admit the most; besides which it is graduated, and therefore perfectly under the dominion of the operator. It will show us, why the old method by the door or ladder, sometimes produced a fracture of the neck of the scapula; as Mr. Pott saw it do himself. Why if a sufficient degree of extension be not made, the towel over the surgeon's shoulder, and under the patient's axilla, must prove an impediment rather than an assistance, by thrusting the head of the humerus under the neck of the scapula, instead of directing it into its socket. Why the bar, or rolling-pin, under the axilla produces the same effect. Why the common method of bending the arm (that is, the os humeri) downward, before sufficient extension has been made, prevents the very thing aimed at, by pushing the head of the bone under the scapula, which the continuation of the extension for a few seconds only would have carried into its proper place. To the observation, that mere extension only draws the head of the bone out from the axilla, in which it is lodged, but does not replace it in the acetabulum scapulæ, Mr. Pott replies, that, when the head of the os humeri is drawn forth from the axilla, and brought to a level with the cup of the scapula, it must be a very great and very unnecessary addition of extending force, that will or can keep it from going into it. All that the surgeon has to do, is to bring it to such level; the muscles attached to the bone will do the rest for him, and that whether he will or not.

7. Another of Pott's principles is, that whatever kind or degree of force may be found necessary for the reduction of a luxated joint, that such force be employed gradually; that the lesser degree be always first tried, and that it be increased gradatim. (See *Pott's Chir. Works*, *Vol.* 1.)

The supposition of the reduction being sometimes prevented by the capsular ligaments, Sir A. Cooper considers erroneous: he assures us, that, in dislocations from violence, those ligaments are always extensively lacerated; and that the idea of the neck of the bone being girt, or confined by them, is altogether untrue. (*Surg. Essays*, *Part* 1, *p.* 18.) But, in addition to the resistance of the muscles, there are in old dislocations, three circumstances, pointed out by him, as causes of the difficulty of reduction. 1. The extremity of the bone contracts adhesion to the surrounding parts, so that in dissection, even when the muscles are removed, the bone cannot be reduced. In this state, he found the head of a radius, which had been long dislocated upon the external condyle, and which is preserved in the collection of St. Thomas's Hospital. In a similar state, he has also seen the dislocated head of the humerus. (*On Dislocations*, *p.* 28.) 2. The socket is sometimes filled up with adhesive matter. 3. A new bony socket is sometimes formed, in which the head of the bone is so completely confined, that it could not be extricated, without breaking its new lodgment. (*Surgical Essays*, *Part* 1, *p.* 21, *and Treatise*, *&c. p.* 10.)

Dislocations in general cannot be reduced without trouble; but, after the reduction is accomplished, it is easily maintained. On the contrary, fractures are for the most part easy of reduction; but cannot be kept in this desirable state without difficulty. The moment extension is remitted, the muscles act, the ends of the broken bone slip out of their proper situation with respect to each other, and the distortion of the limb recurs. As a modern writer has observed, the reduction is only a small part of the treatment of fractures: the most essential point of it is the almost daily care, which a fracture demands during the whole time requisite for its consolidation. The contrary is the case in luxations. Here, in fact, the reduction is every thing, if we put out of consideration the less frequent cases, in which the dislocation is complicated, and attended with such grave circumstances, as render it indispensably necessary to continue for a length of time the utmost surgical care. But, even then, the protracted treatment is less for the dislocation itself, than for the extraordinary circumstances, with which it is accompanied. (See *Roux, Parallèle de la Chirurgie Angloise avec la Chirurgie Francoise, p.* 207.)

All the ancient writers recommend the extending force to be applied to the luxated bone; for instance, above the knee in dislocations of the thigh bone, and above the elbow in those of the humerus. We have stated, that Pott advised this plan, and the same practice, which is approved by J. L. Petit, Duverney, and Callisen, is almost generally adopted in this country.

However, many of the best modern surgeons in France, for instance, Fabre, D'Apony, Desault, Boyer, Richerand, and Levéillé, advise the extending force not to be applied on the luxated bone, but, on that, with which it is articulated, and as far as possible from it. It is said, that this plan has two most important advantages: first, the muscles, which surround the dislocated bone, are not compressed, nor stimulated to spasmodic contractions, which would resist the reduction; secondly, the extending force is much more considerable, than in the other mode; for, by using a long lever, we obtain a greater degree of power.

In Pott's remarks, we find even him influenced by the prevailing prejudice against the above practice, that part of the extending force is lost on the joint, intervening between the dislocation, and the part at which the extension is made. This notion is quite unfounded, as every man, who reflects for one moment, must soon perceive. When extension is made at the wrist, the ligaments, muscles, &c. which connect the bones of the fore-arm with the os brachii, have the whole of the extending force operating on them, and they must obviously transmit the same degree of extension, which they receive, to the bone above, to which they are attached. Indeed, this matter seems so plain, that I think it would be an insult to the reader's understanding to say any more about it, than that such eminent surgeons, as have contrary sentiments, can never have taken the trouble to reflect for themselves on this particular subject. Whether the force, necessary to be exerted in some instances, would have a bad effect on the intervening joint, may yet be a question; but, as Desault's practice was very extensive, and he did not find any objection of this kind, perhaps, we have no right to conclude, that such would exist.

If, however, the common objection to Desault's plan of applying the extending force be unfounded, the question still remains to be settled, whether this practice is most advantageous on the grounds above specified? This is a point, which, perhaps, cannot be at once peremptorily decided altogether in the negative, or the affirmative, since what may be best in one kind of dislocation, may not be so in another. Thus, Sir A. Cooper states, that, as far as he has had an opportunity of observing, it is generally best to apply the extension to the bone, which is dislocated; but, that dislocations of the shoulder are exceptions, in which he mostly prefers to reduce the head of the bone by placing his heel in the axilla, and drawing the arm at the wrist, in a line with the side of the body, whereby the pectoralis major and latissimus dorsi are kept in a relaxed state. (*Surgical Essays, Part* 1, *p.* 25.)

Extension may either be made by means of assistants, who are to take hold of napkins, or sheets, put round the part, at which it is judged proper to make the extension; or else a multiplied pulley may be used. In cases of difficulty, Sir A. Cooper thinks the pulley should always be preferred. "When assistants are employed, their exertions are sudden, violent, and often ill-directed, and the force is more likely to produce laceration of parts, than to restore the bone to its situation. Their efforts are also often uncombined, and their muscles are necessarily fatigued, as those of the patient, whose resistance they are employed to overcome." In dislocations of the hip joint, and in those of the shoulder which have been long unreduced, pulleys should always be employed. (*Surgical Essays, Part* 1, *p.* 24.) But, whether pulleys be used or not, nothing more need be added to what Mr. Pott has stated, concerning the propriety of using moderate force in the first instance, and increasing the extending power very gradually.

The extension should always be first made in the same direction, in which the dislocated bone is thrown; but, in proportion as the muscles yield, the bone is to be gradually brought back into its natural position. Thus the head of the bone becomes disengaged from the parts, among which it has been placed, and is brought back to the articular cavity again by being made to follow the same course, which it took in escaping from it.

Extension will prove quite unavailing, unless the bone, with which the dislocated head is naturally articulated, be kept motionless by counter-extension, or a force at least equal to the other, but made in a contrary direction.

The mode of fixing the scapula and pelvis, in luxations of the shoulder and thigh, will be hereafter described.

In dislocations of ginglymoid joints, extension and counter-extension are only made, for the purpose of diminishing the friction of the surfaces of the joints, so that they may be put in their natural situation.

When the attempts at reduction fail, the want of success is sometimes owing to the extension not being powerful enough, and the great muscular strength of the patient, which counteracts all efforts to replace the bone.

In the latter case, the patient may be freely bled, and put into a warm bath, so as to make him faint. The opening in the vein should be made large, because a sudden evacuation of blood is more likely to produce weakness and swooning, than a gradual discharge of it; and the patient, for the same reason, may be bled as he stands up. In very difficult cases, the expedient of intoxication has been recommended, as when the patient is in this state, his muscles are incapable of making great resistance to reduction. Under these circumstances, opium is also frequently administered with advantage.

"The means to be employed for the reduction of dislocations, (says Sir Astley Cooper,) are both constitutional and mechanical. It is generally wrong to employ force only, as it becomes necessary to use it in such a degree as to occasion violence and injury; and it will be shown in the sequel, that the most powerful mechanical means fail, when unaided by constitutional remedies. The power of the muscles, in the first instance, is to be duly appreciated; as this forms the principal cause of resistance. The constitutional means to be employed for the purpose of reduction, are those which produce a tendency to syncope, and this necessary state may be best induced by one or other of the following means, viz. by bleeding, warm bath, and nausea. Of these remedies, I consider bleeding the most powerful; and that the effect may be produced as quickly as possible, the blood should be drawn from a large orifice, and the patient kept in the erect position; for, by this mode of depletion, syncope is produced, before so large a quantity of blood, as might injure the patient, is lost. However, the activity of this practice must be regulated by the constitution of the person; for as the accident happens to all the varieties of constitution, it must not be laid down as a general rule; but, when the patient is young, athletic, and muscular, the quantity removed should be considerable, and the method of taking it away that which I have described.

"Secondly, in those cases where the warm bath may be thought preferable, or where it may be considered improper to carry bleeding any farther, the bath should be employed at the temperature of 100° or 110°, and as the object is the same as in the application of the last remedy, the person should be kept in the bath at the same heat till the fainting effect is produced, when he should be immediately placed in a chair, wrapped in a blanket, and the mechanical means employed.

"Of late years, I have practised a third mode of lowering the action of the muscles, by exhibiting nauseating doses of tartarized antimony; but, as its action is uncertain, frequently producing vomiting, which is unnecessary, I rather recommend its application, merely to keep up the state of syncope, already produced by the two preceding means, which its nauseating effects will most readily do, and so powerfully overcome the tone of the muscles, that dislocations may be reduced with much less effort, and at a much more distant period from the accident than can be effected in any other way." (*Sir A. Cooper on Dislocation, &c. p.* 29, 30. Also *Surgical Essays, Part* 1, *p.* 22.) In cases of unusual difficulty, the use of antimonium tartar. together with the warm bath and bleeding, seems rational and judicious: but, except in cases of that description, I should prefer long-continued, unremitting, not too violent, extension, which will at last overcome the muscles of the most athletic man. Sometimes the resistance made to reduction by muscles, acting in obedience to the will, may be eluded, by the patient's attention being suddenly taken from the injured part, at which moment the action of those muscles is suspended, and a very little effort on the part of the surgeon will reduce the bone. A case, illustrating this circumstance, is recorded by Sir A. Cooper. (*Surgical Essays, Part* 1, *p.* 25, *and Treatise, &c. p.* 34.)

Dislocations of orbicular joints can seldom be reduced, after a month, though, by means of great violence, Desault used to succeed at the end of three or four. Dislocations of ginglymoid articulations generally become irreducible in twenty, or twenty-four days, in consequence of anchylosis.

The reduction of a dislocation is known by the limb recovering its natural length, shape, and direction, and being able to perform certain motions, not possible while the bone was out of its place. The patient experiences a great and sudden diminution of pain; and, very often, the head of the bone makes a noise at the moment when it returns into the cavity of the joint.

Sir Astley Cooper believes, that much mischief is produced, by attempts to reduce dislocations of long standing in very muscular persons. He has seen great contusion of the integuments, laceration, and bruises of the muscles, and stretching of the nerves, leading to an insensibility and paralysis of the hand, follow an abortive attempt to reduce a dislocation of the shoulder. He is of opinion, that three months for the shoulder, and eight weeks for the hip, may be set down as the period from the accident, when it would be imprudent to make the attempt, except in persons of very relaxed fibre, or advanced age. (See *Treatise on Dislocations, &c. p.* 35.) I have seen two cases, in which very great force was exerted with pulleys, to reduce the thigh bone at the end of three or four weeks; but the attempts completely failed. However, the assistance to be derived from properly lowering the strength of the muscles previously, by means of nauseating doses of antimony, the warm bath, &c. was not here taken advantage of. A dislocation of the upper head of the radius, of about a fortnight's standing, I have known resist all the efforts of two of the most eminent surgeons in London.

In order to keep the bone from slipping out of its place again, we have only to hinder the limb from moving. When splints act powerfully in steadying the joint, they are very often used, as in dislocations of the ankle, wrist, &c. As the humerus cannot be luxated, except when at some distance from the body, a return of its dislocation will be prevented by confining the arm close to the side in a sling. The spica bandage, applied after such an accident, is more satisfactory to the patient, than really efficacious. Whatever bandage is used to keep the arm from moving, should be put on the lower end of the bone, as far as possible from the centre of motion. According to Sir Astley Cooper, the hip is rarely dislocated a second time; but the humerus, and the lower jaw, very frequently slip again from their sockets, which are shallow. Bandages for the prevention of this return of displacement are, therefore, in such cases, particularly necessary. Rest is required for some time after the reduction, in order that the ruptured ligaments may unite. The strength of the muscles, &c. will also be greatly promoted by friction, and pouring cold water over the limb. (*On Dislocations, p.* 35.)

When a bone is broken and dislocated, an endeavour should be made to reduce the dislocation without loss of time, and then pay attention to the fracture. Also if there be a compound fracture of the leg, and a dislocation of the shoulder, the fracture is to be secured in splints, and the dislocation then reduced. (*Sir A. Cooper on Dislocations, p.* 16.) The case of a bone dislocated and fractured at the same time, might be attended with considerable difficulties to the reduction: fortunately it is a very uncommon accident.

COMPOUND DISLOCATIONS.

Compound Dislocations are those, which are attended with a wound communicating with the cavities of the injured joints. Some joints are much more disposed than others to compound dislocations. The accident scarcely ever takes place at the hip. Sir Astley Cooper has known one instance of it at the shoulder, and he has seen one of the knee; but the case is very frequent in the ankle, elbow, and wrist. (*On Dislocations, p.* 19.) In most instances, this opening in the skin is caused by the protrusion of the bone, but sometimes by the part having struck against a hard, or an irregular body. These accidents are frequently attended with great danger; and the same nicety of judgment is requisite in determining, whether amputation ought to be immediately performed, or an effort made to preserve the limb, as in cases of compound fractures, and bad gunshot injuries; and many of the observations which I shall have to offer upon the latter subjects, will, for the most part, be applicable to the present.

When the luxation of a large joint is conjoined with an external wound, leading into the capsular ligament, it is a circumstance, that has a particular tendency to increase the danger. In many cases, injuries of this description are followed by violent and extensive inflammation, abscesses, mortification, fever, delirium, and death. When the patient is advanced in years, much debilitated, or of an unhealthy irritable constitution, a compound luxation, especially if attended with much contusion and other injury of the soft parts, and wrongly treated, very often has a fatal termination. This, however, is not the general event of compound dislocations, and whatever may have happened in former times, we now know, that, in the present improved state of surgery, these accidents mostly admit of cure. This statement may be made, without any censure being cast upon every instance of amputation performed in such cases. I know, that this operation is sometimes indispensable directly after the accident, and I am equally aware, that it may become necessary in a future stage, when extensive abscesses, or sloughing, joined with threatening constitutional symptoms, have taken place. My only design is to recommend the endeavour to cure the generality of compound luxations. But, if a case were to present itself, attended with serious contusion and laceration of the soft parts, I should be as earnest an advocate for amputation as any surgeon.

Mr. Hammick, surgeon to the Royal Naval Hospital, Plymouth, in speaking of compound dislocations of the ankle, advises amputation, "where the lower heads of the tibia and fibula are very much shattered; where, together with the compound dislocation of these bones, some of the tarsal bones are displaced and injured; where any large vessels are divided, and cannot be secured without extensive enlargement of the wound, and disturbance of the soft parts; where the common integuments, with the neighbouring tendons and muscles are considerably torn; where the protruded tibia cannot by any means be reduced; and where the constitution is enfeebled at the time of the accident, and not likely to endure pain, discharge, and length of confinement." (*A. Cooper's Surgical Essays, Part* 2, *p.* 146.) Perhaps, as general remarks, these may not be inaccurate; but there are exceptions to them. Thus, we find in Sir A. Cooper's publication, several cases, in which compound dislocations of the ankle terminated well, notwithstanding the displacement and removal of the astragalus, other instances of which kind of success are to be found in the records of surgery. (See *Laumonier, in Fourcroy, Méd. Eclairée; Percy, in Journ. de Med. continué, Nov.* 1811, *p.* 348.) However, if the ends of the tibia and tarsal bones, especially the astragalus and os calcis, are broken, the operation of amputation is recommended on high authority. (*A. Cooper's Surg. Essays, Part* 2, *p.* 181.) But, with regard to the division of large blood-vessels, Sir A. Cooper states, that he would not at once proceed to amputation on that account. "The case from Mr. Sandford of Worcester, sent me by Mr. Carden, clearly shows, that the division of the anterior tibial artery does not, if it be well secured, prevent the patient's recovery. I also once saw a compound fracture, close to the ankle joint, accompanied by a division of that artery; and, although the patient was in the hospital, and a brewer's servant, who possessed the worst constitution to struggle against severe injuries, yet this man recovered without amputation." Nor in Sir A. Cooper's opinion, would all hope be precluded, even if the posterior tibial artery were injured. (*Vol. cit. p.* 186.) For the method of securing these vessels, see *Arteries.*

The following are the circumstances, which Sir A. Cooper has known give rise to the necessity for amputation in compound dislocations of the ankle. 1. The advanced age of the patient. 2. A very extensive lacerated wound. 3. Difficulty of reducing the ends of the bones he considers rather as a reason for sawing them off, than for amputation. 4. The extremely shattered state of the bones. 5. Dislocations of the tibia outwards cause greater injury of the bones and soft parts, than those inwards, and more frequently require amputation. 6. Sometimes the bone cannot be kept reduced, owing to the tibia in the dislocation outwards being obliquely fractured. 7. Division of a large blood-vessel, attended with extensive wound of the soft parts. 8. Mortification. 9. Excessive contusion. 10. Extensive suppuration. 11. Necrosis, where the sequestra do not admit of removal. 12. Very great and permanent deformity of the foot. 13. When tetanus comes on, Sir A. Cooper does not approve of the operation. 14. A very irritable state of constitution, such as is often met with in very fat subjects, who take no exercise. (*On Dislocations, &c. p.* 332, *&c.*)

The treatment of a compound dislocation requires the reduction to be effected without delay, and with as little violence and disturbance as possible. When the extremity of the bone protrudes, and is smeared with sand or dirt, as frequently happens from its having touched the ground, "it should be washed with warm water, as the least extraneous matter admitted into the joint will produce and support a suppurative process, and the utmost care should be taken to remove every portion of it adhering to the end of the bone. If the bone be shattered, the finger is to be passed into the joint, and the detached pieces are to be removed; but this is to be done in the most gentle manner possible, so as not to occasion unnecessary irritation; and if the wound be so small as to admit the finger with difficulty, and small loose pieces of bone even be felt, the integuments should be divided with a scalpel, to allow of such portions being removed without violence." (*A. Cooper on Dislocations, p.* 254.) If any difficulty of reduction should arise from the bone being girt by the integuments, the opening in them should be dilated with a scalpel. The limb is then to be placed in splints, with the necessary pads, eighteen-tailed bandage, &c. Sir A. Cooper judiciously recommends the portions of this bandage not to be sewed together, "but passed under the leg, so that one piece may be removed when it becomes stiff;" and by fixing another to its end, before it is withdrawn, the fresh piece may be applied, without any disturbance of the limb. (*Surg. Essays, Part* 2, *p.* 120.) The wound is to be freed from any dirt, clots of blood, or other extraneous matter, and its lips are to be accurately brought together with strips of adhesive plaster. Sir A. Cooper considers lint dipped in the blood, which oozes out, the best kind of first dressing. The joint is to be covered with linen kept constantly wet with the liquor plumbi acetatis dilutus, or with what is better, spirit of wine and water; the bandage is to be loosely laid down, and the splints fastened on the limb with their proper straps, or pieces of tape, and the limb is to be kept perfectly at rest in an eligible posture. The patient, if strong and young, is to be bled. This last practice may be more freely adopted in the country, than in London, or large hospitals. An anodyne, the first night or two, will be highly proper. Saline draughts, antimonials, and a low regimen, are also indicated during the first few days of the symptomatic fever, which commonly follows so serious an accident.

According to Sir A. Cooper, purgatives should be used with the utmost caution; "for, (says he,) there cannot be a worse practice, when a limb has been placed in a good position, and adhesion is proceeding, than to disturb the processes of nature by the frequent changes of position, which purges produce; and I am quite sure, that, in cases of compound fracture, I have seen patients destroyed by their frequent administration. That which is to be done by bleeding and emptying the bowels, should be effected within an hour or two after the accident, before the adhesive inflammation arises." (*Surgical Essays, Part* 2, *p.* 121.) Here the fracture bed, invented by Mr. Earle, would allow purgatives to be used, without any disturbance of the limb.

If the case takes a favourable course, the constitutional fever will not be excessive, nor will the pain and inflammation of the limb be immoderate. Sometimes, the wound unites, more or less, without suppuration; a circumstance particularly desirable, as tending more than any thing else to lessen the danger, by changing the case, as it were, from a compound into a simple one. In other cases, the wound is not united; but the inflammation and suppuration are not violent, nor extensive; the constitution is not dangerously disturbed; and hopes of ultimate success may be reasonably entertained. When the wound is disposed to heal favourably, adhesive plaster, with or without lint, or a pledget of soft soap cerate, is the best dressing. In other instances, while the suppuration is copious, and the parts are tense and painful, emollient poultices are the most eligible.

When the symptomatic fever, and first inflammatory symptoms, are over, and much discharge prevails, attended with marks of approaching weakness, the patient is to be allowed more food, and directed to take bark, cordials, porter, wine, &c. If his nights are restless, he must have opiates; if he sweats profusely, sulphuric acid; and, in short, all such medicines, as his particular complaints may require, are to be prescribed.

When the inflammation of a compound dislocation is violent, or extensive, general bleeding, the application of leeches, and the use of fomentations, and poultices, are the most likely means of lessening the mischief. Yet, it is only in strong habits, that venesection to any extent can be prudently practised in large cities, or crowded hospitals.

The following are the instructions, delivered by Sir A. Cooper, on the subject of dressings. "If the patient complain of considerable pain, in the part, in four or five days, the bandage may be raised to examine the wound; and, if there be much inflammation, a corner of the lint (or other dressing) should be lifted from the wound, to give vent to any matter, which may have formed; but, this ought to be done with great circumspection, as there is danger of disturbing the adhesive process, if that be proceeding without suppuration. By this local treatment, it will every now and then happen, that the wound will be closed by adhesion; but, if in a few days it be not, and suppuration take place, the matter should have an opportunity of escaping; and the lint being removed, simple dressings should be applied. After a week, or ten days, if there be suppuration with much surrounding inflammation, poultices should be applied upon the wound, leeches in its neighbourhood, and upon the limb at a distance, the evaporating lotion should still be employed; but, as soon as the inflammation is lessened, the poultices should be discontinued." (*Surgical Essays, Part* 2, *p.* 121.)

In certain examples, the most skilful treament is unavailing. The joint and limb become affected with considerable pain and swelling; the fever runs high; delirium comes on; and the patient may even perish from the violence of the first symptoms, the limb being generally at the same time attacked by gangrene. If these first dangers are avoided, the wound may yet not heal favourably; the inflammation may be considerable, or of an erysipelatous nature; large abscesses under the fasciæ may be formed; the bones may be affected with necrosis; and the hectical symptoms, and sinking state of the patient, may make the only chance of recovery depend upon amputation. But, even this operation is sometimes deferred till too late, and the patient must be left to his miserable fate.

Whoever gives the smallest reflection to the nature of compound luxations, will perceive, that it is often a matter of the highest importance, to make a right decision at the very beginning, whether amputation should be immediately done, or whether an attempt to save the limb ought to be made. In some instances, the patient's sole chance depends upon the operation being performed at once, without the least delay, and the opportunity of doing it never returns. The surgeon should take off the limb as soon as he has seen the nature of the injury, and not wait till a general tendency to swelling and gangrene has spread through the member, and every action in the system is disturbed. Amputation, under these circumstances, is undoubtedly done with a very diminished chance of success; and, until certain facts, were adduced by Baron Larrey, Mr. Lawrence, Mr. A. C. Hutchison, and others, was of late years altogether prohibited. (See *Amputation* and *Mortification.*)

But, besides this first critical period, the surgeon often has to exercise a nice degree of judgment in a future stage of the case; I mean, when the suppuration is copious, the wound open, the bones carious, and the health impaired. Here the practitioner may sometimes err, in taking off a limb, that might be saved; or, he may commit a worse fault, and make the patient lose his life, in a fruitless attempt to save the member. No precepts can form the right practitioner in this delicate part of surgery; genius alone cannot do it; the opportunity of making observations, and the talent of profiting by them, are here the things which make the consummate surgeon.

It should ever be recollected, in regard to bad compound dislocations, that in young subjects, and in a salubrious air, many cases will do well, which in old persons, and in the polluted atmosphere of London, and crowded hospitals, would be fatal without amputation.

The constitutions of some individuals are so irritable, that whether an attempt be made to save the limb, or amputation be at once performed, the case has a rapid and fatal termination. According to Sir A. Cooper, persons who are much loaded with fat, "are generally very irritable, and bear important accidents very ill: indeed," says he, "they generally die, whichever plan of treatment be pursued." However, he adds, that such corpulent people as take a great deal of exercise, form exceptions to the foregoing remark. (*Surgical Essays, Part 2, p.* 195.)

There is a practice, in regard to compound dislocations, which I think ought at all events to be adopted only in a very few cases: I mean the plan of sawing off the head of the luxated bone. According to Léveillé, this method is recommended by Hippocrates as a means of accelerating and perfecting the cure. (*Nouvelle Doctrine Chirurgicale, T.* 2, *p.* 44.) However, it seems not to have done sufficient good, in ancient times, to obtain a lasting reputation. In fact, when it was mentioned by the late Mr. Gooch, it had sunk into such oblivion, that it was received as an entirely new proposal. "Compound luxations (says this author) are of a more dangerous nature than compound fractures, for very plain reasons; but, if a surgeon should judge it advisable to attempt saving a limb under such threatening circumstances, *I am inclined to think, from what I have observed, he will be more likely to succeed, by sawing off the head of the bone, especially if it has long been quite out and exposed to the air.*"

Mr. Gooch afterwards takes notice of a case, in which Mr. Cooper of Bungay, sawed off the heads of the tibia and fibula, and preserved the limb, the patient being able to walk and work for his bread for many years afterwards. Other examples are also briefly mentioned, in which the lower head of the radius was sawn off, and the head of the second bone of the thumb.

The late Mr. Hey, of Leeds, was induced to make trial of this plan in a compound luxation of the ankle. The example, however, which he published, is decidedly unfavourable to the practice, as the following passage will show: "I was in hopes, that this patient would have been able to walk stoutly; but, in this, I was disappointed. He walked indeed without a crutch; but his gait was slow, his leg remaining weak, and his toes turning outwards, which rather surprised me, as his leg was very straight, when I ceased attending him."

Mr. Hey did not recite this case, with the view of recommending a similar practice in all cases of this accident; for, he had not always adopted it, nor, was he of opinion, that the same mode of treatment, whether by replacing the bones, sawing off their extremities, or amputating the limb, ought to be universally practised. When the laceration of the capsular ligament and integuments is not greater, than is sufficient to permit the head of the tibia to pass through them; and when, at the same time, the joint, or contiguous parts, have suffered no other injury: Mr. Hey recommends the replacing of the bone, and an union of the integuments by suture, with the treatment adapted to wounds of the joints. (*Practical Observations in Surgery, Chap.* 11, *Edit.* 2.)

That in a few cases, recorded by Mr. Gooch, and Mr. Hey, the patients recovered with a new sort of joint, only proves to my mind the great resources and activity of nature, and her occasional triumph over the opposition she meets with from bad and injudicious surgery. A limb so treated, must ever afterwards be shorter than its fellow, and consequently the patient be more or less a cripple. We have seen, that, in the only instance published by Mr. Hey, considerable deformity was the consequence of the practice. I cannot help adding my belief, that this gentleman would have experienced more success in the treatment of compound dislocations, had he relinquished the objectionable method of sewing up the wound. In such accidents, every kind of irritation should be avoided as much as possible, and that the wound may be conveniently closed with sticking plaster, the observation of numerous cases in St. Bartholomew's Hospital, has perfectly convinced me. In this munificent institution, under the disadvantage of the air of London, and an hospital, compound luxations used, at the period when I was an apprentice there, to be treated with marked success; and I feel warranted in ascribing the circumstance to the mode of treatment, which was conducted on the principles explained in this section of the dictionary.

The most ingenious arguments, which have yet been urged in behalf of the practice of sawing off the ends of the bones, in compound dislocations of the ankle, are those recently published by Sir A. Cooper. However, he does not advise the plan, without restrictions. If the dislocation (says he) can be easily reduced, without sawing off the end of the bone; if it be not too obliquely broken to remain firmly upon the astragalus after being reduced; if the end of the bone be not shattered, for then the small loose pieces of bone should be removed, and the surface of the bone be smoothed by the saw; if the patient be not excessively irritable, and the muscles, affected with violent spasms, impeding reduction, and causing a displacement of the bones after they have been reduced; Sir A. Cooper advises the immediate reduction of the parts, and uniting the wound by adhesion. In the opposite circumstances, rather than amputate the limb, he would saw off the ends of the bones. (*Surgical Essays, Part* 1, *p.* 154. *Treatise, p.* 302.)

The only case, in which the plan of sawing off the head of the bone can be at all proper, is when a compound dislocation cannot be reduced, notwithstanding the enlargement of the wound in the skin, and every other possible means. There is no other mode of preventing the formidable symptoms, which would ensue, were the bone left in a state of protrusion through the integuments; nor is there any better way of alleviating such symptoms after they have actually begun. M. Roux gives much praise to the English surgeons for the judicious boldness, which they have evinced in cases of this description. Although Fabricius Hildanus, Ferrand, Desault, Laumonier, and several other French surgeons, have, like many British practitioners, ventured to remove the whole of the astragalus, when this bone was totally separated from the scaphoides, and protruded, in compound luxations, yet M. Roux acknowledges, that the bold practice, of sawing off the lower end of the humerus, the lower end of the radius, the lower end of the tibia, and also of the fibula, at the same time, originated with, and was first executed by, English surgeons. (*Parallèle de la Chirurgie Angloise avec la Chirurgie Françoise, p.* 208, 209.)

DISLOCATIONS OF THE LOWER JAW.

The lower jaw can only be luxated forward, and either one, or both of its condyles may become displaced in this direction. Every dislocation, except that forward, is rendered impossible by the formation of the parts. The lower jaw cannot even be dislocated forward, unless the mouth, just before the occurrence of the accident, be very much open. Whenever the chin is considerably depressed, the condyles slide from behind forward, under the transverse root of the zygomatic processes. The cartilaginous cap, which envelops the condyles, and follows them in all their motions, still affords them an articular cavity; but, the depression of the bone continuing, the ligaments give way, the condyles glide before the *eminentiæ articulares*, and slip under the zygomatic arches. Hence, a dislocation mostly happens, while the patient is laughing, gaping, &c. A blow on the jaw, when the mouth is wide open, may easily cause the accident. The case has occasionally arisen from the exercise of great force in drawing out the teeth. Sir Astley Cooper has known a complete luxation, that is to say, of both condyles, produced by a boy suddenly putting an apple into his mouth to keep it from the reach of a play-fellow. (*On Dislocations, p.* 389.) Whenever the jaw has once been dislocated, the same causes more easily reproduce the occurrence. In certain individuals, the ligaments are so loose, and the muscles so weak, that a dislocation is produced by any slight attempt to yawn, laugh, or (as Lamotte has observed) to bite any substance, which is rather large. (*Levéillé, Nouvelle Doctrine Chirurgicale, Tom.* 2, *p.* 54.) There have been persons, who could scarcely ever laugh heartily, without their lower jaws being luxated. But, of all the causes of this occurrence, yawning alone, even without the combination of any external force, is by far the most common.

When the jaw is depressed, and its angles, to the external sides of which the masseters are attached, are carried upwards and backwards, if these muscles contract, the greater part of their force tends to bring the condyles into the zygomatic depression. (*Boyer.*)

Dislocations of the lower jaw are attended with a great deal of pain, which Boyer imputes to the pressure produced by the condyles on the deep seated temporal nerves, and those going to the masseters, which nerves pass before the roots of the zygomatic process. The mouth is wide open, and cannot be shut. It is more open in recent dislocations, than in those, which have continued for some time. An empty space is felt before the ear, in the natural situation of the condyles. The coronoid process forms under the cheek bone a prominence, which may be felt through the cheek, or from within the mouth. The cheeks and temples are flattened by the lengthening of the temporal, masseter, and buccinator muscles. The saliva flows in large quantities from the mouth, the secretion of which fluid is greatly increased by the irritation of the accident. The arch, formed by the teeth of the lower jaw, is situated more forward than that formed by the teeth of the upper jaw. During the first five days after the accident, the patient can neither speak, nor swallow. (*Boyer.*) When only one condyle is dislocated, the mouth is distorted, and turned towards the opposite side, while the fellow teeth of the jaws do not correspond. However, Mr. Hey asserts, that frequently the position of the chin is not perceptibly altered. (*Practical Observations, p.* 322.) The mouth cannot be shut; but, it is not so widely open as in the complete luxation. (*A. Cooper, on Dislocations, p.* 392.)

When a dislocated jaw has remained unreduced for several days or weeks, the symptoms are not so well marked. In such instances, the chin beomes gradually approximated to the upper jaw; the patient recovers by degrees the faculty of speaking and swallowing; but, he stammers, and the saliva dribbles from his mouth. The sufferings, induced by a dislocated jaw, it is said, may even prove fatal, if the case continue unrectified; but, we are not to believe Hippocrates, when he positively declares the accident mortal, if not reduced before the tenth day. Indeed, Sir Astley Cooper, in noticing the severity of the pain, assures us, that he has never seen any dangerous effect produced; on the contrary, that, in time, the jaw becomes more closed, and a considerable degree of its motion is restored. (*On Dislocations, p.* 389.)

Monteggia attended a man, two months after such a luxation, which had not been understood, and Fabricius ab Aquapendente assures us, that he had never seen the prognostic of Hippocrates verified, though he had had many patients of this sort under his care. (*Levéillé, Nouvelle Doctrine Chir. T.* 2, *p.* 58.)

Dislocations of the lower jaw may be reduced in the following manner: The surgeon is first to wrap some linen round his thumbs to keep them from being hurt by the patient's teeth, and then introduce them into the mouth, as far as possible along the grinding teeth. At the same time, he is to place his fingers under the chin and base of the jaw, and while he depresses the molares with his thumbs, he raises the chin with his fingers, by which means the condyles become disengaged from their situation under the zygomas; at which instant the muscles draw those parts so rapidly back into the articular cavities again, that the surgeon's thumbs might sometimes be hurt, did he not immediately move them outward between the cheek and the jaw.

The reduction being accomplished, a fresh displacement is to be prevented by applying a four-tailed bandage, as recommended for the fractured jaw. For a few days, the patient should avoid such food as requires much mastication.

The ancients used to place between the grinding teeth two pieces of stick, and, while they used them as levers to depress the back part of the bone, they raised the chin by means of a bandage. The late Mr. Fox, the dentist, had a patient, whose jaw was dislocated on both sides, in the extraction of a tooth: the reduction was first effected on one side, by placing a piece of wood, a foot long, upon the grinders, and then raising the part of it that was held in the hand. Mr. Fox next reduced the other condyle in the same manner. Sir Astley Cooper, in reducing a complete luxation of the lower jaw, prefers putting the patient in the recumbent posture, introducing two corks behind the molar teeth, and then elevating the chin. (*On Dislocations, p.* 391.) When only one condyle is dislocated, whatever method of reduction be followed, it need only be applied to the side affected.

DISLOCATIONS OF THE VERTEBRÆ.

What have been called dislocations of the spine, as Sir Astley Cooper remarks, are really fractures of the vertebræ, with displacement of the bones, but not of the intervertebral substance. The only true dislocations of the spine, admitted by him, are those of the first and second cervical vertebræ. (*On Dislocations, &c. p.* 17.)

The large surfaces, with which the vertebræ support each other; the number and thickness of their ligaments; the strength of their muscles; the little degree of motion which each vertebra naturally has; and the vertical direction of the articular processes; make dislocations of the dorsal and lumbar vertebræ impossible, unless there be also a fracture of the above mentioned processes. Thus, Sir Astley Cooper, in his very extensive experience, has never witnessed a separation of one vertebra from another, through the intervertebral substance, without fracture of the articular processes; or, if those processes remained unbroken, without a fracture through the bodies of the vertebræ. Of these cases I shall merely remark, that they can only result from immense violence; that the symptoms would be an irregularity in the disposition of the spinous processes, retention or incontinence of the urine and feces, paralysis and a motionless state of the lower extremities, the effects of the pressure, or other injury, to which the spinal marrow would be subjected. Similar symptoms may also arise, when the spinal marrow has merely undergone a violent concussion, without any fracture or dislocation whatever; and, it is certain, that most of the cases, mentioned by authors as dislocations of the lumbar and dorsal vertebræ, have only been concussions of the spinal marrow, or fractures of those bones.

The cervical vertebræ, however, not having such extensive articular surfaces, and having more motion, are occasionally luxated. The dislocation of the head from the first vertebra, and of the first vertebra from the second, particularly the last accident, is the most common; but luxations of the cervical vertebra lower down, though very rare, are possible. Indeed, according to Boyer, many examples have happened, in which one of the inferior oblique, or articular processes of a cervical vertebra has been dislocated, so as to cause a permanent inclination of the neck towards the side opposite to that of the displacement. (*Traité des Mal. Chir. T.* 4, *p.* 114.)

Whether the case, published by Mr. C. Bell, under the name of a subluxation of the spine, ought to be received as an unequivocal specimen of a displacement of the last cervical from the first dorsal vertebra, I cannot presume to determine. This author speaks of an evident loosening between these two bones; of a considerable space between them; of the destruction of the intervertebral substance; and of an immense quantity of pus around the injured part of the spine; as circumstances seen in the dissection. "On the back part, the pus had extended under the scapulæ, and on the fore part was bounded by the œsophagus," and, in the spinal canal, it had descended through the whole length of the sheath to the cauda equina. (*C. Bell, Surg. Obs. Vol.* 1, *p.* 148.)

DISLOCATION OF THE HEAD FROM THE FIRST VERTEBRA, OR ATLAS.

The os occipitis, and first cervical vertebra are so firmly connected by ligaments, that there is no instance of their being luxated from an external cause, and, were the accident to happen, it would immediately prove fatal by the unavoidable compression and injury of the spinal marrow.

Five examples of displacement of the atlas by disease are in the Museum at Leyden, and are described by Sandifort. Boyer has seen one at la Charité; and a very interesting description of a similar case, illustrated by engravings, has been recently published by Schupke. (*De Luxatione Spontanea Atlantis et Epistrophei*, 4to. *Berol.* 1816.) In this tract is collected from the writings of J. P. Frank, (*Delect. Opusc. Vol.* 5.) from those of Reil, (*Feiberlehre, B.* 2, § 102;) and of Rust, &c. an exact detail of the symptoms of the disease; an important topic on which Boyer confesses his inability to give any information. These spontaneous displacements of the atlas may depend upon caries and scrophulous disease of its articular surfaces, or upon an exostosis of its transverse process, or a similar tumor growing from the neighbouring portion of the os occipitis, or petrous portion of the temporal bone. By these causes, the anterior, or posterior arch, or one of the sides of the atlas, has been made to intercept a third, the half, and even two-thirds of the diameter of the foramen magnum. Notwithstanding the very remarkable constriction of the medulla spinalis, thus occasioned, it is noticed by Boyer, that life may be carried on, and the nutritive functions performed sufficiently well to afford time enough either for the exostoses to attain a large size, or for the anchylosis, binding together the head and most of the cervical vertebræ, to acquire great solidity. According to the same author, the atlas is never found free and distinct, when thus displaced, but is confounded at least with the os occipitis, and mostly with five or six of the subjacent vertebræ. And, another interesting fact is, that, in cases of this description, the joint between the atlas and occiput is never the only one, which is displaced and deformed, unless the disease be very slightly advanced; for, the articulation of the processus dentatus with the atlas, and sometimes that of the point of the same process with the occiput, are considerably affected. Sometimes, the processus dentatus and the occiput retain their natural position with respect to each other, and the atlas alone seems to be displaced between them. Sometimes, the second vertebra is out of its place with respect to the os occipitis, in the same direction as the atlas, but not in quite so great a degree. Lastly, in some other instances, the two vertebræ are twisted in opposite directions, as, for instance, one to the left, the other to the right; or vice-versâ. In one of the cases, recorded by Sandifort, this kind of lateral displacement in opposite directions was so extensive, that an interspace, only six lines in breadth, was left between their approximated annular margins. An instance was seen by Duverney, where the displacement of the two vertebræ was from before backward, and where the processus dentatus was approximated to the posterior arch of the atlas to the extent of two thirds of the annular opening in this vertebra. In these cases, nothing can be more obvious, than that there must be a destruction, or at all events a thoroughly diseased state, of the ligaments between the atlas and dentatus, and of those connecting the dental process to the occiput. (*Boyer*, *Vol. cit. p.* 105.)

As for the treatment of the preceding forms of disease, experience has hitherto furnished little satisfactory knowledge. But, as an analogy is seen between these cases, and the scrophulous and carious affections of other joints, blisters, setons, and issues have been proposed and tried. Rust found these remedies only capable of retarding the progress of the disease, and of producing an abatement of the symptoms. The pain often reaching from the back of the head to the forehead, was rendered less severe; and the difficulty of swallowing was considerably lessened. But, the means here specified were not found adequate to arrest the morbid change in the bones. However, Rust thinks, that greater benefit might be expected, if a case were to present itself arising altogether from a local cause, without its origin being connected with constitutional disease. (*Salzburger, Med. Chir. Zeitung. Jehrgang.* 1813, *B.* 3, *p.* 108.)

DISLOCATIONS OF THE FIRST CERVICAL VERTEBRA FROM THE SECOND.

The rotatory motion of the head is chiefly performed by the first vertebra moving on the second. When this motion is forced beyond its proper limits, the ligaments which tie the processus dentatus to the edge of the foramen magnum are torn, and, supposing the head to be forced from the left to the right, the left side of the body of the vertebra is carried before its corresponding articulating surface, while the right side falls behind its corresponding surface. Sometimes the processus dentatus, whose ligaments are ruptured, quits the foramen formed for it by the transverse ligament and the anterior arch of the first vertebra, and presses on the medulla oblongata. But, according to Boyer, the processus dentatus may be displaced in two ways: 1st, It may be carried directly backwards, the transverse and other ligaments being broken. This mode of displacement Boyer considers as the most difficult and uncommon, as it can hardly take place, except from a fall from a great height upon the back of the head, while the spine is bent forwards. (*Traité des Mal. Chir. T.* 4, *p.* 109.) However, the accident may happen in another manner, as in Mr. C. Bell's instance, where it occurred from the chin striking against a curbstone. (*Surg. Obs. Vol.* 1, *p.* 150.) 2dly, In a violent rotation, in which the face is carried sideways beyond the proper limits, the lateral and accessory ligaments of the processus dentatus may be stretched and twisted spirally round this process. The force operates entirely upon them, and not at all upon the transverse ligament. Now when the lateral and accessory ligaments of the processus dentatus have given way, and an effort to incline the head to one side is kept up, one of the sides of the space, bounded by the transverse ligament, may present itself near the point of the processus dentatus, which may then pass below the transverse ligament without rupturing it.

In children, where the processus dentatus is not fully developed, and the ligaments are weaker than in the adult, a perpendicular impulse may break the lateral and accessory ligaments, and then force the processus dentatus under the transverse ligament, without rupturing this latter part; as Boyer conceives must have been the case in the child, which J. L. Petit mentions as having been instantaneously killed by being lifted up by the head.

Lastly, when the transverse, lateral, and other ligaments are capable of making very great resistance to a force, tending to rupture them all, and to throw the processus dentatus directly backwards, this process, if more slender than common, may be broken near its base, and this portion of it forced back upon the spinal marrow.

A case, exemplifying the occurrence, used to be related by Mr. Else in his lectures, and is recorded by Sir Astley Cooper. (*On Dislocations, p.* 348. *Boyer, Vol. cit. p.* 110.)

Patients can hardly be expected to survive mischief of this kind in so high a situation; when the transverse ligament is broken, and the processus dentatus is thrown directly backward against the medulla oblongata, the effect must be instant death, as happened in the case recorded by Mr. C. Bell, (*Surg. Obs. Vol.* 1, *p.* 150,) and in that mentioned by Mr. Else.

According to surgical writers, the causes which may produce this formidable accident, are various: a fall on the head from a high place; the fall of a heavy body against the back of the neck; a violent blow; a forcible twist of the neck; tumbling; standing upon the head; the rash custom of lifting children up by the head, &c. Louis found that the first vertebra was dislocated from the second in the malefactors hanged at Lyons, at which place, the executioner used *to give a sudden twist* to the body, at the moment of its suspension, and then bear with all his weight upon it. Under such circumstances, Boyer conceives, that the processus dentatus might pass under the transverse ligament, without any rupture of the latter.

Dislocations of the cervical vertebræ are said not to be always fatal, as when they occur at the third, fourth, fifth, or sixth of these bones, and only one articular process is luxated. In these instances, the vertebral canal is not so much lessened as to compress the spinal marrow, and occasion immediate death.

With regard to the prognosis and treatment of all luxations in which the processus dentatus is displaced, the reader need only hear, that such cases are immediately fatal. Mistaken notions have been entertained upon this point, in consequence of particular dislocations of the neck having been successfully treated.

A child was brought to Desault, with its neck bent, and its chin turned towards the right shoulder. The accident had been a consequence of the head having been fixed on the ground, while the feet were up in the air. A surgeon happened to be with Desault at the time, and they agreed to make an attempt to reduce the luxation, and to apprise the mother, that though the child might be cured, there was a possibility of its perishing under their hands. Being permitted to do what they judged proper, they fixed the shoulders, and the head was gently raised, and gradually turned into its natural position. The child could now move freely; the pain ceased; and a considerable swelling in the situation of the luxation yet left, was dispersed by the application of emollient poultices. (*Levéillé, Nouvelle Doctrine Chir. T.* 2, *p.* 62.)

Another alleged instance of the reduction of a dislocation of the neck is also recorded by Dr. Settin. (*Schmucker's Vermischte Chirurgische Schriften, B.* 1.) However, both in this case, and that related of Desault, there can now be little, or no doubt, that the accident was not a dislocation of the dentata from the atlas, but only a luxation of one of the oblique processes of a cervical vertebra lower down. Whenever the processus dentatus is suddenly displaced, or fractured, the effects on the medulla spinalis are inevitably fatal. A case, indeed, was attended by Mr. Cline, in which the processus dentatus had lost a part of its natural support, in consequence of a transverse fracture of the first vertebra, and in which the child survived the accident a year. See *A. Cooper on Dislocations, p.* 549. *T. E. Schmidt, De Luxatione Nuchæ, Haller, Disp. Chir.* 2, 351, *Tub.* 1747. *S. T. Soemmering, Bemerkungen über Verrenkung und Bruch des Ruckgraths,* 8*vo. Berlin,* 1793. *Boyer, Traité des Mal. Chir. T.* 4, *p.* 100, *&c.* 8*vo. Paris,* 1814. *A. E. Schupke, De Luxatione Spontanea Atlantis et Epistrophei,* 4*to. Berol.* 1816. *C. Bell, Surgical Obs. Vol.* 1, *p.* 145, 149, *&c.* 8*vo. Lond.* 1816. *Observations on Injuries of the Spine, &c.* 4*to. Lond.* 1824. *Sir A. Cooper, Treatise on Dislocations, &c. p.* 548—551, *&c.* 4*to. Lond.* 1822.

DISLOCATIONS OF THE CLAVICLE.

These are much less common, than fractures, which are said to occur six times more frequently. In fact, as Sir Astley Cooper has truly remarked, the clavicle is so strongly articulated both with the sternum and scapula, that its dislocations are rare in comparison with those of many other joints (*On Dislocations, p.* 395.)

The clavicle may be luxated at its sternal extremity, forwards, backwards, and upwards, but never downwards, on account of the situation of the cartilage of the first rib. The luxation forward is the most frequent; dislocations backwards and upwards are very unusual; and one directly backwards is still more rare. This last case Sir Astley Cooper has never known arise from violence; but, he conceives, that it might happen from a blow on the forepart of the bone, rupturing the capsular ligament and that between the clavicle and rib. The only instance of the dislocation backwards, with which this experienced surgeon is acquainted, proceeded from great deformity of the spine. In this extraordinary case, the bone gradually slipt behind the sternum, and produced so much inconvenience, by its pressure on the œsophagus, that the late Mr. Davie, of Bungay, in Suffolk, was obliged to remove its sternal extremity. (*A. Cooper, on Dislocations, p.* 401.)

If the dislocation be forwards, a hard circumscribed tumor is felt, or even seen, on the front and upper part of the sternum. According to Boyer, when the shoulder is carried forward and outward, the tumor disappears; but, in Sir Astley Cooper's account, it is said, that the projection on the sternum will subside, if the shoulder be drawn backward. The shoulder being elevated, the projection descends; if it be drawn downwards, the dislocated extremity of the bone becomes elevated to the neck. The motions of the clavicle are painful, and the patient moves the shoulder with difficulty. The point of the injured shoulder is less distant from the central line of the sternum, than usual. According to the same authority, the dislocation forwards is sometimes incomplete, only the front of the capsular ligament being torn. The dislocation forwards is generally produced by a fall upon the point of the shoulder, when the force pushes the clavicle inwards and forwards; but, it also frequently happens from falls upon the elbow when this is separated from the side, and thus the clavicle is propelled violently inwards and forwards against the anterior portion of the capsular ligament. (*A. Cooper, on Dislocations, p.* 399.)

When the luxation is upwards, the distance between the sternal ends of the clavicles is diminished.

When the dislocation is backwards, there is a depression where the end of the clavicle ought to be, and the head of the bone forms a projection at the front and lower part of the neck, which, as J. L. Petit remarks, may compress the trachea, œsophagus, jugular vein, carotid artery, and nerves. The head is inclined towards the side, on which the accident itself is situated.

In reducing dislocations of the sternal end of the clavicle, we are to make a lever of the arm, by means of which the shoulder is brought outwards; and when thus brought outwards, it is to be pushed forwards, if the dislocation be in that direction; backwards, if the dislocation be behind; and upwards, if the dislocation be above.

The same position of the arm, and the same apparatus, as in fractures of the clavicle, are to be employed. The wedge-like pad, with its thick part towards the axilla, for the purpose of inclining the shoulder outward, a sling for the support of the weight of the arm, and a bandage judiciously applied, are especially necessary. In consequence of the obliquity and smoothness of the articular surfaces, the reduction is easy, but great attention is requisite to prevent a return of the displacement.

Dislocation of the scapular end of the clavicle from the acromion. The luxation upwards is almost the only one that ever occurs. It is possible, however, for the accident to take place downwards, and for the end of the clavicle to glide under the acromion. The rarity of dislocations of the scapular end of the clavicle, is owing to the strength of the ligaments tying the clavicle and acromion together. While Desault, and Boyer, however, represent these cases as much less common, than displacements of the sternal end of the bone, Sir Astley Cooper's experience pronounces them to be more frequent. (*On Dislocations, p.* 405.)

A fall on the top of the shoulder may cause the dislocation upwards. The scapular end of the clavicle then slides upwards on the acromion, and the shoulder is drawn inwards by the muscles which approximate the arm to the body. It has been asserted, that the violent action of the trapezius muscle, in pulling the clavicle upwards, may tend to produce the accident; but, as Sir Astley Cooper has remarked, the mere action of this muscle, without the simultaneous operation of great violence, could never tear both the ligaments of the coracoid process, which must be broken ere this dislocation can happen. When the projection is but slight, as Sir A. Cooper has sometimes noticed, the circumstance indicates that the internal ligament is not ruptured. (*On Dislocations, p.* 406.) Pain at the top of the shoulder; a projection of the end of the clavicle, under the skin covering the acromion, and a depression of the shoulder, are symptoms indicating what has happened. The patient also inclines his head to the affected side, and avoids moving his arm or shoulder.

This dislocation is reduced by carrying the shoulder outwards, putting a thick cushion in the axilla, and applying Desault's bandage for fractures of the clavicle, (See *Fractures,*) making the turns ascend from the elbow to the shoulder, so as to press the luxated end of the bone downward, and keep it in its due situation, at the same time that the elbow is confined close to the side, and supported in a sling, by which means the shoulder will be kept raised and inclined outwards. This plan, which is advised by Boyer, is more efficient than the common practice, which consists in applying a compress, the figure of 8 bandage, and supporting the arm in a sling. However, the exact maintenance of the reduction by any apparatus whatever, is found to be a matter of the greatest difficulty, and some slight deformity will remain; though it is agreeable to know, that notwithstanding this disadvantage, the use of the limb returns very well. In the course of my time, I have seen several cases in proof of this statement, and one example was shown me by my friend Mr. Vincent, in St. Bartholomew's Hospital. The same observations are applicable to luxations of the sternal end of the bone.

DISLOCATIONS OF THE OS BRACHII.

Nature, which varies according to the necessities of different animals, the number of their joints, has also been provident enough to vary the structure of these parts, according to the use of the different portions of their economy. To great moveableness some unite considerable solidity; for instance, the vertebral column. Others are very strong, but only admit of a slight yielding motion, as we observe in the carpus, tarsus, &c. Lastly, other joints admit of a great latitude of motion; but their strength is easily overpowered by the action of external bodies. Such are, in man, the shoulder-joint, and that between the sternum and clavicle.

The last kinds of articulation are particularly subject to dislocation, and, of all, not one is so often luxated as the shoulder joint. Bichat mentions, that it appears, from a comparative table, that, in some years, this accident at the Hotel-Dieu, has been as frequent, and even more so, than dislocations of all the other bones taken collectively.

Here every thing seems to facilitate the escape of the bone from its natural cavity. An oval shallow cavity, surrounded by a margin of little thickness, receives a semi-spherical head, which is twice as broad as the cavity in the perpendicular direction, and three times as extensive from before backward. With respect to the ligaments, the joint is only strengthened by a mere capsule, which is thin below, where nothing opposes a dislocation; but thicker above, where the acromion, coracoid process, and triangular ligament, form an almost insurmountable obstacle to such an accident. With regard to the muscles, and motions of this joint, strong and numerous fasciculi surround the articular surfaces, make them easily move in all directions, and pushing the head of the os brachii against the different points of the capsule distend this ligamentous bag, and when their power exceeds the resistance, actually lacerate it. As for external bodies, what bone is more exposed, than the os brachii, to the effect of their force?

Thus subjected to the influence of these predisposing causes, the os brachii would be in continual danger of being dislocated, if the scapula, which is as moveable as itself, did not furnish a point of support for it, by accompanying all its motions. This point of support accommodates itself to the variations in the position of the head of the os brachii, so that to the moveableness of the articular surfaces, their strength is, in a great measure, owing.

The shoulder-joint, which is very liable to luxations in a general sense, is not equally so at all points. There are some, where a dislocation cannot occur; there are others, where, though possible, such an accident has never been observed.

Desault divided dislocations of the humerus into *primitive*, which are the sudden effect of external violence, and into *consecutive*, which follow the first, by the influence of causes presently to be explained. In order to simplify the comprehension of the various directions, in which the head of the humerus is luxated, he supposed the glenoid cavity to be bounded by four lines: one representing its upper edge; another its lower; a third its inner; and a fourth its external one.

The head of the humerus cannot be displaced towards the upper edge. Here, are situated the acromion and coracoid process, the triangular ligament stretched between them, the tendons of the triceps, supraspinatus, and the fleshy portion of the deltoid, insurmountable obstacles to the luxation of the head of the bone, propelled by any force upward. Besides, what power could this be? Supposing there were such a force, the head of the bone must necessarily be driven outward as well as upward, ere its head would be displaced. This is impossible, because the trunk prevents the lower part of the arm from being directed sufficiently inward to produce this effect.

On the contrary, at the other margins, there is little resistance. At the inferior one, the long portion of the triceps; at the internal one, the tendon of the subscapularis; and at the external edge, those of the infra-spinatus, and teres minor, will readily yield to any power directed against them, and allow primitive luxations to take place, downward, inward, or outward. Downward, between the tendon of the long portion of the triceps, and the tendon of the subscapularis, which last, in a case dissected by Sir A. Cooper, was ruptured; (*Surg. Essays Part* 1, *p.* 7, *and on Dislocations*, 421, 422,) inward, between the fossa subscapularis, and muscle of this name; outward, between the fossa infraspinata, and infraspinatus muscle.

According to Sir Astley Cooper, the os humeri is liable to be thrown from the glenoid cavity of the scapula in four directions; three of these luxations are complete; the other is only partial. The first is *downwards and inwards*, the dislocation *into the axilla*, as it is usually called, in which case, the head of the bone rests upon the inner side of the inferior costa of the scapula. The second is *forwards, under the pectoral muscle*, the head of the bone being placed below the middle of the clavicle, and on the sternal side of the coracoid process. The third is the dislocation *backwards*, in which the head of the bone can be plainly felt and seen, as a protuberance at the back and outer part of the inferior costa of the scapula, upon the dorsum of this bone. The fourth, which is only partial, is when the front of the capsular ligament is torn, and the head of the bone rests against the outer side of the coracoid process. "Of the dislocation in the axilla, (says Sir Astley Cooper) I have seen a multitude of instances; of that forwards, on the inner side of the coracoid process, several; although it is much less frequent, than that in the axilla; of the dislocation backwards, I have seen only two instances during the practice of my profession for 38 years." (*On Dislocations, &c. p.* 416.)

Sometimes, after the head of the bone has escaped from the internal or inferior part of the capsule, it is carried behind the clavicle, forming a case of consecutive dislocation upward; a specimen of which was preserved in Desault's museum. But, here, the secondary displacement only takes place slowly, and when it occurs, a reduction can rarely be effected, on account of the strong adhesions, contracted by the surfaces of the bone. Thus, in the specimen referred to, a new cavity was formed behind the clavicle, and the humerus adhered by new ligaments to the surrounding parts.

The action of external bodies, directed against the arm; but, particularly, falls, in which this part is forced against a resisting body, gives rise to primitive dislocations, and then the different species of the accident are determined, by the particular position of the humerus at the instant, when the injury takes place.

Should this bone be raised from the side, without being carried either forward, or backward; should the elbow be elevated, and the fall take place on the side, then the weight of the trunk, almost entirely supported by this bone, forces downward its upper part, which stretches and lacerates the lower part of the capsular ligament. Thus a luxation downward is produced, and its occurrence may also be facilitated by the combined action of the latissimus dorsi, pectoralis major, and teres major, muscles, as Fabre has judiciously remarked; for being at this period involuntarily contracted to support the trunk, they act with the power of a considerable lever; the resistance being the head of the bone, which they draw downward, while the fixed point is the lower end of the bone, resting against the ground. Some authors also consider, as the immediate cause of a dislocation downward, the strong action of the deltoid, which is supposed to depress the head of the bone, and push it downward through the capsular ligament. In support of this opinion, Bichat mentions the well known case of a notary, who luxated his arm downward in lifting up a register.

The rationale of the primitive luxation inward differs very little from that of the preceding case. The elbow is both separated from the side, and carried backward: in falling, the weight of the body acts on the humerus, the front part of the capsule is lacerated, and a luxation takes place in this direction.

The dislocation outward (or as Sir Astley Cooper calls it backward) is produced in the same sort of way. The elbow is carried forward, towards the opposite shoulder; the capsule is stretched outward, and if a sufficient force act on the limb, it is lacerated. But, how could such a force arise? In a fall, the arm being pushed against the trunk, and kept there, cannot move extensively enough to cause such a laceration. Hence, a luxation outward, or rather backward under the spine of the scapula, must necessarily be exceedingly rare, and Desault, in all his experience, never saw such an accident. Besides, when, in a fall, the arm is raised from the side, and inclined forward or backward, the weight of the body only operates upon it obliquely, and the limb is very little exposed to the action of the latissimus dorsi, pectoralis major, and teres major muscles. However, a few instances of a dislocation of the head of the humerus in this direction have been recorded. Sir Astley Cooper, in the course of 38 years, has met with two examples. In a dead subject, Boyer remarked a singular inclination of the glenoid cavity backwards, its articular surface, also, presenting on this side an extraordinary elongation, and the humerus readily slipping under the spine of the scapula. (*Traité des Mal. Chir. T.* 4, *p.* 176.)

In the patient, whose history was published by M. Fizeau, and in whom a dislocation of the humerus outwards and backwards, was seen both by that gentleman and Boyer, there was also the particularity, that the luxation was readily reproduced. (*Journ. de Med. par Corvisart, &c. T.* 10, *p.* 386.) Hence, Boyer suspects that this very rare kind of displacement must have been facilitated by some preternatural disposition of the articular surfaces, especially that of the glenoid cavity. No dislocation must occur more frequently, than that downward, in which the influence of the weight of the body, and of the action of the muscles, is direct. However, the luxation inward, or as Sir Astley Cooper and others call it forwards, is common.

In all primitive dislocations from violence, and not from paralysis of the deltoid, and a gradual yielding of the capsule, I believe the latter part is always extensively lacerated. In general, authors have paid too little attention to this circumstance, which dissections have repeatedly demonstrated. Desault had two specimens made of wax; one, of a dislocation inward; the other of one downward; both of which were met with in subjects, who died at the Hôtel Dieu. Bell also makes mention of similar facts, and another English surgeon, says Bichat, has observed the same occurrence. I suppose Bichat here alludes to Mr. Thompson, who long ago noticed the laceration of the capsule, and particularly called the attention of surgeons to the subject. (See *Med. Obs. and Inquiries.*)

Desault conceives that the capsule may be sufficiently torn to let the head of the bone escape; but that the opening may afterwards form a kind of constriction round the neck of the humerus, so as to prevent the return of the head of the bone into the place, which it originally occupied. The correctness of this statement, however, is positively denied by Sir A. Cooper, who remarks, that they who entertain this belief, must forget the inelastic structure of the capsular ligament, and never witnessed by dissection the extensive laceration which it suffers in dislocations from violence. (*Surgical Essays, Part* 1, *p.* 18.)

Several causes may lead to a *consecutive* luxation. If a fresh fall happen, while the arm is separated from the trunk, the head of the humerus, which nothing confines, obeys, with the utmost facility, the power displacing it in this manner, and is again pushed out of the situation, which it accidentally occupies.

A man in going down stairs, meets with a fall, and dislocates the humerus downward; he immediately sends for Desault, who defers the reduction till the evening. In the meantime, the patient in getting upon a chair, slips and falls again. The pain was more acute, than when the first accident occurred, and Desault, on his return, instead of finding the head of the humerus as it was in the morning, in the hollow of the axilla, finds it behind the pectoralis major muscle.

The action of muscles is a permanent cause of a new dislocation. When the humerus is luxated downward, the pectoralis major, and the deltoid draw the upper part of this bone upward, and inward, which, only making a weak resistance to their action, changes its position, and takes one in the above double direction.

The various motions imparted to the arm, may also produce the same effect, according to their direction. Thus, in consequence of unskilful efforts to reduce the bone, a luxation inward frequently follows one downward. By the French surgeons, a great deal of importance has been attached to the division of dislocations of the humerus into primary and consecutive: and perhaps, some of their statements on the secondary change in the position of the head of the bone, may be exaggerated. That a subsequent alteration in the situation of the bone may happen, from the causes, specified by Desault, can hardly be questioned. The observations of Petit, Hey, and others, confirm the fact; and I have myself seen a dislocation in the axilla change into one forward, under the pectoral muscle. However, Sir Astley Cooper believes, that excepting from violence, and the effect of absorption, the nature and direction of a dislocation, are never changed, after the muscles have once contracted. (*On Dislocations, p.* 416.) Perhaps, with the latter qualification, no great difference prevails between him and other writers.

SYMPTOMS.

In general, the diagnosis of dislocations of the humerus is attended with no difficulties.

Whatever may be the mode and situation of the dislocation, there always exists, as Hippocrates has remarked, a manifest depression under the acromion, which forms a more evident projection, than in the natural state. Almost all the motions of the arm are painful; some cannot be performed in any degree; and they are all very limited. The arm cannot move without the shoulder moving also, because the articulation being no longer able to execute its functions, both it and the shoulder form, as it were, one body. When the limb is moved, a slight crepitus may sometimes be felt, probably, in consequence of the synovia having escaped through the laceration of the capsule. (*A. Cooper*, *on Dislocations*, *p.* 418.)

To these symptoms, generally characteristic of every sort of dislocation of the humerus, are to be added such as are peculiar to each particular case. When the luxation is downward, the arm is a little longer, than in the natural state; the natural roundness of the shoulder is lost, in consequence of the deltoid muscle being drawn down with the head of the bone; and the patient cannot use the arm. The elbow is more or less removed from the axis of the body by the action of the deltoid, the long head of the biceps, and supraspinatus muscle, being also stretched, and tending to draw the bone outward. The pain, which arises from this position, compels the patient to lean towards the dislocated limb, to keep the forearm half-bent, and the elbow supported on his hip, in such a way, that the arm, having a resting place, may be sheltered from all painful motion, especially that of the elbow inwards. By this posture alone, Desault often recognized the accident. The head of the humerus may be felt in the axilla; but "only when the elbow is considerably removed from the side." (*A. Cooper*, *on Dislocations*, *p.* 417.) This last circumstance is worthy of particular notice, as the inability to feel the head of the bone, has led to mistakes.

With the general symptoms of dislocations of the humerus, a luxation inward has the following: the elbow, separated from the axis of the body, is inclined a little backward; the humerus seems to be directed towards the middle of the clavicle; motion backward is not very painful, but that forward is infinitely so; a manifest prominence under the great pectoral muscle; the arm is said by Desault to be a very little longer than in the natural state: by Sir Astley Cooper, it is described as being somewhat shortened, (*On Dislocations*, *p.* 435.) and the posture is the same, as in the foregoing case. The coracoid process is on the outer side of the head of the bone.

Were a dislocation outward to present itself, it would be particularly characterized by a hard tumor under the spine of the scapula; by the direction of the elbow forward; and by the somewhat increased length of the arm. The motions of the arm are impaired, but not in so great a degree as in the foregoing cases. In one example, related by Mr. Toulmin, of Hackney, the arm could be moved considerably either upwards, or downwards; but, motion forwards, or backwards, was very limited. And from the observations of Mr. Coley, of Bridgenorth, it would seem, that this dislocation may be attended with the peculiarity of the arm lying close to the side. (*A. Cooper on Dislocations*, *p.* 441—443.)

Many authors, particularly B. Bell, speak of an œdematous swelling of the whole upper extremity, as a frequent consequence of a dislocation inward. In the time of Desault and Bichat, this occurrence was not often noticed at the Hôtel Dieu, except in very old luxations; and when it was, very beneficial effects were obtained, in certain instances, by applying, for a few days, a moderately tight bandage from the fingers up to the axilla. Bichat relates a case, in which the œdema did not disappear with the cause, but even rather increased; but the day after a bandage had been applied, the swelling was found diminished by one half. Considerable swelling, which sometimes takes place very rapidly, may render the nature of the accident too obscure for a practitioner imperfectly acquainted with all its signs, to detect it with certainty; and hence, the patient may not have the benefit of right treatment in due time; the bone at length cannot be reduced; a permanently crippled state of the arm is the consequence; the surgeon is sued for heavy damages; and his reputation and prospects are ruined.

There is another consequence, to which authors have paid but little attention; though it was known to Avicenna, and was several times observed by Desault. This is a palsy of the upper extremity, arising from the pressure, made by the head of the bone, when dislocated inward, upon the axillary plexus of nerves, and sometimes resisting every means of relief.

Indeed, when the nerves have been long compressed, the affection is very difficult of cure. Desault several times applied the moxa above the clavicle. The success, which he first experienced in some patients, did not invariably follow in others. But, when the head of the humerus has only made, as it were, a momentary pressure on the nerves, and the reduction has been effected, soon after the appearance of the symptoms, the paralytic affection often goes off of itself, and its dispersion may always be powerfully promoted by the use of volatile liniments.

OF THE REDUCTION.

We may refer to two general classes, the infinitely various number of means, proposed for the reduction of a dislocated humerus. The first are designed to push back, by some kind of mechanical force, the head of the bone, into the cavity from which it is displaced, either with, or without making previous extension. The others are merely intended to disengage the head of the bone from the place which it accidentally occupies, leaving it to be put into its natural situation by the action of the muscles.

By the first means, art effects every thing; by the second, it limits its interference to the suitable direction of the powers of nature. In the first method, the force externally applied always operates on the bone in the diagonal of two powers, which resist each other at a more or less acute angle; in the last, the power is only in one direction.

All the means, intended to operate in the first way, act nearly in the following manner. Something, placed under the axilla, serves as a fulcrum, on which the arm is moved as a lever, the resistance being produced by the dislocated head of the humerus, while the power is applied either to the lower part of this bone, or the wrist. The condyles of the humerus being pushed downward and inward, the head of the bone is necessarily moved in the opposite direction, towards the glenoid cavity, into which it slips with more or less facility.

Thus operated the machine, so celebrated among the ancients and moderns, under the name of the ambi of Hippocrates; whether used exactly in the form described by him, or with the numerous corrections devised by Paul of Ægina, Ambrose Paré, Duverney, Freke, &c. By this machine, a double motion is communicated to the head of the humerus, as above explained.

The extension usually moves the bone from its unnatural situation, and is executed in different ways. Sometimes, the weight of the body on one side, and the dragging of the end of the dislocated bone on the other, tend to produce this effect. Such was the action of the ladder, door, &c. described in Hippocrates's Treatise on Fractures, and repeated in modern works. Sometimes, the trunk is fixed in an unchangeable manner, while the arm is powerfully extended, as is practised in employing the machine of Oribasius, one of the methods formerly adopted in the public places, where wrestlers combated.

Sometimes, no extension is sensibly executed, and while the end of the humerus is pushed outward by a body placed under the axilla, the surgeon pushes it upward into the glenoid cavity.

The following are the objections common to all these contrivances:

However well covered the body placed under the axilla may be, to serve as a fulcrum, there is always a more or less inconvenient chafing, frequently dreadful stretching and laceration of parts, in consequence of its application, when the trunk is suspended upon it, as in the instance of the door, &c. In this way, Petit saw a fracture of the neck of the humerus produced, and even a laceration and aneurism of the axillary artery.

Few surgeons have the different kinds of apparatus at hand. Hence, trouble and loss of time in getting them; time, which is of so much moment, as the reduction is always more easy, the sooner it is accomplished.

When the luxation is consecutive, how can mechanical means bring back the head of the bone, through the track it has taken? For instance, if to a dislocation downward one inward has succeeded, the head of the bone ought to be brought down, before it can be replaced. The above means often do not co-operate with the muscles, which are chief and essential agents in the reduction.

Perhaps, however, they might be advantageously employed, when a primitive luxation downward is quite recent, and when the head of the bone is very near its cavity. Then the inferior costa of the scapula presents an inclined plane, along which the end of the bone can easily glide, when propelled by any kind of external force.

Desault very often employed the following method with great success. While the patient was seated upon a chair of moderate height, he took hold of the hand on the affected side, placed it between his knees, which he moved downward and backward, in order to make the extension and disengage the head of the bone, while an assistant held back the trunk to effect the counter-extension. This was sometimes executed by the weight of the body, and effort of the patient. At the same time, the surgeon's hands being applied to the arm, in such a way, that the four fingers of each were put in the hollow of the axilla, and the thumbs on the outer part of the arm, pushed upward, and a little outward, the head of the humerus, which usually returned with ease into its natural cavity.

Petit describes this plan, but complicated with the use of a napkin, passed under the patient's axilla, and over the surgeon's neck, who contributes to raise the dislocated end of the bone, by lifting up his head.

When the luxation downward was very recent, Desault occasionally reduced it, by a still more simple process. Marie-Louise Favert fell in going down stairs, dislocated her arm downward, and was conveyed, immediately after the accident, to the Hôtel-Dieu. Desault having recognized the disorder, placed his left hand under the axilla, to serve as a fulcrum, while with the right, applied to the lower and outer part of the arm, he depressed the humerus towards the trunk, and at the same time raised the upper part of the bone. The head of the humerus, directed upward and outward by this double motion, returned into the glenoid cavity, without the least resistance.

Reduction, by means of the surgeon's heel in the patient's axilla, is a well-known method, which is commended by Sir Astley Cooper as the best in three-fourths of recent dislocations. The patient (he observes) should be placed in the recumbent posture, upon a table, or a sofa, and near its edge. " The surgeon then binds a wetted roller round the arm, immediately above the elbow, upon which he ties a handkerchief. Then, with one foot resting upon the floor, he separates the patient's elbow from his side, and places the heel of his other foot in the axilla." The arm is then steadily drawn with the handkerchief for three or four minutes, at the end of which, the bone in common cases is easily replaced. If more force be required, a long towel can be used, with which several persons may pull. Sir Astley Cooper generally bends the forearm nearly to a right angle with the os humeri, because this position relaxes the biceps, and lessens its resistance; in many cases, however, he makes the extension at the wrist, a plan, in which he finds more force requisite, but the bandage is less apt to slip.

Another simple mode of reduction, which Sir Astley Cooper considers proper for recent dislocations, delicate females, and very old, relaxed emaciated persons, is that, by means of the surgeon's knee, as a fulcrum, in the patient's axilla. The patient is placed on a low chair, on the side of which the surgeon rests his foot, while he takes hold of the os humeri just above the condyles, and applies his other hand to the acromion. The arm is then drawn down over the knee, and the head of the bone returns into its place. (*On Dislocations, p.* 432.)

In some cases, the preceding methods are inadequate, and greater extension must be made, The following was the practice of Desault:

The patient is laid upon a table covered with a mattress; a thick linen compress is applied to the axilla, on the side affected, and upon this compress the middle of the first extending bandage is placed, the two heads of which ascend obliquely before and behind the chest, meet each other at the top of the sound shoulder, and are held there by an assistant, so as to fix the trunk, and make the counter extension. The action of this bandage does not affect the margin of the pectoralis major and latissimus dorsi, in consequence of the pad projecting over them. If this were not attended to, these muscles being drawn upward, would pull the humerus in this direction, and thus destroy the effect of the extension, which is to be made in the following manner:

Two assistants take hold of the forearm, above the wrist; or else the towel, doubled several times, is to be applied to this part. The two ends are to be twisted together, and held by one or two assistants, who are to begin pulling in the same direction in which the humerus is thrown. After this first proceeding, which is designed to disengage the head of the bone from its accidental situation, another motion is to be employed, which differs according to the kind of luxation. If this should be downward, the arm is to be gradually brought near the trunk, at the same time that it is gently pushed upward. Thus, the head of the bone being separated from the trunk, and brought near the glenoid cavity, usually glides into this situation with very little resistance.

When the luxation is inward, after the extension has been made in the direction of the humerus, the end of this bone should be inclined upward and forward, in order that its head may be guided backward; and *vice versâ*, when the luxation is outward.

When the head of the bone has been disengaged by the first extension, the motion imparted to it by the rest of the extension, should in general be exactly contrary to the course which the head of the bone has taken, after quitting the glenoid cavity. When there is difficulty experienced in replacing the head of the bone, we should, after making the extension, move the bone about in various manners, according to the different direction of the dislocation, and the principle just noticed. This plan often accomplishes what extension alone cannot; and the head of the bone, brought by such movements towards its cavity, returns into it, during their execution.

When the dislocation is consecutive, it is the first extension, made in the direction of the displaced bone, which brings back its head to the situation where it was primitively lodged, and the case is then to be managed just as if it were a primitive dislocation.

Thus, we see, that, except in a few cases, where the beneficial operation of the muscles had been prevented, by the oldness of the dislocation, or by adhesions, and where it was necessary to employ means to force, as it were, the head of the bone into its cavity, to which the muscles could not bring it, Desault only employed extension, variously diversified, till he had put the muscles in a state, favourable for accomplishing reduction.

When the muscles are very powerful, or the displacement has continued several days, Sir Astley Cooper, instead of the treatment by the heel in the axilla, recommends the patient to be put upon a chair, and the scapula to be fixed by means of a bandage, which allows the arm to pass through it, and is buckled on the top of the acromion, so that it cannot slip downward. A wetted roller is next applied round the arm, just above the elbow, and over the roller a strong worsted tape, fixed with what the sailors term the *clove-hitch* knot. The arm should now be raised to a right angle with the body, and, if much difficulty be experienced, even above the horizontal line, in order to relax more completely the deltoid and supraspinatus muscles. Two persons are then to pull the worsted tape, and two the scapula bandage, in opposite directions, with a steady, equal, and combined force. After the extension has been kept up a few minutes, the surgeon is to place his knee in the axilla with his foot resting upon the patient's chair; he now raises his knee, while he pushes the acromion downwards and inwards, and the head of the bone usually slips into the glenoid cavity. Sometimes, Sir Astley Cooper has seen a gentle rotatory motion of the limb, made during the extension, bring about the reduction

In old cases, and others attended with great difficulty from the powerful contraction of the muscles, Sir Astley prefers making the extension with pulleys, because with them, when the resistance is likely to be long, jerks and unequal force are more likely to be avoided, than in the preceding method of reduction; and the assistants less apt to be fatigued. The patient sits between two staples, which are screwed into the sides of the room; the bandages are then applied precisely in the same way as when the extension is made without pulleys; and the force is applied in the same direction. The surgeon is to pull the chord of the pulley gently and steadily, until pain is complained of, when he is to maintain the extension already made, but not increase it. During this stop, he should converse with the patient, and direct his mind to other subjects. In two, or three minutes, more force should be applied, and very gently increased, until pain be again complained of, when another stop should be made. The surgeon should proceed in this way for a quarter of an hour, at intervals slightly rotating the limb. When the extension seems great enough, an assistant should hold the chord of the pulley, and keep up the degree of extension, while the surgeon puts his knee into the axilla, and, resting his foot upon the chair, gently raises and pushes back the head of the bone towards the glenoid cavity, into which it generally returns without the snap usually heard, when the reduction is effected by other means. Sir Astley Cooper precedes the use of the pulleys with venesection, the warm bath, and a grain of tartarized antimony, every ten minutes, until faintness is produced, as already noticed in our general remarks. (*On Dislocations, p.* 429.)

When the head of the humerus is dislocated forwards, or under the middle of the clavicle, Sir Astley Cooper recommends the biceps to be relaxed, and the extension to be made obliquely downwards and a little backwards. In most instances of this kind, he says, the plan of reduction, by means of the heel in the axilla, will succeed, care being taken to apply the foot rather more forward, than in a dislocation into the axilla, so that it may press on the head of the bone. However, when the dislocation has continued several days, he considers gradual extension with pulleys necessary. As soon as the head of the bone has been drawn below the level of the coracoid process, it is to be pressed backwards with the surgeon's heel, or knee, and the elbow at the same moment pulled forwards. (*Op. cit. p.* 439.)

The dislocation on the dorsum of the scapula appears, from some cases in Sir Astley Cooper's work, to be reducible by nearly the same mode of extension, as that employed for the reduction of the dislocation in the axilla. Mr. Coley, of Bridgenorth, who has met with two cases of luxation backwards, advises the reduction to be effected by elevating the arm, and rotating it outwards, so as to roll the head of the humerus towards the axilla, when it is to be kept in this position, while the arm is brought down into a horizontal direction: on the extending force being now applied, the bone is easily reduced. (*Op. cit. p.* 444.)

In the partial dislocation forwards, or that where the head of the bone lies at the scapular side of the coracoid process, the mode of reduction, according to Sir Astley Cooper, is the same as that employed in the complete dislocation forwards; but it is necessary to draw the shoulders backwards, and as soon as the reduction is accomplished, the bone is to be kept from slipping forwards again by maintaining the shoulders in that position with a bandage. (*Op. cit. p.* 449.) The elbow and forearm should also be supported, as much forward as possible, in a sling.

In the museum of St. Thomas's Hospital is a preparation, exhibiting a dislocation of the humerus into the axilla, complicated with a separation of the greater tubercle by fracture. In Sir Astley Cooper's valuable work on this subject is also recorded a case of compound dislocation of the shoulder, which was under the care of Messrs. Saumarez and Dixon, of Newington, and was cured by anchylosis. (*P.* 450.) Such an accident must be treated on the same principles as other severe compound dislocations.

For the purpose of preventing the head of the bone from slipping out of its place again, the arm should be kept for some days quiet, the elbow bandaged close to the side, and supported in a sling. Sir Astley Cooper recommends a cushion to be put in the axilla, and a stellate bandage and sling to be applied. (*On Dislocations, p.* 432.) After the reduction of a dislocation, which has happened downward, the facility of a fresh displacement is said to depend very much upon the extent to which the tendon of the subscapularis muscle has been lacerated. (*A. Cooper's Surgical Essays, Part* 1, *p.* 7.)

OF SOME CIRCUMSTANCES, RENDERING THE REDUCTION DIFFICULT.

1. *Narrowness of the opening of the Capsule.*

While Desault considers this circumstance as one of the chief impediments to the return of the head of the humerus into the glenoid cavity, Pott and Sir Astley Cooper are of opinion, that the capsular ligament can never create any such difficulty. According to Desault, the obvious indication is to enlarge such an opening, by lacerating its edges. This is fulfilled by moving the bone about freely, in every direction, particularly in that in which the dislocation has taken place. Now, by pushing the head of the bone against the capsule already torn, the latter becomes lacerated still more, in consequence of being pressed between two hard bodies. The reduction, which is frequently impracticable before this proceeding, often spontaneously follows, immediately after it has been adopted. In the *Journal de Chirurgie* are two cases, by Anthaume, and Faucheron, establishing this doctrine.

Mr. C. White of Manchester, also believed, that the reduction was sometimes prevented by the head of the bone not being able to get through the laceration in the capsule again. He succeeded in reducing some cases which he supposed to be of this nature, in the following manner: having screwed an iron ring into a beam at the top of the patient's room, he fixed one end of the pulleys to it, and fastened the other to the dislocated arm by ligatures attached to the wrist, placing the arm in an erect position. In this way, he drew up the patient, till his whole body was suspended; but, that too much force might not be sustained by the wrist, Mr. White at the same time directed two other persons to support the arm above the elbow. He now used to try with his hands to conduct the arm into its place, if the reduction had not already happened, as was sometimes the case. Occasionally, a snap might be heard, as soon as the patient was drawn up; but, the reduction could not be completed, till he was let down again, and a trial made with the heel in the arm-pit. When no iron ring was at hand, Mr. White used to have the patient raised from the ground by three or four men, who stood upon a table. (*Cases in Surgery, p.* 95.)

2. *Oldness of the Dislocation.*

When the head of the bone has lodged a long while in its accidental situation, it contracts adhesions to it. The surrounding cellular substance becomes condensed, and forms, as it were, a new capsule, which resists reduction, and which, when such reduction cannot be accomplished, supplies, in a certain degree, the office of the original joint, by allowing a considerable degree of motion.

In such cases, the common advice used to be, that no attempt at reduction should be made, as it would be useless in regard to the dislocation, and might be injurious to the patient, from the excessive stretching of parts. This was for some time the doctrine of Desault; but, in his latter years, experience led him to be bolder.

Complete success, obtained in dislocations, which had existed from fifteen to twenty days, encouraged him to attempt reduction at the end of thirty, and thirty-five days, and, in the two years preceding his death, he succeeded, three or four times, in reducing dislocations which had existed two months and a half, and even three months, both when the head of the bone was situated at the lower, and at the internal part of the scapula.

In these cases, it is necessary, before making the extension, to move the bone about extensively in all directions, for the purpose of first breaking its adhesions, lacerating the condensed cellular substance, which forms an accidental capsule, and of producing, as it were, a second dislocation, in order to remove the first. Extension is then to be made in the ordinary way, but with an additional number of assistants.

The first attempts frequently fail, and the dislocated head of the bone continues unmoved, notwithstanding the most violent efforts. In this case, after leaving off the extension, the arm is to be again moved about very extensively. The humerus is to be carried upward, downward, forward, and backward. Force the resistances. Let the arm describe a large segment of a circle, in the place where it is situated. Let it be once more rotated on its axis; then let the extension be repeated, and directed in every way. Thus, the head of the bone will first be disengaged by the free motion, and afterwards reduced.

In these cases, when the dislocation, in consequence of being very old, presents great obstacles to reduction, even though the attempts made for this purpose should fail, they are not entirely useless. By forcing the head of the bone to approach the glenoid cavity, and even placing it before the cavity, and making it form new adhesions, after the destruction of the old ones, the motions of the arm are rendered freer. Indeed, they are always the less obstructed, the nearer the head of the bone is to its natural situation. Notwithstanding the encouragement, given by Desault, to making attempts to reduce old dislocations of the humerus, experience proves, that when the bone has been out of its place more than a month, success is rarely obtained. And, as for the danger, which may arise from long protracted immoderate force, a case, which, I have elsewhere cited, proves, that caution is here a virtue, which cannot be too highly commended. (See *First Lines of Surgery, Vol.* 2, *p.* 465.) Another instance, in which a woman died from the violence used in the extension, is reported by Sir Astley Cooper. (*On Dislocations*, *p.* 422.)

3. *Contractions of the Muscles.*

A third impediment to the reduction of every kind of dislocation, is the power of the muscles, which is augmented beyond the natural degree, in consequence of their being on the stretch. Sometimes, this power is so considerable, that it renders the head of the bone immoveable, though the most violent efforts are made. Here the means to be adopted are such as weaken the patient, bleeding, the warm bath, nauseating doses of tartarized antimony, as advised by Loder, Sir Astley Cooper, &c.; opium, &c. Should the patient happen to be intoxicated at the time of his being first seen by the surgeon, the opportunity would be very favourable to reduction, as the muscles would then be capable of less resistance. Extension unremittingly, but not violently, continued for a length of time, will ultimately fatigue the resisting muscles, and overcome them with more safety and efficacy, than could be accomplished by any sudden exertion of force. In all cases of difficulty, pulleys should be preferred.

The swelling about the joint, brought on by the accident, usually disappears without trouble.

Another consequence, which seldom occurs in practice, but which Desault saw twice, is a considerable emphysema, suddenly originating at the time of reduction. In the middle of such violent extension, as the long standing of the dislocation requires, a tumor suddenly makes its appearance under the great pectoral muscle. Rapidly increasing, it spreads towards the arm pit, the whole extent of which it soon occupies. It reaches backward, and, in a few minutes, sometimes becomes as large as a child's head. A practitioner, unacquainted with this accident, might take it for an aneurism, occasioned by the sudden rupture of the axillary artery, by the violent extension. But, if attention be paid to the elasticity of the tumor, its fluctuation, the situation where it first appears, commonly under the great pectoral muscle, and not in the axilla; the continuance of the pulse; and the unchanged colour of the skin; the case may easily be discriminated from a rupture of the artery. (*Œuvres Chir. de Desault, par Bichat, T.* 1.)

For dispersing the above kind of swelling, the lotio plumbi acetatis, and gentle compression with a bandage, are recommended.

I shall conclude the subject of luxations of the shoulder with the following singular observation, recorded by Baron Larrey.

" Among the curious anatomical preparations, (says he) which I saw in the cabinet of the University of Vienna, there was a dissected thorax, shown to me by Professor Prokaska, in which the whole orbicular mass of the head of the right humerus, engaged between the second and third true ribs, projected into the cavity of the chest. This singular displacement was the result of an accidental luxation, occasioned by a fall on the elbow, while the arm was extended and lifted from the side. The head of the humerus, after tearing the capsular ligament, had been violently driven into the hollow of the axilla, under the pectoral muscles, so as to separate the two corresponding ribs, and pass between them. The diameter of the head of the bone surmounted this obstacle, and penetrated entirely into the cavity of the thorax, pushing before it the adjacent portion of the pleura. Every possible effort was made in vain to reduce this extraordinary dislocation. The urgent symptoms, which arose, were dissipated by bleeding, warm bathing, and antiphlogistic remedies. The arm, however, remained at a distance from the side, to which condition, the patient became gradually habituated, and, after several years of suffering and oppression, he at length experienced no inconvenience. The patient was about sixteen or seventeen, when he met with the accident; and he lived to the age of thirty-one, when he died of some disease, which had no concern with the dislocation. His physicians were anxious to ascertain the nature of this curious case, of which they had been able to form only an imperfect judgment. They were much surprised to find, upon opening the body, the head of the humerus lodged in the chest, surrounded by the pleura, and its neck closely embraced by the two ribs above specified. They were still more astonished to find, instead of a hard spherical body covered with cartilage, only a very soft membranous ball, which yielded to the slightest pressure of the finger. The cartilage and osseous texture of the whole portion of the humerus, contained within the cavity of the chest, had entirely disappeared. *Les absorbans s'en étaient emparés* (says M. Larrey), *et comme autant de gardiens fidèles, ils avaient cherché à détruire par portions, n'ayant pu l'expulser en masse, un ennemi qui s'était furtivement introduit dans un domicile où sa presence devait étre importune et nuisible.* Of the humerus, there only remained some membranous rudiments of its head, and a great part of these seemed to belong to the pleura costalis. (*Mémoires de Chirurgie Militaire, T.* 2, *p.* 405—407.)

DISLOCATIONS OF THE FORE ARM FROM THE HUMERUS.

Notwithstanding the extent of the articular surfaces of the radius and ulna, the strength of the muscles and ligaments surrounding the joint, and the mutual reception of the bony eminences, rendering the articulation a perfect angular ginglymus, a dislocation of both the radius and ulna from the humerus, is an accident for which a surgeon is sometimes consulted. The radius and ulna are most frequently luxated backward; sometimes laterally, but very rarely forward: the latter luxation cannot occur without a fracture of the olecranon. Indeed, it is so uncommon, that neither Petit nor Desault ever met with it. The luxation backwards is facilitated by the small size of the coronoid process, which, when the humerus is forcibly pushed downwards and forwards, may slip behind it, and ascend as high as the cavity, which receives the olecranon in the extended state of the fore-arm.

Sir Astley Cooper's experience has made him acquainted with five different luxations of the elbow: 1. That of the radius and ulna backwards. 2. That of both these bones laterally. 3. That of the ulna alone. 4. That of the radius alone forwards. 5. That of the radius backwards. (*On Dislocations, p.* 467.)

In the luxation backwards, the radius and ulna may ascend more or less behind the humerus; but the coronoid process of the ulna is always carried above the articular pulley, and is found lodged in the cavity destined to receive the olecranon The head of the radius is placed behind and above the external condyle of the humerus. The annular ligament, which confines the superior extremity of the radius to the ulna, may be lacerated: in which case, even when the bones are reduced, it is difficult to keep them in their proper places, as the radius tends constantly to quit the ulna.

This accident always takes place from a fall on the hand; for, when we are falling, we are led by a mechanical instinct to bring our hands forwards to protect the body. If, in this case, the superior extremity, instead of resting vertically on the ground be placed obliquely with the hand nearly in a state of supination, the repulsion which it receives from the ground will cause the two bones of the fore-arm to ascend behind the humerus, whilst the weight of the body pressing on the humerus, directed obliquely downwards, forces its extremity to pass down before the coronoid process of the ulna.

The fore-arm is in a state of half-flexion, and every attempt to extend it produces acute pain. The situation of the olecranon, with respect to the condyles of the humerus, is changed. The olecranon, which, in the natural state, is placed on a level with the external condyle, which is itself situated lower than the internal, is even higher than the latter. Posteriorly a considerable projection is formed by the ulna and radius. On each side of the olecranon, a hollow appears. A considerable hard swelling is felt on the fore part of the joint, arising from the projection of the lower end of the humerus. The hand and fore-arm are supine, and the power of bending the joint is in a great measure lost. (*Sir Astley Cooper on Dislocations, p.* 468.)

The swelling which supervenes in twenty-four hours after the accident, renders the diagnosis more difficult; but notwithstanding the assertion of Boyer, I believe the olecranon and internal condyle, are never so obscured, that the distance between them cannot be felt to be increased. It is true, that the rubbing of the coronoid process and olecranon against the humerus, may cause a grating noise, similar to that of a fracture; and some attention is certainly requisite to establish a diagnosis between a fracture of the head of the radius, and a dislocation of the fore-arm backwards. "This dislocation (says Sir Astley Cooper), is at first sometimes undiscovered, in consequence of the great tumefaction, which immediately succeeds the injury; but, this circumstance does not prevent the reduction, even at the period of several weeks after the accident; for, I have known it thus reduced by bending the limb over the knee, even without great violence being employed." (*On Dislocations, &c. p.* 470.)

A luxation backward, must be attended with serious injury of the surrounding soft parts. The lateral ligaments are constantly ruptured, and sometimes the annular ligament of the radius. In a case, dissected by Sir Astley Cooper, the annular ligament was entire. The biceps muscle was only slightly put upon the stretch; but the brachialis was excessively so. Probably the lower insertions of the biceps and brachialis internus would likewise be more frequently lacerated, by the violent protrusion of the head of the humerus forwards, were it not that their attachments are at some distance from the joint. This mischief, however, occasionally takes place, and, then the fore-arm is observed to be readily placed in any position, and not to retain one attitude, as is generally the case in dislocations. The lower end of the humerus, indeed, has been known not only to lacerate these muscles, but to burst the integuments, and present itself externally; an instance of which is recorded by Petit, and two such cases I saw myself during my apprenticeship at St. Bartholomew's. Boyer justly remarks, that it is difficult to conceive how under these circumstances, the brachial artery and median nerve can escape. In fact, this vessel has sometimes been ruptured, and mortification of the limb been the consequence; but, this injury of the artery, and the laceration of the muscles and skin, are rare occurrences. (*Traité des Mal. Chir. T.* 4, *p.* 215.) Nor, if the artery were wounded, would gangrene be invariably the result; for, if my memory is correct, an instance, in which the limb was saved, notwithstanding such a complication, is mentioned by Mr. Abernethy in his lectures, though, no doubt, the risk would be great.

The following method of reducing the case, is advised by Boyer: —The patient being seated, an assistant is to take hold of the middle of the humerus, and make counter-extension, while another assistant makes extension at the wrist. The surgeon, seated on the outside, grasps the elbow with his two hands, by applying the fore-fingers of each to the anterior part of the humerus, and the thumbs to the posterior, with which he presses on the olecranon, in a direction downwards and forwards.—This method will generally be successful. If the strength of the patient, or the long continuance of the luxation, renders it necessary to employ a greater force, extension is to be made with a towel applied on the wrist, and a cushion is to be placed in the axilla, and the arm and trunk fixed, as is done in cases of luxation of the humerus.

In Sir Astley Cooper's method, the patient sits in a chair. The surgeon places his knee on the inner side of the elbow joint, in the bend of the arm, and taking hold of the patient's wrist, bends the arm. At the same time, he presses on the radius and ulna with his knee, so as to separate them from the os humeri. Thus the coronoid process is pushed out of the posterior fossa of the humerus; and whilst the pressure is kept up with the knee, the arm is to be forcibly, but slowly, bent, and the reduction is soon effected. According to the same authority, the bones may also be reduced by bending the arm over a bed-post, or by bending it whilst it is engaged in the opening of the back of the elbow chair in which the patient sits. (*On Dislocations, p.* 469.)

A bandage may afterwards be applied, in the form of a figure of 8, evaporating lotions used, and the arm kept in a sling. The swelling, which follows, is to becombated by antiphlogistic means.

At the end of seven or eight days, when the inflammation has subsided, the articulation is to be gently moved, and the motion is to be increased every day, in order to prevent an anchylosis, to which there is a great tendency.

In this luxation, the annular ligament which confines the head of the radius to the extremity of the ulna, is sometimes torn, and the radius passes in front of the ulna. In such cases, pronation and supination are difficult and painful, though the principal luxation has been reduced, the head may be easily replaced, by pressing it from before backwards, and it is to be kept in its place by a compress, applied to the superior and external part of the fore-arm. The bandage and compress are to be taken off every two or three days, and the joint gently bent and extended, in order to prevent anchylosis.

In a modern publication, an instance of a dislocation of the heads of the radius and ulna backward is related, where the lower end of the humerus protruded through the integuments, and as it could not be reduced, it was sawn off. The patient, a boy, recovered the full use of his arm. (*Evans, Pract. Obs. on Cataract; Compound Dislocations, &c. p.* 101, *Wellington*, 1815.)

A luxation forwards should be treated as a fracture of the olecranon, with which it would be inevitably accompanied. Here, on account of the great injury done to the soft parts, it would also be right to bleed the patient copiously, and put him on the antiphlogistic regimen.

With respect to lateral luxations, either inwards or outwards, they are always incomplete, and easily discovered. In the case outwards, the coronoid process is situated on the back part of the external condyle. The projection of the ulna backwards is even greater, than in the dislocation of both bones directly backwards, and the radius forms a protuberance behind, and on the outer side of the os humeri. By moving the hand, the rotation of the head of the humerus can be distinctly felt. In the lateral dislocation inwards, the ulna may be thrown upon the internal condyle, so as to produce an apparent hollow above it, and the rotation of the head of the radius can be distinctly felt. Sometimes, when the ulna is thrown upon the internal condyle, it still projects backwards, as in the external lateral dislocation, in which circumstance, the head of the radius is in the posterior fossa of the humerus, and the outer condyle forms a considerable projection. (*A. Cooper, Op. cit. p.* 471.) Boyer advises the reduction of lateral dislocations to be effected, by extending the humerus and fore-arm, and at the same time pushing the extremity of the humerus, and the heads of the ulna and radius, in opposite directions.

According to Sir Astley Cooper, in each of the lateral dislocations, the reduction may be performed, by bending the arm over the knee; but in a recent case, as one which he relates proves, he considers that the business may be most readily accomplished by forcibly extending the arm; for when this is done, the biceps and brachialis draw the heads of the radius and ulna into their right places again. (*p.* 472.)

These luxations cannot be produced without considerable violence; but when the bones are reduced, they are easily kept in their place. It will be sufficient to pass a roller round the part, to put the fore-arm in a middle state, neither much bent nor extended, and to support it in a sling. But much inflammation is to be expected from the injury done to the soft parts. In order to prevent, or at least mitigate it, the patient is to be bled two or three times, and put on a low diet, and the articulation is to be covered with the lotio plumbi acet. or an emollient poultice. It is scarcely necessary to repeat, that the arm is to be moved as soon as the state of the soft parts will admit of it. (*Boyer, sur les Maladies des Os, T.* 2.)

A dislocation of the fore-arm backward, is said to occur ten times as frequently as lateral luxations; and those forward are so rare, that no comparison whatever can be drawn. (*Œuvres Chir. de Desault, T.* 1.)

All recent dislocations of the elbow are easily reduced, and as easily maintained so; for a displacement is prevented by the reciprocal manner in which the articular surfaces receive each other, and by their mutual eminences and cavities. This consideration, however, should not lead us to omit the application of a bandage in the form of a figure of 8, and supporting the arm in a sling.

DISLOCATION OF THE RADIUS FROM THE ULNA.

The majority of writers on dislocations of the fore-arm, have not separately considered those of the radius. The subject was first well treated of by Duverney. However, dislocations of its lower end remained unnoticed, until Desault favoured the profession with a particular account of them.

The radius, the moveable agent of pronation and supination, rolls round the ulna, which forms its immoveable support, by means of two articular surfaces; one above, slightly convex, broad internally, narrow outwardly, and corresponding to the little sigmoid cavity of the ulna, in which it is lodged; the other below, concave, semicircular, and adapted to receive the convex edge of the ulna. Hence, there are two joints, differing in their motions, articular surfaces, and ligaments.

Above, the radius, in pronation and supination, only moves on its own axis: below, it rolls round the axis of the ulna. Here, being more distant from the centre, its motions must be both more extensive and powerful, than they are above. The head of the radius, turning on its own axis in the annular or coronary ligament, cannot distend it in any direction. On the contrary, below, the radius, in performing pronation, stretches the posterior part of the capsule, and presses it against the immoveable head of the ulna, which is apt to be pushed through, if the motion be forced. A similar event, in a contrary direction, takes place in supination. The front part of the capsule being rendered tense, may now be lacerated.

Add to this disposition, the difference of strength between the ligaments of the two joints. Delicate and yielding below; thick and firm above; their difference is very great. The upper head of the radius, supported on the smaller immoveable articular surface of the ulna, is protected from dislocation in most of its motions. On the contrary, its lower end, carrying along with it, in its motions, the bones of the carpus, which it supports, cannot itself derive any solid stability from them.

From what has been said, the following conclusions may be drawn: 1. That with more causes of luxation, the lower articulation of the radius has less means of resistance; and, that under the triple consideration of motions, ligaments tying the articular surfaces together, and the relations of these surfaces to each other, this joint must be very subject to dislocation. 2. That, for opposite reasons, the upper joint must, according to Desault, be rarely exposed to such an accident. He here excludes from consideration, cases in which the annular ligament of the radius is lacerated in a luxation of both heads of the radius and ulna backwards; and particularly confines his reasoning to a dislocation of the upper head of the radius from the lesser sigmoid cavity of the ulna, as a single and uncomplicated injury, suddenly produced by an external cause, and, therefore, neither to be confounded with the cases above specified, nor with other examples, in which the displacement happens slowly, especially in children, in consequence of a diseased or relaxed state of the ligaments.

However, some instances of dislocation of the upper head of the radius, suddenly produced by external causes, are recorded by Duverney; the particulars of another case were transmitted to the French Academy of Surgery; and I have been informed of four examples, which were met with in this country.

Two of these cases occurred in the practice of Mr. Dunn, of Scarborough; one in that of Mr. Lawrence; and the other was attended by Mr. Earle. Sir Astley Cooper has himself seen six examples of the dislocation of the head of the radius forwards. Baron Boyer says, that many instances are now known, in which the upper head of the radius was dislocated backwards; indeed, in opposition to what Desault has stated, he asserts, that dislocations of the lower joint between the radius and ulna are more rare, than those of the upper joint between the same bones. The latter accident he has twice seen himself. (*Mal. Chir. T.* 4, *p.* 248.)

The displacement backwards is described by this author, as occurring more readily and frequently in children, than in adults, or old subjects. The reason of this circumstance is ascribed to the lesser firmness both of the ligaments and of the tendinous fibres of the exterior muscles, which fibres, in a more advanced age, contribute greatly to strengthen the external lateral ligament. In a child, also, the little sigmoid cavity of the ulna is smaller, and the annular ligament, extending further round the head of the radius, is longer, and more apt to give way. Hence, in a subject of this description, efforts, which may not at first produce a dislocation, if frequently repeated, cause a gradual elongation of the ligaments, a change in the natural position of the bones, and, at length, a degree of displacement as great as in a case of luxation, suddenly and immediately effected. (*Traité des Mal. Chir. T.* 4, *p.* 239.)

Another fact, mentioned by Boyer, is, that the dislocation of the upper head of the radius backwards is always complete, its articular surfaces being perfectly separated both from the lower end of the humerus, and from the little sigmoid cavity of the ulna. The usual cause of the accident is a pronation of the fore-arm, carried with great violence beyond the natural limits.

In a dislocation of the head of the radius backwards, the fore-arm is bent, and the hand fixed in the state of pronation. Supination can neither be performed by the action of the muscles, nor by external force; and every attempt to execute this movement produces a considerable increase of pain. The hand and fingers are moderately bent, and the upper head of the radius may be observed forming a considerable projection behind the lesser head of the humerus. In the case, which was mentioned to me by my friend Mr. Lawrence, the head of the radius lay upon the outside of the external condyle.

Sir Astley Cooper has never seen a dislocation of the upper head of the radius backwards in the living subject; but a man was brought for dissection into the theatre of St. Thomas's hospital, who had such a dislocation, which had never been reduced. The head of the radius was thrown behind the external condyle, and rather to the outer side of the lower extremity of the humerus. The forepart of the coronary ligament was torn through, as well as the oblique one, and the capsular was partially lacerated.

In the kind of case described by Sir Astley Cooper, where it seems the limb was extended, this experienced surgeon conceives, that the bone would be easily reduced by bending the arm.

The reduction is to be accomplished, by extending the fore-arm, and endeavouring to bring it into the supine posture, at the same time, that the surgeon tries to press with his thumb the head of the radius forwards, towards the lesser tubercle of the humerus, and into the little sigmoid cavity of the ulna again. Success is indicated by the patient being now able to perform the supine motion of the hand, and to bend and extend the elbow with freedom.

For the purpose of preventing a return of the displacement, and giving nature an opportunity of repairing the torn ligaments, measures must be taken to hinder the pronation of the hand. Boyer recommends with this view a roller, compresses, and a sling; but, it appears to me, that a splint, extending nearly to the extremity of the fingers, and laid along the inside of the fore-arm, with a pad of sufficient thickness to keep the hand duly supine, would be right, in addition to the sling, roller, &c.

In the dislocation of the head of the radius forwards, this part is thrown into the hollow above the external condyle, and upon the coronoid process of the ulna. According to Sir Astley Cooper, the fore-arm is slightly bent, but cannot be bent to a right angle, nor completely extended. When it is suddenly bent, the head of the radius strikes against the fore-part of the os humeri. The hand is in the prone position, and, if rotated, the corresponding motion of the head of the radius can be felt at the upper and front part of the elbow joint. The coronary or annular, the oblique ligament, the front of the capsular, and a portion of the interosseous ligament, are torn.

Sir Astley says, that the cause of this accident is a fall upon the hand, when the arm is extended; in which event, the radius receives the weight of the body, and is forced up by the side of the ulna, and thrown over the external condyle upon the coronoid process. In two of the cases recorded by him, the reduction could not be accomplished: in the third, it was effected during a syncope, by extending the fore-arm, while the olecranon rested on Sir Astley's foot. In the fourth, the patient was placed on a sofa, and his arm bent over the back of it, in which state, extension was made from the hand, *without including the ulna*. The sofa fixed the os humeri, and the reduction was accomplished in a few minutes. The chief things to be observed are, to let the extension act upon the radius alone, without the ulna, and during the extension to let the hand be supine. (*Dislocations, p.* 474-477.) In the latter posture, the fore-arm should also be kept by means of a splint, pad, and bandage, until the torn parts are healed.

DISLOCATION OF THE LOWER END OF THE RADIUS.

The causes are, 1. Violent action of the pronator and supinator muscles. Thus, Desault has published the case of a laundress, who dislocated the lower end of the radius forwards, by a powerful pronation of her hand in twisting a wet sheet. (*Boyer, Traité des Mal. Chir. T.* 4, *p.* 249.)

2. External force, moving the radius violently into a state of pronation, and rupturing the back part of the capsule; or into a state of supination, and breaking its fore part.

Hence, there are two kinds of dislocation: one of the radius forward; the other backward. The first is very frequent; the second is much less so. The latter case is not mentioned by Sir Astley Cooper, and never presented itself to Desault but once in the dead body of a man, both of whose arms were dislocated, and of whom no particulars could be learnt. The head of the ulna was placed in front of the sigmoid cavity of the radius, and in contact with the os pisiforme, to which it was connected by a capsular ligament. (*Boyer, Traité des Mal. Chir. T.* 4, *p.* 249.) The latter writer has also recorded one instance of this rare accident. (*Vol. cit. p.* 253.)

In the dislocation of the lower head of the radius forwards, described by Sir Astley Cooper, this part is thrown upon the front of the carpus, and lies upon the os scaphoides and the os trapezium.

The luxations of the lower head of the radius described by Desault, are the same as those named by Sir Astley Cooper, dislocations of the lower end of the ulna from the radius, and differ from the case, called by him, a luxation of the radius only at the wrist, inasmuch as the hand is not thrown in the opposite direction to that of the radius; but this bone is merely displaced from the convex articular surface of the ulna, the hand going along with it. This circumstance makes a material difference in the mode of reduction, with reference to the direction in which the hand is to be pushed. In the luxation of the lower head of the radius forward, described by Desault, the symptoms are, constant pronation of the fore-arm; an inability to perform supination, and great pain on its being attempted; an unusual projection at the back of the joint, in consequence of the protrusion of the little head of the ulna through the capsule; the position of the radius is more forward than natural; constant adduction of the thumb, which is almost always extended; a half-bent state of the fore-arm, and very often of the fingers, which posture cannot be changed, without considerable pain. The outer side of the hand is twisted backwards, and the inner forwards. The protuberance made on the fore part of the wrist by the head of the radius is very evident, and, as Sir Astley Cooper observes, the styloid process of the radius is no longer situated opposite to the os trapezium. This case, he says, usually happens from a fall while the hand is bent back. (*On Dislocations, p.* 503.)

Sometimes the lower head of the radius is driven through the skin at the inside of the wrist, between the radial artery, and the mass formed of the flexor tendons of the wrist and fingers. Cases of this description, when well managed, generally have a favourable termination, as we see in the case reported by M. Thomassin. (*Journ. de Med. T.* 39.)

If the smallness of the opening in the skin cause an impediment to reduction, the integuments should be divided with a knife.

A luxation of the radius backward is characterized by symptoms, the reverse of those above-mentioned. They are, a violent supination of the limb; inability to put it prone; pain on making the attempt; a tumor in front of the fore-arm formed by the head of the ulna; a projection backward of the large head of the radius; and abduction of the thumb.

When the dislocation is forward, an assistant is to take hold of the elbow, and raise the arm a little from the body; while another is to support the hand and fingers.

The surgeon is to take hold of the end of the fore-arm with both his hands; one applied to the inside, the other to the outside, in such a manner, that the two thumbs meet each other in front of the limb, between the ulna and radius, while the fingers are applied to the back of the wrist. He is then to endeavour to separate the two bones from each other, pushing the radius backward and outward, while the ulna is held in its proper place. At the same time, the assistant, holding the hand, should try to bring it into a state of supination, and consequently the radius, which is its support. Thus pushed, in the direction contrary to that of the dislocation, by two powers, the radius is moved outward, and the ulna returns into the opening of the capsule, and into the sigmoid cavity.

Sir A. Cooper, who describes this case, under the name of a dislocation of the lower end of the ulna backward, reduces it by pressing the bone forwards, and maintains the reduction with splints, well padded, and a compress of leather over the end of the ulna. (*On Dislocations, p.* 505.)

If chance should present a dislocation of the lower head of the radius backward, or, in other words, of the lower head of the ulna forwards, the same kind of proceeding, executed in the opposite direction, would serve to accomplish the reduction. (See *Œuvres Chir. de Desault, T.* 1.)

In the luxation of the lower head of the radius forwards, upon the carpus, Sir Astley Cooper effects the reduction by extending the hand, while the fore-arm is fixed. (*On Dislocations, p.* 504.)

DISLOCATIONS OF THE WRIST.

The carpal bones may be luxated from the lower ends of the radius and ulna forwards, or backwards: The case backwards is the most frequent. It is facilitated by the direction of the convex articular surfaces of the scaphoid, lunar, and cuneiform bones, which slope more backwards than forwards. According to Sir Astley Cooper, the direction of the force determines the direction, in which the carpal bones are thrown: thus, if a person in falling, put out his hand to save himself, and fall upon the palm, a dislocation is produced, the radius and ulna are forced forwards upon the annular ligament, and the carpal bones are thrown backwards. A considerable swelling is produced by the radius and ulna on the fore part of the wrist, and a similar protuberance upon the back of the wrist by the carpus, with a depression above it, and the hand is bent back.

When the carpal bones are dislocated forwards under the flexor tendons, and the radius and ulna backwards upon the posterior part of the carpus, the accident has been caused by a fall on the back of the hand.

In each of these cases, two swellings are produced; one by the radius and ulna; the other, by the bones of the carpus. Sprains will often cause a great swelling over the flexor tendons, and give rise to the suspicion of a luxation, from which they may always be known by the swelling being single, and its not having made its appearance directly after the injury.

Dislocations inwards, or outwards, are never complete. The projection of the carpal bones at the inner, or outer side of the joint, and the distortion of the hand, make such cases sufficiently evident.

Recent dislocations of the wrist, particularly such as are incomplete, are easy of reduction; but, when the displacement has been suffered to continue some time, more difficulty is experienced, and, in a few days, all attempts are generally unavailing. This observation applies to all dislocations of ginglymoid joints; and I cannot, therefore, too strongly condemn the waste of time in trials to disperse the swelling of the soft parts, ere the bones are replaced; an absurd plan, which, I am sorry to say, is sanctioned by Boyer. (*Mal. Chir. T.* 4, *p.* 260.)

For the purpose of reducing the dislocated bones, gentle extension must be made, while the two surfaces of the joint are made to slide on each other in a direction contrary to what they took when the accident occurred.

In dislocations of the wrist, numerous tendons are always seriously sprained, and many ligaments lacerated; consequently a good deal of swelling generally follows, and the patient is a long time in regaining the perfect use of the joint. Hence, the propriety of bleeding, low diet, and opening, cooling medicines; while the hand and wrist should be continually covered with linen wet with the lotio plumbi acetatis, or spirit of wine and water, and the fore-arm and hand kept in splints, which ought to extend nearly to the end of the fingers, so as to prevent a return of the displacement. The limb must also remain quiet in a sling.

When the ruptured ligaments have united, liniments will tend to dispel the remaining stiffness and weakness of the joint.

DISLOCATIONS OF THE CARPUS, METACARPUS, FINGERS AND THUMB.

A simple dislocation of the carpal bones from each other seems almost impossible. The os magnum, however, has been known to be partially luxated from the deep cavity formed for it in the os scaphoides and os lunare. This displacement is produced by too great a flexion of the bones of the first phalanx on those of the second, and the os magnum forms a tumor on the back of the hand. (*Chopart; Boyer; Richerand.*)

Chopart once met with a partial luxation of the os magnum in a butcher. Baron Boyer has seen several examples of the accident, which, he says, is more common in women, than men; a circumstance, which he imputes to the ligaments being looser in females, and to the bones of the carpus in them having naturally a greater degree of motion. The tumor increases, when the hand is bent, and diminishes, when it is extended. The case does not produce any serious inconvenience. If the wrist be extended, and pressure be made on the head of the os magnum, the reduction is easily accomplished; though a renewal of the displacement cannot be prevented, unless the extension and compression be kept up by means of a suitable apparatus, during the whole time, requisite for the healing of the torn ligaments. As the inconveniences of the accident are slight, few patients will submit to any tedious, irksome treatment; and sometimes the surgeon is never consulted, till it is too late to think of replacing the bone. In general, therefore, the surgeon is obliged to be content with treating the case as a sprain, or contusion.

Sir Astley Cooper has seen two cases of displacement of the os magnum in females: the accidents produced a weakened state of the limb, and arose from relaxation of the ligaments. One example is also given of a dislocation of the os scaphoides, which was thrown backward upon the carpus, with the lower portion of the broken radius. (*On Dislocations, p.* 514, 515.) Compound dislocations of the carpal bones are not uncommon, and generally arise from gunshot violence, or other great mechanical injury. In these cases, it is sometimes necessary to take away the displaced bones altogether; and too frequently, the accident is such as to require amputation.

The connexion of the metacarpal bones with one another, and with those of the carpus, is so close, and the degree of motion so slight, that a dislocation can hardly take place. Thus, Sir Astley Cooper, in his vast experience, has never seen them dislocated, except by the bursting of guns, or by the passage of heavy carriages over the hand; cases frequently demanding amputation. (*On Dislocations, p.* 519.) The first metacarpal bone, which is articulated with the os trapezium, and admits of the movements of flexion, extension, abduction, and adduction, is capable of being luxated; but the accident is uncommon, for reasons explained in my other work.

Although from the nature of the joint, between the first metacarpal bone and the trapezium, one might infer, that a dislocation is possible in the four directions backwards, forwards, inwards, and outwards, yet, if we are to believe Boyer, the first case is the only one which has been observed. The accident is produced by the application of external force to the back of the metacarpal bone, which is suddenly and violently thrown into a state of flexion, the case usually arising from a fall on the outer edge of the hand. In this circumstance, the upper head of the bone is forcibly driven backwards, the capsular ligament is lacerated, the extensor tendons of the thumb are pushed up, and the head of the bone slips behind the trapezium.

For an account of the symptoms and treatment of this accident, I must refer to the 4th Ed. of the *First Lines of the Practice of Surgery*, Vol. 2, p 469.

The first phalanges of the fingers may be dislocated backwards off the heads of the metacarpal bones. A luxation forwards would be very difficult, if not impossible, because the articular surfaces of the metacarpal bones extend a good way forwards, and the palm of the hand makes resistance to such an accident. The first phalanx of the thumb, in particular, is often dislocated backwards, behind the head of the first metacarpal bone, in which case it remains extended, while the second phalanx is bent.

These dislocations should be speedily reduced; for, after eight or ten days, they become irreducible. In a luxation of the first bone of the thumb, which was too old to be easily reduced, and where the part was thrown behind the head of the metacarpal bone, Desault proposed cutting down to the dislocation, and pushing the head of the bone into its place with a spatula. Even in cases, which are quite recent, this kind of dislocation frequently cannot be reduced without the utmost difficulty; and the different proposals which have been made, respecting this particular accident, by Mr. Evans, the late Mr. Hey, Mr. C. Bell, and Boyer, deserve the notice of the surgical practitioner, who will find them explained in my other work. On this subject, however, Sir Astley Cooper remarks, that he has seen too much mischief arise from injury to the tendons and ligaments, ever to recommend their division, in order to facilitate the reduction, when extension will not succeed. (*On Dislocations, p.* 523.) Dislocations of the thumb and little finger inwards, and that of the thumb outwards, (which are possible cases) and luxations of the first phalanges of the other fingers backwards, and of their second phalanges forwards, are all reduced by making extension on the lower end of the affected thumb, or finger, and at the same time pressing the head of the bone towards its natural situation.

After the reduction, the thumb, or finger should be rolled with tape, and surrounded and supported with pasteboard, till the lacerated ligaments have united; care being taken to keep the hand and fore-arm in a sling. The luxation of the first phalanx of the thumb, behind the metacarpal bone, requires peculiar treatment, as I have elsewhere explained.

DISLOCATIONS OF THE BONES OF THE PELVIS.

Experience proves, that the bones of the pelvis, notwithstanding the vast strength of their ligaments, may be dislocated by violence: thus, the os sacrum may be driven forwards towards the interior of the pelvis; the ossa ilium may be displaced forwards and upwards; and the bones of the pubes may be totally separated at the symphysis, and an evident degree of moveableness occur between them. For the production of these accidents the operation of enormous force is requisite; and, in fact, their usual causes are falls from a great height; the fall of a very heavy body against the sacrum, at a period when the body is fixed; and the pressure of the pelvis between a wall, or post, and the wheel of a carriage, or waggon. Hence, the dislocation is generally the least part of the mischief occasioned by such kinds of violence, and the case is commonly attended with concussion of the spinal marrow, injury of the sacral nerves, extravasation of blood in the cellular substance of the pelvis, or cavity of the peritoneum, injury of the kidneys, and fracture of one, or more, of the bones of the pelvis. As Sir A. Cooper has remarked, some of these cases, complicated with fracture, are liable to be mistaken for dislocations of the thigh:—"When," says this gentleman, "a fracture of the os innominatum happens through the acetabulum, the head of the femur is drawn upwards, and the trochanter somewhat forwards, so that the leg is shortened, and the knee and foot are turned inwards. Such a case, therefore, may be readily mistaken. If the os innominatum is disjointed from the sacrum, and the pubes and ischium are broken, the limb is slightly shorter than the other; but the knee and foot are not turned inwards. These accidents may generally be detected by a crepitus perceived in the motion of the thigh, when the surgeon applies his hand to the crista of the ilium, and there is greater motion, than in a dislocation of the thigh." (*Surgical Essays, Part* 1, *p.* 49.)

In addition to the complications which may attend a dislocation of the bones of the pelvis, and arise immediately from the external violence, the case is always followed by inflammation, which may be very serious, not only on account of the extent of the articular surfaces affected, but because such inflammation may extend to the peritoneum, and viscera of the abdomen and pelvis, as I have myself seen in two or three instances.

Louis relates a case, in which the os ilium of the right side was found separated from the sacrum, so as to project nearly three inches behind it. This accident was caused by a heavy sack of wheat falling on a labourer. (*Mém. de l'Acad. de Chir. T.* 4, 4*to.*)

In a case, recorded by Sir A. Cooper, the posterior part of the acetabulum was broken off, and the head of the thigh-bone had slipped from its socket; the fracture extended across the os innominatum to the pubes, the bones of which were separated at the symphysis nearly an inch asunder. The ilia were separated on each side, and the left os pubis, ischium, and ilium broken. (*Surgical Essays, Part* 1, *p.* 50.) In the same work may also be perused another case of fracture of the body of the os pubis and ramus of the ischium, combined with a luxation of the right os innominatum from the sacrum, and laceration of the ligaments of the symphysis of the pubes.

When these cases do not prove fatal from the direct effect of the great violence committed on many parts, or from peritonitis, the same unpleasant event sometimes follows rather later from suppuration of the articular surfaces taking place, and abscesses forming in the cellular membrane of the pelvis. (*Boyer, Traité des Mal. Chir. T.* 4, *p.* 147.)

A case, in which a dislocation of the left os innominatum upwards had a successful termination, was attended by Enaux, Hoin, and Chaussier, and is published in a modern work. (*Mém. de l'Acad. des Sciences de Dijon.*) As the reduction could not be accomplished at first, antiphlogistic treatment was followed for some days, when new attempts to replace the bone were made, but could not be continued, as they caused a recurrence of pain and other bad symptoms. A third trial, made at a later period, was not more effectual; and all thoughts of reduction were then abandoned. After the patient had been kept quiet some time, though not so long as was wished, he quitted his bed, and began to walk about on crutches. I do not understand, however, as is asserted, how the weight of the body could now bring about the reduction, which had been previously attempted in vain. Be this as it may, the result was the patient's recovery. The fact clearly proves, as Boyer observes, that, in cases of this description, the most important object is not to aim at the reduction, but rather to oppose, by every means in our power, inflammation and its consequences. Frequently, the use of the catheter is necessary, and, sometimes an incontinence of urine, or the involuntary discharge of the feces, demands the strictest attention to cleanliness. In these cases, if the patient live any time, there is also another source of danger, consisting in a tendency to sloughing in the soft parts, on which the patient lies, and, which, when they have been bruised, require still greater vigilance.

The os coccygis is not so easily dislocated as fractured. Boyer has seen it displaced in a man, who was greatly emaciated by disease. This subject had considerable ulcerations about the coccyx, and the bone itself was bare There was an interspace of nearly two inches, between the sacrum and base of the os coccygis. In proportion as the man regained his strength, the bone recovered its right position, and at length united to the os sacrum, notwithstanding the action of the levatores ani, which are inserted into it. This case, however, was not an accidental luxation; and it clearly arose from the destruction of the ligaments by disease.

Authors mention two kinds of dislocation, to which the os coccygis is liable; one, inward; the other, outward. The first is always occasioned by external violence; the second, by the pressure of the child's head in difficult labours. Pain, difficulty of voiding the feces and urine, tenesmus, and inflammation, sometimes ending in abscesses, which interest the rectum, are symptoms, said to attend and follow dislocations of the os coccygis.

The best authors now regard all schemes for the reduction useless, as the bone will spontaneously return into its place as soon as the cause of displacement ceases; and the introduction of the finger within the rectum, and handling of the painful and injured parts, are more likely to increase the subsequent inflammation, and produce abscesses, than have any beneficial effect. In short, the wisest plan is to be content with enjoining quietude, and adopting antiphlogistic measures.

DISLOCATION OF THE RIBS.

J. L. Petit was silent on this subject, as he thought such cases never occurred. Since his death, a French surgeon, Buttet, has related an instance, which he supposed to be a dislocation of the posterior extremity of the rib from the vertebræ; but Boyer clearly proves, that there were no true reasons for this opinion, and that the case was only a fracture of the neck, or end of the bone, near the spine. (*Traité de Mal. Chir. T.* 4, *p.* 123.)

Ambrose Paré, Barbette, Juncker, Platner, and Heister, not only admit the occurrence of luxations of the ribs, but describe different species of them. Lieutaud also extended the term luxations to cases, in which the head of the rib is separated by disease, the pressure of aneurisms, &c.

In a modern work may be read the particulars of a case, where all the ribs are said to have been dislocated from their cartilages. The accident arose from the chest being violently compressed between the beam of a mill and the wall. In such a case there is no means of reduction, except the effect produced by forcible inspirations; nor are there any modes of relief, but bleeding, and the application of a roller round the chest. (See *C. Bell's Surg. Obs. p.* 171.)

DISLOCATIONS OF THE THIGH-BONE.

The head of the thigh-bone may be dislocated upwards on the dorsum of the ilium; upwards and forwards on the body of the os pubis; downwards and forwards on the foramen ovale; and backwards on the ischiatic notch.

The dislocation upwards and that downwards and forwards, are the most frequent.

The dislocation of the thigh-bone upwards, on the dorsum of the ilium, is attended with the following symptoms. The limb is from one inch and a half to two inches and a half shorter than its fellow, the thigh a little bent, and carried inwards. The knee inclines more forwards and inwards than the opposite one; the leg and thigh are turned inwards, and the foot points in this direction; the toe resting, as Sir A. Cooper remarks, against the tarsus of the other foot. *(Surgical Essays, Part 4, p. 27.)* There is an approximation of the trochanter major to the anterior superior spinous process of the ilium, and at the same time it is elevated and carried a little forwards. It is also less prominent, than that on the opposite side, and the natural roundness of the hip has disappeared. The natural length of the limb cannot be restored, without reducing the luxation: the foot cannot be turned outwards, and any attempt to do so causes pain; but, the inclination of the foot inwards may be increased. *(Boyer.)*

When an attempt is made to draw the leg away from the other, it cannot be accomplished; but the thigh may be slightly bent across its fellow.

A dislocation on the dorsum of the ilium is generally at once readily discriminated from a fracture of the neck of the thigh-bone, within the capsular ligament, by *the rotation of the limb inwards;* a position, which is unusual in a fracture of any part of the os femoris. "In a fracture of the neck of the thigh-bone (says Sir A. Cooper) the knee and foot are generally turned outwards: the trochanter is drawn backwards: the limb can be readily bent towards the abdomen, although with some pain; but, above all, the limb, which is shortened from one to two inches by the contraction of the muscles, can be made of the length of the other by a slight extension, and when the extension is abandoned, the leg is again shortened. If, when extended, the limb is rotated, a crepitus can often be felt, which ceases when rotation is performed under a shortened state of the limb. The fractured neck of the thigh-bone, within the capsular ligament, rarely occurs but in advanced age, and it is the effect of the most trifling accidents, owing to the absorption which this part of the bone undergoes at advanced periods of life. Fractures external to the capsular ligament occur at any age; but generally in the middle periods of life; and these are easily distinguished by the crepitus which attends them, if the limb is rotated and the trochanter is compressed with the hand. The position is the same as in fractures within the ligament. The proportion of fractures of the neck of the thigh-bone, which I have seen, is at least four cases to one of dislocation." *(A. Cooper, Surg. Essays, Part 1, p. 28.)*

The rotation of the limb inward, in cases of fracture of the neck of the thigh-bone, is uncommon, though sometimes met with: Sir Astley Cooper saw one example of it under the care of Mr. Langstaff. (*On dislocations, preface.*) To reduce this dislocation, the patient should be placed on his opposite side upon a table firmly fixed, or a large four-posted bedstead. A sheet folded longitudinally, is first to be placed under the perineum, and one end being carried behind the patient, the other before him, they are to be fastened to one of the legs, or posts of the bed. Thus the pelvis will be fixed, so as to allow the necessary extension of the thigh-bone to be made. Great care must be taken during the extension to keep the scrotum and testicles, or the pudenda in women, from being hurt by the sheet passed under the perineum. The patient must be further fixed by the assistants.

The best practitioners of the present day in France, advise the extending force to be applied to the inferior part of the leg, in order that it may be as far as possible from the parts, which resist the return of the head of the bone into its natural situation. In this country, surgeons generally prefer making the extension by means of a sheet, or the strap of a pulley, fastened round the limb just above the condyles of the os femoris. The direction in which Sir A. Cooper makes the extension, is in the line made by the limb, when it is brought across the other thigh a little above the knee. As soon as the head of the bone has been brought on a level with the acetabulum by the assistants, who are making the extension, the surgeon is to force it into this cavity by pressing on the great trochanter; or by rotating the knee and foot gently outwards, as practised by Sir A. Cooper.

The extension should always be made in a gradual and unremitting manner: at first, gently; but afterwards more strongly; never violently. The difficulty of reduction arises from the great power and resistance of the muscles, especially the glutei and triceps, which will at length be fatigued, so as to yield to the extending force, if care be taken that it be maintained the necessary time, without the least intermission. Sometimes, when there is difficulty in bringing the head of the bone over the lip of the acetabulum, Sir A. Cooper raises it by placing his arm under it near the joint.

The disappearance of all the symptoms, and the noise made by the head of the bone, when it slips into the acetabulum, denote that the reduction is effected. This noise, however, is not always made when pulleys are used. The bone is afterwards to be kept from slipping out again, by tying the patient's thighs together with a bandage placed a little above the knees. The patient should be kept in bed at least three weeks; live low, and rub the joint with a camphorated liniment. Due time must be given for the lacerated ligaments to unite, and the sprained parts to recover; premature exercise may bring on irremediable disease in the joint.

Mr. Hey gives the following description of the way, in which he reduced a case of this kind.

"The extension of the limb must be made in a right line with the trunk of the body; and, during the extension, the head of the bone must be directed outwards as well as downwards. A rotatory motion of the os femoris on its own axis, towards the spine, (the patient lying prone) seems likely to elevate the great trochanter, bring it nearer to its natural position, and direct the head of the bone towards the acetabulum. These circumstances led to the following method. A folded blanket was wrapped round one of the bed-posts, so that the patient, lying in a prone position, and astride of the bed-post, might have the affected limb on the outside of the bed. The bed was rendered immoveable by placing it against a small iron pillar, which had been fixed for the purpose of supporting the curtain-rods. The leg was bent to a right angle with the thigh, and was supported in that position by Mr. Lucas, who, when the extension should be brought to a proper degree, was to give the thigh its rotatory motion, by pushing the leg inwards, that is, towards the other inferior extremity. Mr. Jones sat before the patient's knee, and was to assist in giving the rotatory motion, by pushing the knee outwards at the same moment. I sat by the side of the patient, to press the head of the bone downwards and outwards during the extension. Two long towels were wrapped round the thigh just above the condyles, one towel passing on the inside of the knee, the other on the outside. Three persons made the extension; but when we attempted to give the thigh its rotatory motion, we found it confined by the towel which passed on the inside of the knee and leg. We therefore placed both the towels on the outside; and in this position the extending force concurred in giving the rotatory motion. The first effort that was made, after the towels were thus placed, had the desired effect, and the head of the bone moved downwards and outwards into the acetabulum." (*Hey's Practical Observations, p.* 313.)

For the purpose of facilitating the reduction, many surgeons endeavour to produce a temporary faintness by a copious venesection, immediately before the extension is begun; a practice which, when the patient's state of health does not forbid it, is adviseable, as lessening very materially the resistance of the muscles. Sir A. Cooper gives it his general approbation, as well as the warm bath, and nauseating doses of tartarized antimony. After taking away from twelve to twenty ounces of blood, this gentleman places the patient in a bath heated to 100 degrees, and gradually raised to 110 degrees, until faintness is induced. While in the bath, the patient is also to take a grain of tartarized antimony every ten minutes, until nausea is excited, when he is to be removed from the bath, put in blankets, and placed between two strong posts, in each of which a staple is fixed, or he may be placed on the floor, into which two rings may be screwed The manner in which Sir A. Cooper performs the reduction with pulleys, and by making the extension with the thigh slightly bent, having been detailed in the 2d vol. of the First Lines of Surgery, I shall not here repeat it. Of Mr. Hey's plan, especially the direction of the limb in it, he entertains an unfavourable opinion, as little calculated to answer, where the reduction has been at all delayed. (*On Dislocations, p.* 45.) In this sentiment I fully concur. In all cases of difficulty, the above mentioned debilitating means, the intoxicating effect of a liberal dose of opium, and the use of pulleys, for the reduction, appear to me to deserve recommendation.

An instance of dislocation of the thigh-bone on the dorsum of the ilium, with fracture of the same bone, is recorded by Sir Astley Cooper: the dislocation was not at first detected, and afterwards no attempt to reduce the bone was considered prudent. "The probability is that dislocation, thus complicated with fracture, will generally not admit of reduction, as an extension cannot be made until three or four months have elapsed from the accident, and then only with strong splints upon the thigh, to prevent the risk of disuniting the fracture." (*On Dislocations, &c. p.* 62.)

Luxations of the thigh-bone, downwards and forwards, upon the obturator foramen, are the next in frequency to those upon the dorsum of the ilium. The accident is facilitated by the great extent, to which the abduction of the thigh can be carried; by the notch at the inferior and internal part of the acetabulum; by the weakness of the orbicular ligament, which on this side is torn through; and by the ligamentum teres not opposing, or being necessarily ruptured by it; that is to say, it is only broken, when the head of the femur has been carried with great violence a certain distance from the acetabulum. On this point, however, I mention with great respect the statement of Sir Astley Cooper: "the dislocation in the foramen ovale happens whilst the thighs are widely separated, during which the ligamentum teres is upon the stretch; and when the head of the bone is thrown from the acetabulum, *the ligament is torn through* before it entirely quits the cavity." (*On Dislocations, &c. p.* 65.) That the ligamentum teres is frequently ruptured admits of no doubt. It seems also that the pectinalis and adductor brevis muscles are sometimes lacerated. (See *Case, vol. cit. p.* 66.) The head of the bone is thrown between the obturator ligament, and obturator externus muscle.

The symptoms are as follows: the injured limb is two inches longer than its fellow, the head of the femur being lower then the acetabulum; the trochanter major, which is less prominent than natural, is removed to a greater distance from the anterior superior spinous process of the ilium, and the thigh is flattened in consequence of the elongation of the muscles. A hard, round tumor, formed by the head of the femur, is felt at the inner and superior part of the thigh, towards the perineum. The leg is slightly bent; and, according to Sir A. Cooper's experience, the foot, though widely separated from the other, is generally turned neither outwards nor inwards; but, he has seen a little variation in this respect, in different instances. Hence, he prefers as the diagnostic symptoms, the bent position of the body, caused by the psoas and iliacus muscles being on the stretch; the separated knees; and the increased length of the limb. (*Essays, Part* 1. *p.* 37.) The latter symptom alone is a sufficient indication of the case not being a fracture.

Dislocations on the obturator foramen, are very easy of reduction. The pelvis having been fixed, the extension is to be made downwards and outwards, so as just to dislodge the head of the bone. The muscles then generally draw it into the acetabulum, on the extending force being gradually relaxed, if the upper part of the bone be pulled outward, with a bandage, and the ankle be at the same instant inclined inwards. Thus the limb is used as a lever, with very considerable power.

Mr. Hey says, that "In this species of dislocation, (downwards and forwards,) as the head of the bone is situated lower than the acetabulum, it is evident, that an extension made in a right line with the trunk of the body, must remove the head of the bone farther from its proper place, and thereby prevent, instead of assisting, reduction. The extension ought to be made with the thigh at a right angle, or inclined somewhat less than a right angle, to the trunk of the body. When the extension has removed the head of the bone from the external obturator muscle, which covers the great foramen of the os innominatum, the upper part of the os femoris must then be pushed or drawn outwards; which motion will be greatly assisted by moving the lower part of the os femoris, at the same moment, in a contrary direction; and, by a rotatory motion of the bone upon its own axis, turning the head of the bone towards the acetabulum." (*Hey*, 316.)

The ensuing case illustrates Mr. Hey's practice. "The lower bed-post, on the right side of the bed on which the patient lay, was placed in contact with a small immoveable iron pillar (about an inch square in thickness,) such as in our wards are used for supporting the curtain rods of the beds. A folded blanket being wrapped round the bed-post and pillar, the patient was placed astride of them, with his left thigh close to the post, and his right thigh on the outside of the bed. A large piece of flannel was put between the blanket and the scrotum, that the latter might not be hurt during the extension.

"The patient sat upright, with his abdomen in contact with the folded blanket which covered the bed-post. He supported himself by putting his arms round the post, and an assistant sat behind him to prevent him from receding backwards. He was also supported on each side.

"Two long towels were put round the lower part of the thigh, after the part had been well defended from excoriation by the application of a flannel roller. The knot, which the towels form, was made upon the anterior part of the thigh, that the motion intended to be given to the leg might not be impeded by the towels.

"The thigh being placed in a horizontal position, or rather a little elevated, with the leg hanging down at right angles to the thigh, I sat down upon a chair, directly fronting the patient, and directed a gentle extension to be made by the assistants standing at my left side. This was done with the view of drawing the head of the bone a little nearer to the middle of the thigh, and the extension had this effect. I then placed the two assistants, who held the towels, at my right side, by which means the extension would be made in a direction a little inclined to the sound limb. Mr. Logan stood on the right side of the patient, with his hands placed on the upper and inner side of the thigh, for the purpose of drawing the head of the bone towards the acetabulum, when the extension should have removed it sufficiently from the place in which it now lay.

"I desired the assistants to make the extension slowly and gradually; and to give a signal when it arrived at its greatest degree. At that moment, Mr. Logan drew the upper part of the bone outwards, while I pushed the knee inwards, and also gave the os femoris a considerable rotatory motion, by pushing the right leg towards the left. By these combined motions, the head of the os femoris was directed upwards and outwards, or, in other words, directly towards the acetabulum, into which it entered at our first attempt made in this manner." (*Hey*, *p.* 318.)

The thigh-bone is sometimes luxated upwards and forwards on the pubes. The whole limb is turned outwards, and cannot be rotated inwards: it is shortened by one inch; the trochanter major is nearer the anterior superior spinous process of the ilium than natural; the head of the bone forms a tumor in the groin above the level of Poupart's ligament, on the outer side of the femoral artery and vein, where it can be perceived to move when the thigh-bone itself is moved. By the stretching of the anterior crural nerve, which lies over the neck of the bone, (See *A. Cooper on Dislocations*, *p.* 95,) great pains, numbness, and even paralysis, are liable to be produced. The knee is generally carried backwards.

In the account of the position of the limb, however, authors vary; and, in opposition to what Boyer has stated, Sir A. Cooper remarks, that there is a slight flexion forwards and outwards. (*Surgical Essays*, *Part* 1, *p.* 45.)

The head of the bone felt in the groin, and the impossibility of rotating the limb inward, distinguish this case from a fracture of the neck of the bone.

In reducing this dislocation, Sir A. Cooper recommends the extension to be made in a line behind the axis of the body, so as to draw the thigh bone backwards; and, when such extension has been continued some time, a napkin is to be put under the upper part of the bone, and its head lifted over the pubes and edge of the acetabulum.

The last dislocation of the thigh remaining to be spoken of, is that backwards.

In this case, according to the valuable description of it given by Sir A. Cooper, the head of the thigh-bone is placed on the pyriformis muscle, between the edge of the bone which forms the upper part of the ischiatic notch and the sacrosciatic ligament, being behind the acetabulum, and a little above the level of the middle of that cavity. The limb is generally not more than half an inch shorter than its fellow; and the knee and foot are turned inwards, but not nearly in so great a degree as in the dislocation on the dorsum of the ilium. The thigh inclines a little forward, the knee is slightly bent, and the limb is so fixed, that flexion and rotation are in a great measure prevented.

Sir A. Cooper considers this dislocation as the most difficult, both to detect and reduce: difficult to detect, because the length of the limb, and the position of the knee and foot, are but little changed; difficult to reduce, because the head of the bone is placed deeply behind the acetabulum, and requires to be drawn over the edge of the socket, as well as towards it. In thin subjects, a hard tumor is felt at the posterior and inferior part of the buttock, and the great trochanter is removed further from the spine of the ilium.

The pelvis being fixed, the extension is to be made downwards and forwards, across the middle of the other thigh, so as to dislodge the head of the bone, while the surgeon, with a napkin, placed just below the trochanter minor, pulls the upper part of the femur towards the acetabulum. In this case, pulleys are preferable for making the extension.

DISLOCATIONS OF THE PATELLA.

The patella may be luxated outwards, or even inwards, when violently pushed in this direction. It is also liable to a displacement upwards, in consequence of its ligament being sometimes ruptured by the action of the extensor muscles. The luxation outwards is the most frequent, because the bone more easily slips in this direction off the outer condyle of the femur, than inwards. The assertion made by some authors, that the dislocation inwards is the most common, is quite erroneous, as I have elsewhere more particularly considered. (See *First Lines of Surgery, Vol.* 2.) In confirmation of what is here observed, I may mention the opinion of Sir A. Cooper, who states, that the bone is most frequently thrown on the external condyle, where it produces a projection; and this circumstance, with an incapacity of bending the knee, is evidence of the nature of the injury. (*Surgical Essays, Part* 1, *p.* 66.) The accident is most common in persons, whose knees incline inwards, a circumstance, that accounts for the tendency of the patella to be drawn outwards by the action of the extensor muscles. The dislocation inwards, which is much less frequently met with, is produced either by a fall upon a projecting body, which strikes the outer edge of the patella, or by the foot being turned inwards at the time of the fall.

In each case, if there be no previous morbid relaxation of the parts, a portion of the capsular ligament will be torn. (*A. Cooper, On Dislocations, &c. p.* 179.) The generality of cases are easily reduced by pressure, when the extensors of the leg have been completely relaxed; but, owing to a lax state of the ligament of the patella, or other predisposing causes, the bone is sometimes difficultly kept in its proper situation, unless a roller be applied. The inflammatory affection of the joint is to be opposed by bleeding, purging, and the use of the lotio plumbi subacetatis. The joint must be kept quiet a few days, and then gently moved in order to prevent stiffness. When the relaxation of the ligaments is such, that a relapse is likely to ensue from slight causes, a laced kneecap, with a strap and buckle, above and below the patella, should be worn, as recommended by Sir Astley Cooper. (*On Dislocations, p.* 181.) The luxation of the patella upwards, from a rupture of its ligament, is a case followed by a considerable degree of inflammation. Hence, Sir Astley Cooper particularly recommends early depletion; the use of evaporating lotions from four to seven days, and then a roller to the foot and leg. The leg is to be kept extended by means of a splint behind the knee; a leather strap is to be buckled round the lower part of the thigh, and to it, on each side, another is buckled, which extends from the sole of the foot, and is carried up each side of the leg. Thus the patella is kept down, and an opportunity is afforded for the ligament to unite. In a month, the knee may be gently moved every day. (*On Dislocations, p.* 182.)

DISLOCATIONS OF THE KNEE.

The tibia may be luxated forward, backward, or to either side. As Boyer observes, complete dislocations of the upper head of the tibia are exceedingly rare, because the articular surface of the condyles of the femur is so extensive, that the tibia cannot be entirely removed from it, without a prodigious laceration of the ligaments, tendons, and all the rest of the soft parts.

The condyles of the femur are disposed in such a manner, that, in the extreme flexion of the leg, the articular cavities of the upper head of the tibia are still in contact with those bony eminences; and this circumstance, together with the resistance made by the ligament of the patella, the patella itself, and the tendon of the extensor muscles of the leg, renders a sudden dislocation of the tibia backwards so difficult, that Boyer seems even to question the possibility of the accident, notwithstanding the case recited by Heister. (*Traité des Mal. Chir. T.* 4, *p.* 366.) That this accident, however, sometimes really happens, no longer admits of dispute: the case is noticed by Sir A. Cooper as producing the following appearances; a shortened state of the limb; a projection of the condyles of the os femoris; a depression in the situation of the ligament of the patella; *and a bending of the leg forwards:* which last statement differs from that of Boyer, who declares, that, the leg is bent to a very acute angle, and cannot be extended again. (*Mal. Chir. T.* 4, *p.* 369.) It appears further, from the particulars of the example of this accident seen by Dr. Walshman, that the dislocation may even be complete, the head of the tibia being thrown behind the condyles of the femur into the ham. The tendinous connexion of the patella to the rectus muscle was ruptured; and, probably, without a laceration of that tendon, or of the ligament of the patella, such a degree of displacement could scarcely have happened. (*Surgical Essays, part* 2, *p.* 74.)

But, if a sudden dislocation of the tibia from the femur backwards is uncommon, the same remark cannot be made respecting a displacement in that direction, gradually produced by the effects of disease. Several cases of the latter kind have fallen under my own observation.

A dislocation of the head of the tibia forwards, from the condyles of the femur, cannot happen, without the greatest difficulty; for the accident would be likely to be attended with a laceration of the lateral, crucial, and oblique, or posterior ligaments, all which tend to prevent the leg from being too far extended; and, in addition to all this injury, Boyer calculates, that the heads of the gastrocnemius, the popliteus, and the extensor tendons of the leg, would be immoderately stretched, and even torn. However, it deserves notice, that, in one compound luxation of the knee, where the os femoris was thrown behind the outer side of the head of the tibia, the external condyle being dislocated backwards and outwards, and the internal one thrown forwards upon the head of the tibia, the dissection proved, that "neither the sciatic nerve, the popliteal artery and vein, the lateral, nor the crucial ligaments were ruptured." (*A. Cooper, on Dislocations, p.* 197.) Both heads of the gastrocnemius were lacerated, and the back portion of the capsular ligament extensively torn. In 1802, an instance of a luxation of the tibia forwards was seen in Guy's Hospital. According to Sir Astley Cooper, while the tibia projects forward the thigh-bone is depressed, and thrown somewhat laterally, as well as backwards. The os femoris makes such pressure on the popliteal artery, as to prevent the pulsation of the anterior tibial artery on the instep; and the patella and tibia are drawn forwards by the rectus muscle. (*Surgical Essays, part* 2, *p.* 73.)

Dislocations inwards or outwards, though more frequent than the foregoing cases, are still to be considered as rare, and are always incomplete. In the dislocation inwards, the condyle of the os femoris is thrown upon the external semilunar cartilage, and the tibia projects at the inner side of the joint, so as at once to disclose the nature of the accident; and a depression may be felt under the external condyle. In the luxation of the head of the tibia outwards, the condyle of the os femoris is thrown upon the inner semilunar cartilage, or, as Sir Astley Cooper says, rather behind it. In both these cases, this gentleman thinks, that the tibia is rather twisted upon the os femoris, so that the condyle of the latter bone is thrown somewhat backwards, as well as outwards, or inwards.

I have stated, that lateral luxations of the tibia from the femur are almost always incomplete: but, the possibility of a complete dislocation inwards seems to be established by the 402d Obs. of Lamotte.

Whenever the tibia is dislocated from the femur, the accident has generally happened either while some force was operating upon that bone, at a period when the femur was fixed and immoveable, or else while the thigh-bone was propelled, or twisted with great violence, while the leg itself was firmly fixed.

These accidents are all most easily reduced, by making gentle extension, and pushing the head of the tibia in the proper direction. The grand object, after the reduction, is to avert inflammation of the knee, and promote the union of the torn ligaments. The first demands the rigorous observance of the antiphlogistic plan—bleeding, leeches, low diet, opening medicines, and a cooling evaporating lotion; both require the limb to remain perfectly motionless. With respect to splints, I conceive, that their pressure would be objectionable. As soon as the ligaments have grown together, and the danger of inflammation is over, which will be in about three weeks, the joint should be gently bent and extended every day, in order to prevent stiffness. Liniments will now also be of service.

In this section, we must notice the cases, which were first described by the late Mr. Hey, and are named by Sir A. Cooper partial luxations of the thigh-bone from the semilunar cartilages. Mr. Hey observes, that the disorder may happen either with, or without contusion. When no contusion has occurred, or the effects of it are removed, the joint, with respect to shape, appears uninjured. If there is any difference from its usual appearance, it is that the ligament of the patella seems rather more relaxed than that of the sound limb. The leg is readily bent, or extended by the hands of the surgeon, and without pain to the patient: at most, the degree of uneasiness, caused by this flexion and extension, is trifling. But, the patient himself cannot freely bend, nor perfectly extend the limb in walking; and he is compelled to walk with an invariable and small degree of flexion. Yet, though the leg is stiff in walking, it may be freely moved, while the patient is sitting down.

Mr. Hey ascribed this complaint to any causes which had the effect of hindering the condyles of the os femoris from moving truly in the hollow formed by the semilunar cartilages, and articular depressions of the tibia; an unequal tension of the lateral, or crucial ligaments; or some slight derangement of the semilunar cartilages. (*Pract. Obs. p.* 333, *ed.* 2.) Sir A. Cooper says, the most frequent cause of the accident is the point of the foot, while everted, striking against any projection, when pain is immediately felt in the knee, and the patient becomes incapable of perfectly extending the leg. He has also known the case produced by a person's suddenly turning in bed, and the clothes not suffering the foot to turn as quickly as the rest of the body. A sudden twist of the knee inwards may also displace the semilunar cartilages.

Sir A. Cooper gives the following explanation of the case. The semilunar cartilages are united to the tibia by ligaments, which, when relaxed, allow the cartilages to be easily pushed from their natural situation by the condyles of the femur, which then come into contact with the head of the tibia; and now, upon an attempt being made to extend the leg, a complete movement of this kind is prevented by the edges of the semilunar cartilages. (*Surgical Essays*, *Part* 2, *p.* 76.) In several examples recorded by Mr. Hey, a cure was effected by placing the patient upon an elevated seat, extending the joint, while one hand was placed above the knee, and then suddenly moving the leg backwards, so as to make as acute an angle with the thigh as possible. (*Pract. Obs. p.* 337, &c.) This manœuvre seems to have the effect of restoring the semilunar cartilages to their natural position. Sometimes, however, it will not answer; and, in one such case, mentioned by Sir A. Cooper, the patient used to accomplish the reduction by sitting upon the ground, and then bending the thigh inwards and pulling the foot outwards. A knee-cap laced tightly, and furnished with a strong leather strap just below the patella, was requisite in this instance for preventing a return of the displacement. In another case, subject to frequent relapses, these were at length hindered by a bandage with four rollers attached to it, which were tightly applied above and below the patella. (*A. Cooper, Surgical Essays*, *Part* 2, *p.* 77.)

Compound dislocations of the knee generally demand immediate amputation.

DISLOCATIONS OF THE FIBULA.

According to Sir A. Cooper, luxations of the upper head of the fibula, from relaxation of the ligaments, are more frequent than those from violence. The head of the bone is thrown backwards. The bone is easily replaced, but immediately slips behind the tibia again. When the case is attended with disease, repeated blisters are recommended: and, afterwards, a strap to confine the bone in its natural situation. (*Surg. Essays*, *Part* 2, *p.* 105.) In other instances, a roller, a compress applied over the head of the fibula, and a splint along this bone, would be proper. (*Boyer*, *Mal. Chir. T.* 4, *p.* 374.) The latter author has seen a displacement of the whole fibula upwards, accompanying a dislocation of the foot outwards. This case must be exceedingly unfrequent, as it is resisted not only by the ligaments of the upper joint of the fibula, but also by those very strong ligamentous bands, which bind the malleolus externus to the astragalus and os calcis. In all the cases, which I have seen, the pressure of the astragalus, when driven outwards, has broken the fibula. In the instance mentioned by Boyer, the double luxation of the fibula was readily reduced, by rectifying the position of the foot, and bringing the astragalus into its proper place again with respect to the tibia.

DISLOCATIONS OF THE FOOT.

The tibia may be dislocated from the astragalus inwards, or outwards; forwards, or backwards; and either of these luxations may be complete or incomplete. The dislocation inwards is the most common; the foot being thrown outwards, and its inner edge resting upon the ground, while the fibula is broken about two or three inches above the ankle. Upon dissection, as Sir A. Cooper observes, the end of the tibia is found resting upon the inner side of the astragalus, and, if the accident has been produced by a jump from a considerable height, the lower end of the tibia, where it is connected to the fibula by ligament, is split off, and remains attached to the latter bone. The broken end of the fibula itself is carried down upon the astragalus, occupying the natural situation of the tibia. The malleolus externus remains in its natural situation, with two inches of the fibula, and the piece of the tibia, which is split off. The capsular ligament, attached to the fibula, and the three strong fibular tarsal ligaments, are uninjured. (*Surgical Essays, Part 2, p.* 107.)

One thing, very essential to be understood in this case, is, that the fracture of the fibula is here the first mischief, without which the dislocation could not have happened. The fibula may easily be fractured without any luxation of the foot, but the above-described dislocation can never take place unpreceded by a fracture of the fibula; and, grave and serious as the displacement of the joint is, it is always a secondary event. (*Dupuytren, Annuaire Med. Chir.* 1819, *p.* 3.)

It was to this particular case, joined with the fracture of the fibula, that Mr. Pott drew the attention of surgeons, as affording a striking example of the benefit derived from relaxing the muscles; the instance, in which, "by leaping, or jumping, the fibula breaks within two or three inches of its lower extremity. When this happens, the inferior fractured end of the fibula falls inward towards the tibia, that extremity of the bone which forms the outer ankle is turned somewhat outward and upward, and the tibia having lost its proper support, and not being of itself capable of steadily preserving its true perpendicular bearing, is forced off from the astragalus inwards; by which means the weak bursal, or common ligament of the joint, is violently stretched, if not torn, and the strong ones, which fasten the tibia to the astragalus and os calcis, are always lacerated; thus producing, at the same time, a perfect fracture and a partial dislocation, to which is sometimes added a wound in the integuments, made by the bone at the inner ankle. By this means, and indeed as a necessary consequence, all the tendons which pass behind or under, or are attached to the extremities of the tibia and fibula, or os calcis, have their natural direction and disposition so altered, that, instead of performing their appointed actions, they all contribute to the distortion of the foot, and that by turning it outward and upward."

When this accident is accompanied, as it sometimes is, with a wound of the integuments of the inner ankle, and that made by the protrusion of the bone, the danger and difficulties of the case are seriously increased.

"By the fracture of the fibula, the dilatation of the bursal ligament of the joint, and the rupture of those which should tie the end of the tibia firmly to the astragalus and os calcis, the perpendicular bearing of the tibia on the astragalus is lost, and the foot becomes distorted; by this distortion the direction and action of all the muscles already recited are so altered, that it becomes (in the usual way of treating this case) a difficult matter to reduce the joint; and, the support of the fibula being gone, a more difficult one to keep it in its place after reduction. If it be attempted with compress and strict bandage, the consequence often is a very troublesome, as well as painful ulceration of the inner ankle, which very ulceration becomes itself a reason why such kind of pressure and bandage can be no longer continued; and if the bone be not kept in its place, the lameness and deformity are such as to be very fatiguing to the patient, and to oblige him to wear a shoe with an iron, or a laced buskin, or something of that sort, for a great while, or perhaps for life.

"All this trouble, pain, difficulty, and inconvenience, are occasioned by putting and keeping the limb in such position as necessarily puts the muscles into action, or into a state of resistance, which in this case is the same. This occasions the difficulty in reduction, and the difficulty in keeping it reduced; this distorts the foot, and by pulling it outward and upward makes that deformity which always accompanies such accident; but if the position of the limb be changed, if by laying it on its outside, with the knee moderately bent, the muscles forming the calf of the leg, and those which pass behind the fibula, and under the os calcis, are all put into a state of relaxation and non-resistance, all this difficulty and trouble do in general vanish immediately; the foot may easily be placed right, the joint reduced, and by maintaining the same disposition of the limb, every thing will in general succeed very happily, as I have many times experienced." (*Pott.*)

I think the profession are much indebted to Sir A. Cooper, for his application of terms to dislocations of the ankle, which are liable to no mistake, or confusion. Thus, when he speaks of a dislocation of the tibia inwards, or outwards, backwards or forwards, the case spoken of is immediately known. On the contrary, when authors write about dislocations of the ankle, or foot, in any named direction, their meaning may be various and misinterpreted. We find this exemplified in Dupuytren's valuable memoir on fractures of the lower end of the fibula; for, instead of terming the above case, a dislocation of the foot *outwards*, as the generality of writers have done, he thinks it should be named a dislocation of the foot *inwards*, on account of the direction, in which the astragalus is carried. (*Annuaire, Med. Chir. p.* 3, 1819.)

With respect to the treatment of the preceding case, Dupuytren admits, that Pott's method easily effects a reduction, though incapable of maintaining it; but, as I have endeavoured to explain in the 2d Vol. of the First Lines of Surgery, the practice recently proposed at the Hôtel-Dieu, it would be useless repetition to enter into the subject again. Sir A. Cooper appears to prefer the mode of treatment on Mr. Pott's principles; but gives one very essential piece of advice, which is, that the splint, upon which the outer part of the limb rests, may have a foot-piece, "to give support to the foot, prevent its eversion, and preserve it at right angles with the leg. If much inflammation succeeds, leeches are to be applied to the parts, and the constitution will require relief by taking blood from the arm." (*Surgical Essays, Part* 2, *p.* 108.)

When the tibia is dislocated outwards, the internal lateral ligaments are always ruptured, or pulled away from the bones, and the inner malleolus broken, previously to the fracture of the fibula. On a part of this statement, however, Dupuytren and Sir A. Cooper differ, as the latter mentions, that the deltoid ligament remains unbroken. In some cases, he says, the fracture is not confined to the malleolus, but passes obliquely through the articular surface of the tibia, which is thrown forwards and outwards upon the astragalus, in front of the malleolus externus. Sometimes, the astragalus is fractured, and the lower extremity of the fibula broken into several splinters. He states, also, that, when the fibula is not broken, the external lateral ligaments are ruptured. The foot is thrown inwards, its outer edge resting upon the ground; while a considerable projection is made by the malleolus externus under the skin. The accident is generally caused by the passage of the wheel of a carriage over the leg, or a violent twist of the foot inwards in jumping, or falling. (*A. Cooper, Vol. cit. p.* 113.)

The reduction is accomplished by relaxing the muscles of the calf, making extension in the axis of the leg, and pressing the lower head of the tibia inwards towards the astragalus. "The limb is to be laid upon its outer side, resting upon a splint with a foot-piece, and a pad is to be placed upon the fibula just above the outer angle, and extending a few inches upwards, so as in some measure to raise that portion of the leg, and prevent the tibia and fibula slipping from the astragalus, as well as lessen the pressure of the malleolus externus upon the integuments." (*Surg. Essays, Part* 2, *p.* 113.) Sir A. Cooper also enjoins paying the strictest attention to hindering the foot from being twisted inwards, or pointed downwards.

Dupuytren's manner of treating this case, is described in the second Vol. of the First Lines of Surgery.

A complete dislocation of the lower head of the tibia forwards cannot happen, without the fibula being first broken, and either the base of the malleolus internus fractured, or its point torn away. The foot being then acted upon by the extensor and flexor muscles, and unretained by the malleoli and their ligaments, yields to the powerful operation of the muscles of the calf, the astragalus passing behind the tibia, while this projects forward under the tendons and skin of the instep. (*Dupuytren, Annuaire Med. Chir. p.* 187, 4*to. Paris,* 1819.) The foot of course is much shortened, the heel lengthened, and firmly fixed, and the toes point downwards. Upon dissection, the tibia is found to rest upon the upper surface of the os naviculare, and os cuneiforme internum. The anterior part of the capsular ligament is torn through; the deltoid ligament is only partially lacerated; and the three ligaments of the fibula remain unbroken. (*A. Cooper, Vol. cit. p.* 109.)

This case is much more difficult of reduction, than the instance in which the foot is thrown inwards; and the cause is owing to the powerful manner, in which the muscles resist the extension of the parts, and placing them in their natural position again. As Dupuytren observes, it is true, that such resistance may be lessened by relaxing the muscles, and drawing the patient's attention from his limb, plans, which fully answer for the reduction of the other above mentioned case; yet, in that now under consideration, they are insufficient, and here a greater effort is required to bring the foot from behind forwards, and to place the astragalus under the tibia. And, a still greater difficulty is to keep the parts reduced during the time necessary for the fibula and torn ligaments to be firmly united. In fact, the upper surface of the astragalus, which is convex from behind forwards, is so slippery, that it is hard to make the tibia rest securely on the articular pulley of that bone, which is itself incessantly acted upon by the extensor muscles of the leg, so as to have a tendency to slip behind the lower head of the tibia. In addition therefore to the bent posture, Dupuytren deems it necessary here to employ an apparatus, which propels the foot footward, and the lower head of the tibia backwards. (*Annuaire Med. Chir. p.* 188.) As this apparatus has been described in the second Vol. of the First Lines of Surgery, I need not explain it again.

Sir A. Cooper prefers keeping the limb upon the heel, resting upon a pillow. A splint, with a suitable pad, and a foot-piece, is to be applied to each side of the leg, care being taken to keep the foot well supported at a right angle with the leg. (*Surgical Essays, Part* 2, *p.* 110.)

Besides the complete dislocation of the tibia forwards, a partial case is sometimes met with, where one-half of the articular surface of the bone rests upon the os naviculare, and the other on the astragalus. According to Sir A. Cooper, the fibula is broken; the foot appears but little shortened; nor is there any considerable projection of the heel. The foot points downwards; it cannot be put flat on the ground, and is nearly stiff; and the heel continues drawn up. The accident, if not detected and rectified in its early stage, afterwards admits of no relief, the change in the state of the muscles, and the position in which the fibula has united, not suffering any reduction, even though great force be employed.

Dislocations of the tibia, forwards or backwards, are not common: during fifteen years, Dupuytren has scarcely met with two, or three cases; though he has seen some hundreds of lateral dislocation. It must be obvious to every body, says he, that when the foot is violently bent, or extended, many powerful muscles resist the movement in question, and prevent the mischief, with which the articulation is threatened. (*Annuaire Med. Chir. de Hopitaux de Paris, p.* 34.) A luxation of the tibia from the astragalus backwards, Sir A. Cooper has never had an opportunity of observing; a proof of the rarity of the accident.

A luxation of the astragalus, either simple, or complicated with a laceration of the integuments, as Mr. Hey has remarked, is an accident, which does not often occur. Above, the astragalus is articulated with the tibia and fibula; below, it is united, by means of a capsular ligament, to the os calcis; while, in front, it is connected to the os naviculare by a capsular, and broad internal lateral ligament. Thus situated, it is evident, that its displacement is not likely to happen with great frequency; and, yet this observation must be received only as a comparative one; for, the cases of dislocation of the astragalus, now upon record, are rather numerous.

When a dislocation of the lower head of the tibia is combined with one of the astragalus from the os calcis, and os naviculare, and the ligaments, which kept these bones together, are nearly destroyed, while a considerable portion of the astragalus itself protrudes through the wound in the integuments, if it be judged prudent to attempt the preservation of the limb, it is best perhaps to imitate Desault, Ferrand, Trye, and Evans, and extract the astragalus altogether.

A luxation of the astragalus, unattended with a wound in the skin, is a serious and embarrassing accident; for, in general, the reduction is so difficult, that it is not many years since the case was deemed a ground for amputation. (See *Gooch's Chir. Cases, &c.*) When the displacement in question happens, the astragalus is generally thrown forwards upon the os naviculare, forming a tumor on the instep, and inclining a little either to the outer, or inner side of the foot. In many cases of this description, the reduction is found to be impracticable. Here, as Boyer observes, the impediment does not depend upon the head of the bone being constricted in the narrow opening of the capsule; but rather upon the impossibility of making the extending force, and the pressure of the surgeon's hands, operate with much effect upon the displaced bone. However, an example is recorded by Desault; where the reduction was accomplished by dividing the skin, and then extending the incision through a part of the ligaments. In the *Journ. de Chir.* another case is also related of a simple dislocation of the astragalus from the os calcis, and os naviculare, where the reduction was easily performed by common means. Boyer conceives it probable, that, in these cases, most of the ligaments, uniting the astragalus to the os calcis, and os naviculare were ruptured, and that the first of these bones was therefore sufficiently moveable to admit of being replaced by the pressure of the fingers. But, the luxated astragalus may be so wedged between the tibia, os calcis, and os naviculare, that its reduction is impossible, as Boyer has actually seen. In the case, here referred to, things were left to take their course, except that every possible means was employed to keep off inflammation. The result was, that the skin covering the projection of the astragalus at the inner and upper part of the foot, sloughed, and amputation was at length deemed necessary. (*Mal. Chir. T.* 4, *p.* 400.) A similar example is recorded by Sir Astley Cooper. (*On Dislocations, p.* 360.) In another case, recorded by Mr. Hey, pressure was made with a tight bandage on the prominence of the astragalus, and the soft parts over it became gangrenous; yet, a recovery followed without amputation, all the projecting portion of the astragalus having gradually come away in fragments. (*Hey's Pract. Obs. p.* 384, *Ed.* 2.) In an instance, recently published by Dupuytren, a person dislocated the astragalus by alighting with great violence upon the heel, the bone being driven forwards by the pressure, which it had sustained between the tibia and os calcis, so as to form a protuberance under the skin of the instep. As the reduction was found impracticable, a cut was made down to the displaced bone, with the intention of extracting it; but, Dupuytren found, that he could not remove it so readily as he expected; nor could he replace it; and, it was not till after a tedious operation, that he succeeded in taking it away. The difficulty arose from the upper surface of the bone being turned downwards, while the back projection of what was naturally the lower part of it took hold of the tibia in the manner of a hook. (*Annuaire Med. Chir. des Hôpitaux de Paris*, 1819, *p.* 28.)

In another modern valuable publication, two cases of dislocation of the astragalus are related. One was a simple luxation of the astragalus inwards, the os calcis, and rest of the foot being thrown outwards. The reduction was easily performed by fixing the knee, then extending the foot gently and directly from the leg, by laying hold of the heel with one hand, and placing the other on the dorsum of the foot; and lastly, by pressing the foot inwards, whilst counterpressure was made with the knee upon the opposite side of the lower extremity of the tibia. The other instance, alluded to, was a compound luxation, in which the astragalus was displaced outwards, and the other tarsal bones thrown inwards. Reduction was accomplished first by bending the leg so as to relax the muscles, and then by extending the foot, as above explained, and rotating it outwards. (*A. Cooper, Surgical Essays, Part* 2, *p.* 207.)

By heavy weights falling upon the foot, a dislocation is sometimes produced at the transverse joint between the astragalus and os calcis behind, and the os naviculare and os cuboides in front.

Sir A. Cooper has twice seen the os cuneiforme internum dislocated, and, in both cases, the head of the bone naturally connected to the os naviculare, projected inwards and somewhat upwards, being drawn in this direction by the action of the tibialis anticus muscle. In neither instance was the reduction accomplished; and, in one, the patient had so trivial a lameness, that the functions of the foot were expected to be in time perfect again. (*Surgical Essays, Part* 2, *p.* 209.) With regard to the treatment, Sir Astley Cooper recommends, first, confining the bone in its place with a roller, kept wet with spirits of wine and water, and, when the inflammation is subdued, he directs a leather strap to be buckled round the foot, so as to maintain the bone in its right situation. (*On Dislocations, p.* 384.)

The phalanges of the toes are sometimes dislocated, and the first bone of the great toe is frequently luxated from the first metatarsal bone; but, I am not aware, that these cases are attended with any particular difficulty in the reduction, like some dislocations of the thumb.

On the subject of Dislocations, consult *A. Flach, de Luxatione Ossis femoris rariore, frequentiore colli fractura, Disp. Argent.* 1723. *H. Linguet, Quæstio, &c. An in Humeri luxationi ambi potius quam scala, Janua, Polyspastusque iterato renovata? Paris,* 1732. *G. C.*

Reichel, Diss. de Epiphysium ab Ossium Diaphysi Diductione, Lips. 1759. *J. L. Petit, Traité des Maladies des Os,* 1725, *et Traité des Mal. Chir.* 1783; *Duverney Traité des Maladies des Os. Richerand, Nosographie Chir. T.* 3, *p.* 193, *&c. Edit.* 4. *Œuvres Chir. de Desault, par Bichat, T.* 1. *Pott's Remarks on Fractures and Dislocations,* 1775; *Kirkland's Observations upon Mr. Pott's General Remarks on Fractures, &c. White's Cases in Surgery. Medical Observations and Inquiries, Vol.* 2. *Bromfield's Chirurgical Cases and Observations,* 1773. *J. F. P. Castella, Sur les Fractures du Péroné; Landshut,* 1808. *C. Bell, A System of Operative Surgery,* 1809. *J. Howship, Pract. Obs. in Surgery, and Morbid Anatomy,* 8*vo. Lond.* 1816. *Callisen, Systema Chirurgiæ Hodiernæ, T.* 2. *Desault Journal de Chirurgie. Boyer Traité des Mal. Chir. T.* 4, *Paris,* 1814. *Trye's Illustrations of some of the Injuries to which the lower limbs are exposed.* 30. *W. Hey, on Dislocations and internal Derangement of the Knee-joint, in Pract. Obs. in Surgery, Ed.* 2. *Dupuytren, Sur la Fracture de l'Extremité inférieure du péroné, les luxations, et les accidens, qui en sont la suite, in Annuaire Medico-Chir. des Hopitaux de Paris,* 4*to. Paris,* 1809. *The observations in this memoir are highly interesting, and afford new and instructive views of the subject. G. F. D. Evans, Pract. Obs. on Cataract, closed Pupil, Amp. at the Shoulder, &c. and Compound Dislocations,* 8*vo. Wellington,* 1815. *Astragalus removed; shattered end of the fibula sawn off; protruded lower end of the humerus similarly removed; a compound dislocation of the shoulder-joint; and head of the metacarpal bone of the thumb, dislocated, in two instances towards the palm, and, on account of the difficulty of reduction, exposed by an incision and sawn off. Surgical Essays; also a Treatise on Dislocations and Fractures of the Joints, by Sir Astley Cooper, Bart.: a work which abounds in practical information, and does infinite credit to the talents and industry of its experienced author.*

DISTICHIA, or DISTICHIASIS. (from δις, twice, and ϛιχος, a row.) Gorrhæus, Heister, and St. Ives, apply this term to an affection, in which each tarsus has a double row of eye-lashes which, inclining inward, irritate the eye, and keep up ophthalmy. Such authors speak of this, as a very frequent complaint; but, the author of the present article in the *Encyclopédie Méthodique, Partie Chirurgicale,* remarks, that he has never met with it at all, though, in ulceration of the eyelids, he has often seen a certain number of the eye-lashes incline inward, and cause a good deal of disturbance to the eye, already in a state of inflammation. This disorder cannot properly be called distichiasis. However it may be, all writers recommend plucking out such eyelashes, as assume an unnatural direction. Some of the hairs are first to be taken out one after the other, and a few days are allowed to elapse before the operation is repeated. In order that the eye-lashes may be more completely extirpated, and that others may not grow in the same situation, the places from which they grow are usually touched with the argentum nitratum. (See *Trichiasis.*)

DURA MATER, FUNGOUS TUMORS OF. The dura mater, the outer membrane of the brain, was so named by the ancients, on account of its hardness, and its being formerly supposed to be the source of all the other membranes of the body.

Fungous tumors of the dura mater, the true nature of which was ascertained late in the last century, did not escape the notice of the ancient writers; but the disease is very imperfectly described by them, and under an erroneous denomination. They supposed, that the swelling was of the encysted kind, or what they termed *matta, talpa, testudo,* and that it gradually altered and destroyed the cranium. They sometimes mistook the fungous, or sarcomatous tumor of the dura mater for coagulated blood, or for ill-conditioned excrescences, like those which make their appearance on ulcers attended with caries. Such are the ideas, which seem to be conveyed by some imperfectly detailed cases in the writings of Lanfranc, Guido di Cauliaco, Theodoricus, and other authors of the thirteenth and fourteenth centuries. Amatus Lusitanus has given the appellation of lupus with caries to a fungous tumor of the dura mater. The swelling occurred in a child eight years old, who died in convulsions, two days after an opening had been made in it.—(*Centur.* 5, *obs.* 8.) Another similar case, which happened in a child, and was noticed by Camerarius at Paris, is styled a singular bony excrescence. (*Ephemer. curios. natur. decad* 2, *ann.* 6, 1687, *obs.* 99.) Lastly, Cattier, a physician of Montpellier, has recorded the history of a lady, who died from the consequences of a fungous tumor of the dura mater. The disease was so acutely painful, as to compel the patient to cry out. The swelling was opened with caustic. Pimprenelle, a Parisian surgeon, recommended the trepan to be employed; but his advice was overruled. After death, a fungus of the dura mater, with a perforation in the skull, was detected, and it is described by the author as a hard, stony substance, accompanied with points and asperities. (*Obs. Med. obs.* 15, *p.* 48.—See *Lassus, Pathologie Chirurgicale, Tom.* 1, *p.* 498. *Edit.* 1809.)

The old surgeons, ignorant of the real character of fungous tumors of the dura mater, used often to commit the most serious and fatal mistakes in the treatment. These diseases are of a chronic nature, and make their appearance gradually, in the form of a tumor, which makes its way through the bones of the cranium, rises up, and insensibly blends itself with the integuments, which seem, as it were, to make a part of it. Such fungous tumors of the dura mater may originate spontaneously at any part of this membrane; but they are particularly apt to grow on the surface, which is adherent to the upper part of the skull, or to its basis. They are firm, indolent, and chronic, seeming as if they were the consequence of slow inflammation, affecting the vessels, which supply the dura mater, and inosculate with those of the diploe. It is very difficult, one might say, impossible, to determine, whether, in an affection of this kind, the disease begins in the dura mater, or the substance of the bone itself. The general belief, however, is, that the bone is affected secondarily, and that the disorder originates in the dura mater.

The patient, who is the subject of the first case, related in a memoir by M. Louis, had received no blow upon the head, and could only impute his complaint to a fall, which he had met with four, or five months previously, and in which the head itself had not received any violence; but, from this time, he experienced a stunning sensation, which continued till he died. The cranium and dura mater were found both equally diseased. Though this case may tend to prove, that fungous tumors of the dura mater may form spontaneously, yet, it is not the less confirmed by the examination of a vast number of cases, that this affection more frequently follows blows on the head, than any other cause. Hence, a slow kind of thickening of the dura mater is produced, which ends in a sarcomatous excrescence, the formation of which always precedes the destruction of the bone. In the memoir, published by M. Louis in the fifth volume, 4to. of those of the Royal Academy of Surgery, there is a very interesting case, illustrating the nature of the present disease.

The subject was a young man, aged twenty-one, who had a considerable tumor on the left side of the head, which was taken for a *hernia cerebri*. (*See this Article.*) The swelling had begun in the region of the temple, and had gradually acquired the magnitude of a second head. The external ear was displaced by it, and pushed down as low as the angle of the lower jaw. At the upper part of the circumference of the base of the tumor, the inequalities of the perforated bone, and the pulsations of the brain, could be distinctly felt. Some parts of the mass were elastic and hard, others were soft and fluctuating. A plaster, which had been applied, brought on a suppuration at some points, from which an ichorous matter was discharged. Shiverings and febrile symptoms ensued, and the man died in less than four months, in the year 1764. On dissection, a sarcomatous tumor of the dura mater was detected, together with a destruction of the whole portion of the skull, corresponding to the extent of the disease.

When a tumor of this nature has decidedly formed, it makes its way outward through all the parts, soft or hard, which are opposed to it. The swelling, in becoming circumscribed, is partly blended with the dura mater, and its pressure produces an absorption of such parts of the skull, as oppose its enlargement. It unexpectedly elevates itself externally, confounding itself with the scalp, and presents itself outwardly in the form of a preternatural, soft, yielding swelling, which even sometimes betrays an appearance of a decided fluctuation, or a pulsation, which may make it be mistaken for an aneurismal tumor. When once the swelling has made its exit from the cavity of the cranium, it expands on every side under the integuments, which readily make way for its growth. The scalp becomes distended, smooth, and œdematous over the extent of the tumor, and lastly it ulcerates. The matter, discharged from the ulcerations, is thin and sanious: the outer part of the tumor is confounded with the integuments and edges of the skull, on which it rests, so that, in this state, it is easy to mistake the tumor for one, whose base is altogether external. While the swelling thus increases in size externally, it also enlarges internally. The latter change takes place in particular, while the opening in the cranium is not large enough to admit the whole mass of the tumor, which then depresses the brain, and lodges in an excavation, which it forms for itself. But this cavity quickly diminishes, and becomes reduced almost to nothing, as soon as the tumor projects outwardly. The tables of the skull are absorbed to let the swelling arrive externally; but, it is remarked, that the internal, or vitreous table, is always found much more extensively destroyed, than the external one. Sometimes, new bony matter is found deposited around the opening in the cranium.

It is asserted, that, whatever may be the situation of a fungous tumor of the dura mater, the outer layer of this membrane, upon which the disease forms, is alone altered, the inner layer and the pia mater being always unchanged. (*Lassus, Pathologie Chirurgicale, Tom.* 1, *p.* 501. *Edit.* 1809.)

In one of these cases, detailed by Walther, the inner layer of the dura mater was quite natural, though one half of the tumor, which was very large, was within the skull, where it had formed for itself a deep excavation in the posterior lobe of the brain. And, what is remarkable, notwithstanding this latter change, the patient, the day before her death, retained all her intellectual faculties, and the power of voluntary motion. (*Journ. für Chirurgie von C. Graefe and Ph. v. Walther, B.* 1, *p.* 64—65, *8vo. Berlin*, 1820.)

According to surgical writers, fungous tumors of the dura mater have been caused by contusions on the skull, falls on the buttocks, concussions of the head or whole body, lues venerea, scrofula, inveterate rheumatism, &c. The three last of the alleged causes, however, seem to be little better than mere conjecture; and the same may be said of Walther's idea, that the disease is of a similar nature to white swelling of the joints, (*Graefe's Journ. B.* 1, *p.* 104,) beginning rather in the bone, than in the dura mater.

Even children of the most tender years are liable to the disease. M. Louis has related, that a child, two years of age, died of a fungus of the dura mater, which had produced a swelling above the right ear, attended with a destruction of a portion of the parietal and temporal bones. (*Mém. de l'Acad. de Chirurgie, Tom.* 5, *4to. p.* 31.)

Though the common opinion is, that these fungi grow entirely from the dura mater, Sandifort asserts, that the vessels of the diploe have a considerable share in their production. (*Descriptio Musei Anat. Acad. Lugd. T.* 1, *p.* 152.)

A similar belief was entertained by Heister and Kaufmann, and is espoused by Siebold and Walther, the latter imputing the disease to a simultaneous affection of the vessels of the dura mater, and pericranium, attended with an absorption of the earthy part of the bone. (*Journ. für Chir. von C. Graefe, &c. p.* 91—93.)

The existence of a fungous tumor of the dura mater cannot be ascertained, as long as there is no external change. The effects, produced, may originate from so many causes, that there would be great risk of a gross mistake in referring them to any particular ones. This is not the case, when there is an opening in the skull. Then a hardness, felt from the very first at the circumference of the tumor, denotes that it comes from within. When the swelling is carefully handled, such a crackling sensation is perceived, as would arise from touching dry parchment stretched over the skin. On making much pressure, pain is occasioned, and sometimes a numbness in all the limbs, stupefaction, and other more or less afflicting symptoms. The tumor, in some measure, returns inward, *especially, when not very large*, and gradually rises up outward again, when the pressure is discontinued. Sometimes, there is pain; at other times, there is none; which may be owing to the manner, in which the tumor is affected by the edges of the bone, through which it passes. The pain is often made to go off by compression, but returns as soon as this is taken off. The tumor has an alternate motion, derived from the pulsation of the brain, or of the large arteries at its base. This throbbing motion has led many practitioners to mistake the disease for an aneurism, as happened in the second case, related in the memoir of M. Louis. When the tumor is pushed sideways, and the finger carried between it and the edge of the bone, through which the disease protrudes, the bony edge may be felt, touching the base of the swelling, and more or less constricting it. This symptom, when distinguishable, added to a certain hardness and elasticity, and sometimes a facility of reduction, forms a pathognomonic mark, whereby fungous tumors of the dura mater may be discriminated from herniæ of the brain, external fleshy tumors, abscesses, exostosis, and other affections, which at first sight resemble them.

Probably, however, some variety in the symptoms prevails in different instances; for, in the cases recorded by Walther, there was no pulsation, strictly so called, but merely an obscure movement, or an alternate distention and flaccidity, arising from the influx of blood into the vessels of the diseased mass; the tumors could not be pushed within the cranium in the slightest degree; nor did the attempt cause any of the effects usually observed to proceed from pressure on the brain. No aperture could be felt in the skull, much less could the irregular edges of the bone around the tumor be distinguished. (*Journ. für Chir. B.* 1, *p.* 57—61, *&c. 8vo. Berlin*, 1820.)

Whatever movements also were perceptible in the swellings, Walther is convinced could not be communicated to them by the pulsations of the subjacent brain; because they were wedged, as it were, in an aperture in the skull, and adherent to the dura mater beneath them, and to the superincumbent periosteum, so that, even in the dead subject, they did not admit of being pushed in the least more outwards without difficulty, and the employment of strong pressure. (*Vol. cit. p.* 57.)

Indeed, this tight constriction of the tumor not only explains why stupor, paralysis, &c. were not brought on in these particular examples by external pressure, but also why the edges of the hole in the skull could not be felt; and the small size of the same opening, in relation to the magnitude of the swelling, fully accounts in my opinion for the circumstance of the swellings not sinking inwards under pressure. But, I am far from being convinced with Walther, that fungi of the dura mater are in their nature always irreducible, (see *Vol. cit. p.* 82); a belief, which, he grounds upon the connexion of the diseased mass with the vessels of the diploe; its constriction by the bone; and its expansion under as well as above, the cranium. Here I think Walther is as wrong in saying, that none of these fungi can possibly be reduced, as others would be in asserting that it is their invariable character to be reducible. These differences must chiefly depend upon the size of the swelling, in relation to that of the aperture in the skull.

Generally speaking, fungous tumors of the dura mater are very dangerous, as well on account of their nature, as of the difficulty of curing them in any certain manner, and of the internal and external disorder, which they may occasion. Such as have a pedicle, the base of which is not extensive; which are firm in their texture, without much disease in the surrounding bone, are moveable, not very painful, and in persons, who are in other respects quite well, are in general reputed to be the least perilous. These are the cases, in which a cure may be attempted, with a hope of success, though the event is always exceedingly doubtful.

When the contrary of what has been just related occurs, when the disease is of long continuance, and the brain already affected, nothing favourable can be expected.

Compression is the most simple means of cure, and that which has naturally occurred to such practitioners, as have mistaken the disease for an aneurism, or a hernia cerebri. The efficacy of this method has been further misconceived, because the tumor, when not very large, has sometimes been partly, or even wholly reduced, without any bad consequences. This had no little share in leading to errors, concerning the true character of the disease. But, as might be conceived, this reduction, only being attended with temporary success, and having no effect whatever on the original cause of the affection, the symptoms returned, and the tumor rose up again, the moment the compression was discontinued. There is a fact in the memoir of M. Louis, which seems to evince, that good effects may sometimes be produced by compression judiciously employed. A woman, brought to the brink of the grave by the symptoms, occasioned by a tumor of the above kind, having rested with her head, for some time, on the same side as the tumor, found the swelling so suddenly reduced, without any ill effects, that she thought herself cured by some miracle. Compression artfully kept up, by means of a piece of tin, fastened to her cap, prevented the protrusion of the tumor again. The pressure, however, not having been always very exact, the symptoms every now and then recurred, while the tumor was in the act of being depressed again, and they afterwards ceased, on the swelling having assumed a suitable position. The symptoms were, doubtless, occasioned by the irritation, which the tumor suffered, in passing the inequalities around the opening, through which it protruded. The patient lived in this state nine years, having every now and then trances, in one of which, attended with hiccough and vomiting, she perished.

As compression cannot be depended upon, the following safer method may be tried. It consists in exposing the tumor with a knife, which is certainly preferable to caustics, the action of which is very tedious and painful, and can never be limited or extended with any degree of precision. A crucial incision may be made through the scalp covering the tumor, and the flaps dissected up, and reflected, so as to bring all the bony circumference into view. Then with trephines repeatedly applied, or with what would be better, Mr. Hey's saws, all the margin of the bone should be carefully removed. Now, if it be true, that the vessels of the diploe are chiefly concerned in the supply of the diseased mass, we see, that this source of its growth must be destroyed by the foregoing proceeding.

The tumor, thus disengaged on all sides, may be cut off with a scalpel; and such arteries as bleed much should be tied. Then, instead of applying caustic, as sometimes advised, perhaps, it would be better to remove every part of both layers of the dura mater immediately under the situation of the excrescence. By this means, and the removal of the surrounding bone and diploe, all chance of the regeneration of the tumor would be prevented. In attempting the excision of a fungus of the dura mater, it is certainly an interesting point to know, whether the tumor has an intimate vascular connexion with the diploe, and pericranium, as asserted by Siebold, Walther, and some other respectable authorities; though the importance of the information on this subject to the practitioner is somewhat lessened by his being aware, that it is necessary always to begin with sawing away the bone in the immediate vicinity of the diseased mass. In the dissection of one case, Walther found the pericranium thickened for a considerable extent around the disease, and closely connected with the tumor by vessels. (*Vol. cit. p.* 100.)

When the tumor is sarcomatous, and its pedicle small and narrow, as sometimes happens, one should not hesitate to cut it off.

This method is preferable to tying its base with a ligature, a plan which could not be executed, without dragging, and seriously injuring the dura mater. The excision is also preferable to caustics, which cause great pain, and very often convulsions. In performing the extirpation, we should remove the whole extent of the tumor, and, if possible, its root, even though it may extend as deeply as the internal layer of the dura mater. This step must not be delayed, for the disease will continue to increase, so as to affect the brain, become incurable, and even mortal. It is to such decision, that we must impute the success, which attended the treatment of the Spaniard Avalos, of whom Marcus Aurelius Severinus makes mention. The above nobleman was afflicted with intolerable head-achs, which no remedy could appease. It was proposed to him to trepan the cranium, an operation to which he consented. This proceeding brought into view, under the bone, a fungous excrescence, the destruction of which proved a permanent cure of the violent pains, which the disease had occasioned. It is not mentioned in this case, whether the internal layer of the dura mater was healthy, or not; but, there is foundation for believing, that if the extirpation of these tumors be undertaken in time, and bold measures be pursued, as in the instance just cited, success would often be obtained. Indeed, reason would support this opinion; for, when the disease is not extensive, it is necessary to expose a much smaller surface of the dura matter.

It appears to me, however, that trepanning can never be warrantable, unless the disease be indicated by some external changes. I saw my late master, Mr. Ramsden, trepan a man for a mere fixed pain in one part of the head, on the supposition, that there was a tumor under the bone; but no tumor was found, and the operation caused inflammation of the dura mater, and proved fatal.

No doubt, in some cases, the hemorrhage will be considerable, as was exemplified in the instance in which Walther made an incision at the base of one of these fungi, in order to ascertain its nature: two pints of blood being lost from several vessels of very large size ere they could be secured; and the further use of the knife discontinued.

M. Louis has described other tumors, which grow from the surface of the dura mater, when this membrane has been denuded, as after the application of the trephine. They only seem to differ from the preceding cases in not existing, before the opening was made in the skull. These cases are not to be confounded with the hernia cerebri. (*See this Article.*) See on the preceding subject, *Mémoire sur les Tumeurs fougueuses de la Dure-Mere, par M. Louis, in Mém. de l'Académie de Chirurgie, Tom.* 5, *4to., or Tom.* 13, *12mo. Encyclopédie Méthodique, Partie Chirurgicale, art. Dure-Mere. J. P. Kaufmann, de Tumore Capitis fungoso post Cariem Cranii exorto. Helmst.* 1743. *Lassus, Pathologie Chirurgicale, Tom.* 1, *p.* 497. *Edit.* 1809. *J. and C. Wenzel, über die Schwammigen Auswuchse auf der aussern Hirnhaut. Fol. Mainz.* 1811. *In this work, the sentiments of M. Louis are espoused. Ph. v. Walther in Journ. für Chirurgie von C. Græfe, &c. B.* 1, *p.* 55, *&c. 8vo. Berlin.* 1820. *The latter writer criticises the opinions of the Wenzels, and, of course, differs considerably from Louis on several points, some of which I have noticed in the foregoing pages.*

For an account of inflammation of the dura mater, See *Head, Injuries of.*

E.

EAR, DISEASES OF.

An organ, so valuable and necessary to the perfection of our existence, as the ear, should have all the resources of surgery exerted for the preservation of its integrity, and the removal of the diseases, with which it may be affected. What, indeed, would have been our lot, if nature had been less liberal, and not endued us with the sense of hearing? As Leschevin has observed, we should then have been ill qualified for the receipt of instruction; a principal inlet of divine and human knowledge would have been closed; and there being no reciprocal communication of ideas, our feeble reason could never have approached perfection. Even our life itself being as it were dependent upon all such bodies as surround us, would have been incessantly exposed to dangers. The eyesight serves to render us conscious of objects, which present themselves before us, and, when we judge them to be hurtful, we endeavour to avoid them. But, to say nothing of our inability of looking on all sides at once, our eyes become of no service to us, whenever we happen to be enveloped in darkness. The hearing is then the only sense, that watches over our safety. It warns us, not only of every thing, which is moving about us, but likewise of noises, which are more or less distant. Such are the inestimable advantages, which we derive from this organ. Its importance, when healthy, makes it worthy of the utmost efforts of surgery, when diseased. (*Leschevin, in Mémoires sur les Sujets proposés pour le Prix de l'Acad. Royale de Chirurgie, T.* 9, *p.* 111, 112. *Edit.* 12*mo.*)

It is not many years since the diseases of the ear were a subject, on which the greatest ignorance and the most mistaken opinions prevailed; and, indeed, how could any correct pathological information be expected, while anatomists had not given a complete and accurate description of the organ itself? Also, notwithstanding what has now been made out, respecting disorders of the ear, it is generally admitted, that they still require further investigation, and renewed industry. Though Duverney, Valsalva, Morgagni, &c. dispelled some of the darkness, which covered this branch of surgery, they left a great deal undone. Since their time, science has been enriched with the valuable discoveries of Cotunni, Meckel, Scarpa, and Comparetti; the two first of whom demonstrated, that the labyrinth is filled with a limpid fluid, and not (as was pretended) with confined air; while the two last distinguished anatomists favoured the public with the first very accurate description of the parts composing the labyrinth, especially, the semicircular canals.

In 1763, the French Academy of Surgery offered a prize for the best essay on diseases of the ear, and, two years afterwards, the honour was adjudged to that of Leschevin, senior surgeon of the hospital at Rouen. This memoir is still of great value, few modern treatises being more complete. The most useful contributors to our stock of information on the pathology of the ear, subsequently to M. Leschevin, have been Kritter, and Lentin (*Ueber das Schwere Gehoer. Leipz.* 1794): Trampel (*Arneman's Magaz. B.* 2, 1798); Pfingsten (*Vieljahrige Erfahrung ueber die Gehoerfehler, Kiel,* 1802); Alard (*sur le Catarrhe de l'Oreille,* 8*vo. Paris,* 1807, 2*d Edit.*) Sir A. Cooper (*Phil. Trans.* 1802.) Portal (*Anat. Med.* 1803.) J. C. Saunders (*Anat. and Dis. of the Ear,* 1806.) Baron Boyer (*Mal. Chir. T.* 6.) Itard (*Traité des Mal. de l'Oreille,* 8*vo.* 2 *Tomes.*) Saissy, in an essay, which received the approbation of the Medical Society of Bordeaux; and Professor Rosenthal in a short but sensible tract on the pathology of the ear. (See *Journ. Complem. T.* 6, 1820.)

But, notwithstanding the laudable endeavours of so many men of eminence, the pathology of the internal ear and the treatment of its diseases, are far, I may say, very far from a high state of improvement. To further advances, indeed, some discouraging obstacles present themselves: the auditory apparatus is extremely complicated; the most important parts of it are entirely out of the reach of ocular inspection; the anatomy of the organ is perhaps not yet completely unravelled; the exact uses and action of several parts of it, anatomically known, are still involved in mystery; the opportunities of dissecting the ear in a state of disease are neither frequent, nor duly watched, and even when they are taken, and when vestiges of disease, or imperfection, are traced to particular parts of the organ, the utmost difficulty is experienced in drawing any useful practical conclusion, because the natural uses of those parts, and the precise manner in which they contribute to the perfection of the ear, are not known to the most enlightened physiologists. We are here nearly in the same helpless dilemma, as a watchmaker would be, were he, in examining the interior of a watch, to find parts broken and out of order, the exact uses of which, in the perfection of the instrument, he had not first studied and comprehended. In fact, the physiology of the ear is but very imperfectly understood; and, as Rosenthal remarks, (*Journ. Complem. T.* 6, *p.* 17.) if, notwithstanding the progress made in optics, and the complete knowledge of the structure of the eye, a perfect explanation has not yet been given of the phenomena of this organ, as an instrument of vision, we cannot wonder, that, with far more circumscribed information about acoustics, and the greater difficulty of unravelling the structure of the ear, so little progress should have been made in the physiology of the latter organ. Were it practicable in acoustics to arrive at that precision and certainty, which would enable us to establish laws in the theory of sound, as fixed as those which relate to light, this void in physiological science might perhaps be obviated. But, Rosenthal justly argues, that hitherto the approach to perfection has not been made, and this notwithstanding the learned and valuable labours of Chladni. (*Akustik.* 4*to. Leipz.* 1802.) Some facts, however, are admitted to be well ascertained, and the researches of Autenrieth and Kerner (*Reil's Archiv. für die Physiol. T.* 9, *p.* 313—376), are honourably mentioned; for, though they only elucidate the function of the conductor-part of the ear, they are of unquestionable importance to the medical practitioner. It is clearly proved, that the difference in the length and breadth of the meatus auditorius, the form of the membrana tympani, and the make of the cavity of the tympanum, modify sound; that is to say, that the differences of structure of the auricle and meatus auditorius externus which merely receive and concentrate the sonorous undulations, as these emanate from a vibrating body, can only influence the degree of force, or weakness of the sound; while, on the contrary, the differences of structure in the membrane and cavity of the tympanum are not limited to this effect, but the greater or less tension of the one, and the more or less considerable capacity of the other, appear to alter in a greater or lesser degree the particular character of the sound. (*Journ. Complem. T.* 6, *p.* 20.)

1. *Wounds and Defects of the External Ear.*

The external ear, which is a sort of instrument calculated for concentrating the undulations or waves of sound, may be totally cut off, without deafness being the consequence. For a few days after the loss, the hearing is rather hard; but the infirmity gradually diminishes, the increased sensibility of the auditory nerve compensating for the imperfection of the organic apparatus. (*Richerand Nosogr. Chir. T.* 2, *p.* 122, *Edit.* 2.)

Dr. Hennen says, that he has met with a case, where the external ear was completely removed by a cannon shot, and yet the sense of hearing was as acute as ever. (*Principles of Military Surgery, p.* 348, *Ed.* 2.) Another case, recorded by Wepfer, also proves, that a total loss of the auricle may not cause any material injury of hearing, for the patient of whom he speaks had had the whole of the external ear destroyed by ulceration, and yet could hear as well as before the loss. (*Kritter und Lentin Ueber das schwere Gehoer, p.* 19, *Leipz.* 1794.) However, if we are to credit the statement of other writers, the recovery is generally far less complete. Thus Leschevin notices, that they who have lost the external ear, or have it naturally too flat, or ill shaped, have the hearing less fine. The defect can only be remedied by an artificial ear, or an ear trumpet, which, receiving a large quantity of the sonorous undulations, and directing them towards the meatus auditorius, thus does the office of the external ear. (*Prix de l'Acad. Royale de Chir. T.* 9, *p.* 120, *Edit.* 12*mo.*)

Wounds are not the only causes, by which the external ear may be lost: its separation is sometimes the consequence of ulceration, and sometimes the effect of the bites of horses and other animals. In cold climates, it is frequently frozen, and afterwards attacked with inflammation and sloughing. When the external ear is not totally separated from the head, the surgeon should not despair of being able to accomplish the reunion of it. This attempt should always be made, however small a connexion the part may have with the skin; for, in wounds of this kind, the efforts of surgery have occasionally succeeded beyond all expectation.

Wounds of the external ear, whatever may be their size and shape, do not require different treatment from that of the generality of other wounds. The reunion of the divided part is the only indication, and it may be in most instances easily fulfilled by means of methodical dressings. Such writers, as have recommended sutures for wounds of the ear, (says Leschevin,) have founded this advice upon the difficulty of applying to the part a bandage, that will keep the edges of the wound exactly together. The cranium, however, affords a firm and equal surface, against which the external ear may be conveniently fixed. Certainly, it is not more easy to secure dressings on the nose than the ear; and, yet, cases are recorded, in which the cartilaginous part of the nose was wounded, and almost entirely separated, and the union was effected without the aid of sutures. (See *Mém. de M. Pibrac sur l'Abus des Sutures, in Mem. de l'Acad. de Chir. Tom.* 3.)

In wounds of the ear, then, we may conclude, that sutures are generally useless and unnecessary. As examples may occur, however, in which the wound may be so irregular and considerable as not to admit of being accurately united, except by this means, it should not be absolutely rejected. An enlightened surgeon will not abandon altogether any curative plans; he only points out their proper utility, and keeps them within the right limits. When sticking plaster, simple dressings, and a bandage, that makes moderate pressure, appear insufficient for keeping the edges of a wound of the ear in due contact, the judicious practitioner will not hesitate to employ sutures.

When a bandage is applied to the external ear, it should only be put on with moderate tightness, since much pressure gives considerable uneasiness, and may induce sloughing. In order to prevent these disagreeable effects, Leschevin advises us to fill the space behind the ear with soft wool or cotton, against which the part may be compressed without risk. (*Op. cit. p.* 119.)

Baron Boyer remembers a medical student, who was compelled by an ulcer on the sacrum to lie for a long time on his side, in which posture the pressure on the ear caused a slough of the antihelix, and after the separation of the dead part, an aperture, large enough to receive the end of the little finger, was left in the pinna or auricle.

In the application of sutures to the ear, the ancients caution us to avoid carefully the cartilage, and to sew only the skin. They were fearful, that pricking the cartilage would make it mortify, "*ce qui est souvente-fois arrivé,*" says Paré. But, notwithstanding so respectable an authority, as Leschevin has remarked, the moderns make no scruple about sewing cartilages. In wounds of the nose, Verduc expressly directs the skin and cartilage to be pierced at once, and the success of the plan is put out of all doubt by a multitude of facts. The same treatment may also be safely extended to the ear.

Celsus, lib. 3, c. 6, speaks of fractures of the cartilage of the ear; but, such an accident seems hardly possible, unless the part be previously ossified. Leschevin and Boyer have never met with such a case, either in practice, or in the works of surgical writers.

In this section, a few malformations of the external ear require notice. Sometimes the orifice of the meatus auditorius is diminished by the tragus, antitragus, and antihelix being depressed into it. Here the excision of these wrongly formed eminences has been recommended, as a surer means of perfecting the sense of hearing, than the use of any tube, or dilating instruments. The tragus has been known to project considerably backwards, and to apply itself most closely over the orifice of the meatus, which was also a mere slit, instead of a round opening. In one case of this description, relief was obtained by the introduction of tubes, calculated to maintain the tragus in its proper position. (*Dict. des Sciences Med. T.* 38, *p.* 28.)

Sometimes the outer ear is entirely wanting. Thus Fritelli has given an account of a child in this condition, whose physiognomy at the same time strongly resembled that of an ape. (*Orteschi Giorn di Med. T.* 3, *p.* 80.) Oberteuffer has also recorded an example of a total deficiency of the auricles in an adult, who yet heard very well. (*Stark's Neuves Archiv. B.* 2, *p.* 638. *J. F. Meckel Handbuch der Pathol. Anat. B.* 1, *p.* 400, *Leipz.* 1812.)

Many years ago, I remember a child, which was shown to several medical gentleman in London, as a curiosity; it was entirely destitute of all appearance of external ears, and no vestiges of the meatus auditorii could be seen, these openings being completely covered by the common integuments. Yet the child could hear a great deal, though the sense was certainly dull and imperfect. I recollect, that the circumstance of the patient hearing so well as he did, was what excited considerable surprise. I am sorry I do not more particularly recollect, at the present time, the degree in which this sense was enjoyed, and several other circumstances, such as the child's age, power of speech, &c. The example, however, is interesting, inasmuch as it proves, that even a deficiency of the auricles, combined with an imperforate condition of both ears, may be unattended with complete deafness, provided the internal and more essential parts of these organs are sound and perfectly formed.

Baron Boyer attended a young man, the lobule of one of whose ears extended in a very inconvenient manner over the cheek: the redundant portion was removed with a pair of scissars, and the wound soon healed.

The auricle, not being a very irritable part, is not often inflamed, and when it is so, the affection is generally of an erysipelatous character. Portal has seen the part nearly an inch thick; and he takes notice of the prodigious thickness, which the lobe of the ear sometimes acquires in women, who wear very heavy ear-rings, which keep up constant irritation. Small encysted and adipose swellings occasionally grow under the skin of the external ear, and demand the same treatment as swellings of the same nature in other situations. (See *Tumors.*) Lastly, the external ear is frequently the seat of scrofulous, and other ill-conditioned ulcers. These cases generally require cleanliness, alterative medicines, and to be dressed with the ung. hydrarg. nitrat. or a solution of the nitrate of silver; and sometimes, when the sores resist for a long time the effects of medicine and the usual dressings, they will soon heal up, if the treatment be assisted with a blister, or seton, kept open on the nape of the neck. (See *Dict. des Sciences Med. T.* 38, *p.* 28, 29.)

2. *Of the Meatus Auditorius, and its Imperfections.*

This is the passage, which leads from the cavity of the external ear, called the concha, down to the membrane of the tympanum. It is partly cartilaginous, and partly bony, and has an oblique winding direction, so that its whole extent cannot be easily seen. There are circumstances, however, in which it is proper to look as far as possible into the passage. Such is the case, when the surgeon is to extract any foreign body, to remove any excrescence, or to detect any other occasion of deafness. Fabricius Hildanus gives a piece of advice upon this subject, not to be despised; namely, to expose the ear to the rays of the sun, in order to be enabled to see the very bottom of the meatus auditorius externus.

The surgical operations practised on the meatus auditorius are confined to opening it, when preternaturally closed, extracting foreign bodies, washing the passage out with injections, and removing excrescences, which may form there.

The case which we shall next treat of, is the imperforation of the meatus auditorius externus, a defect with which some children are born.

When the malformation exists in both ears, it generally renders the subject dumb, as well as deaf, for, as he is incapable of imitating sounds, which he does not hear, he cannot of course learn to speak, although the organs of speech may be perfect, and in every respect rightly disposed. In this case, the surgeon has to rectify the error of nature, and, (to use the language of Leschevin,) he has to give by a double miracle, hearing and speech to an animated being, who, deprived of these two faculties, can scarcely be regarded in society as one of the human race. How highly must such an operation raise the utility and excellence of surgery in the estimation of the world!

When the meatus auditorius externus is merely closed by an external membrane, the nature of the case is evident, and the mode of relief equally easy. But, when the membrane is more deeply situated in the passage, near the tympanum, the diagnosis is attended with more difficulty, and the treatment with greater trouble.

If the preternatural membrane is external, or only a little way within the passage, it is to be divided with a bistoury; the small flaps are to be cut away; a tent, of a suitable size, is to be introduced into the opening; and the wound is to be healed *secundum artem,* care being taken to keep it constantly dilated, until the cicatrization is completed.

When the obstruction is deeply situated, we must first be sure of its existence, which is never ascertained, or even suspected, till after a long while. It is not till after children are past the age, at which they usually begin to talk, that any defect is suspected in the organ of hearing, because until this period, little notice is taken, whether they hear or not. As soon as it is clear, that this sense is deficient, the ears should always be examined with great attention, in order to discover, if possible, the cause of deafness. Sometimes, the infirmity depends upon a malformation of the internal ear, and the cause does not then admit of detection. The most convenient method of making the examination is to expose the ear, which is about to be examined, to the light of the sun. In this situation, the surgeon will be able to see beyond the middle of the bony part of the meatus, if he places his eye opposite the orifice of the passage, and takes care to efface the curvature of the cartilaginous portion of the canal, by drawing upward the external ear. If the passage has been carefully cleansed, before the examination, the skin, forming the obstruction, may now be seen, unless it be immediately adherent to the tympanum.

When the preternatural septum is not closely united to the tympanum, its destruction should be attempted, and hopes of effecting the object, either suddenly, or gradually, may reasonably be entertained. According to Leschevin, the particular situation of the obstruction is the circumstance, by which the surgeon ought to be guided in making a choice of the means for this operation. If the membranous partition is so far from the tympanum, that it can be pierced without danger of wounding the latter part, there can be no hesitation in choosing the plan to be adopted. In the contrary state of things, Leschevin is an advocate for the employment of caustic, not only on account of the risk of injuring the tympanum with a cutting instrument, but. also, because, if the puncture were ever so well executed, a tent could not be introduced into it, so as to prevent it from closing again.

In the first case, a very narrow sharp-pointed bistoury should be used: after its blade has been wrapped round with a bit of tape to within a line of the point, it is to be passed perpendicularly down to the preternatural membrane, which is to be cut through its whole diameter. The instrument being then directed first towards one side, then the other, the crucial incision is to be completed. As the flaps, which are small and deeply situated, cannot be removed, the surgeon must be content with keeping them separated by means of a blunt tent. The wound will heal just as favourably as that occasioned in removing the imperforation of the concha, or outer part of the meatus auditorius. (*Prix de l'Acad. de Chir. p.* 124—126, *T.* 9.) In the second case, that is to say, when the risk of wounding the tympanum leads us to prefer the employment of caustic, the safest and most commodious way of putting the plan in execution would be that of touching the obstruction, as often as circumstances may require, with the extremity of a bougie armed with the argentum nitratum. In the intervals of the applications, no dressings need be introduced, except a bit of clean soft cotton, for the purpose of absorbing any discharge, which may take place within the passage.

It is manifest, that if the whole, or a considerable part of the meatus auditorius externus were wanting, the foregoing measures would be insufficient. The following observations of Leschevin merit attention: "I do not here allude to cases, in which a malformation of the bone exists. I know not, whether there are any examples of such an imperforation; but, it is clear, that it would be absolutely incurable. I speak of a temporal bone perfectly formed in all its parts, and the meatus auditorius of which, instead of being merely lined by a membrane, as in the natural state, is blocked up by the cohesion of the parietes of this membrane throughout a certain extent of the canal; just as the urethra, rectum, or vagina, is sometimes observed to be not simply closed by a membrane, but by a true obliteration of its cavity.

"Such a defect in the ear may be congenital, and it may also arise from a wound, or ulceration, of the whole circumference of the meatus auditorius externus, this canal having become closed by the adhesion of its parietes, on cicatrization taking place.

"Such an imperforation, whether congenital, or accidental, must certainly be more difficult to cure, than the examples treated of above; but, (says Leschevin) I do not for this reason believe, that the case ought to be entirely abandoned. Yet, I would not have the cure attempted in all sorts of circumstances. For instance, if the defect only existed in one ear, and the other were sound, I would not undertake the operation, because, as the patient can hear tolerably well on one side, the advantages which he might derive from having the enjoyment of the other ear, would not counterbalance the pain and bad symptoms occasioned by such an experiment, the success of which is extremely uncertain. I would not then run the risk of making a perforation, except in a case of complete deafness; and I propose this means only as a dubious one upon the fundamental maxim, so often laid down, that it is preferable to employ a doubtful remedy, than none at all.

"With respect to the mode of executing this operation," says Leschevin, "the trocar seems the most eligible instrument. I would employ one, that is very short, and the point of which is bluntish, and only projects out of a cannula as little as possible. This construction would indeed make the instrument less adapted to pierce any thing; but, still, as the parts to be perforated are firm, their division might be accomplished sufficiently well; and the inconvenience of a trivial difficulty in the introduction of the trocar is comparatively much less, than that which would attend the danger of wounding with a sharper point the membrane of the tympanum. I would plunge the point of the instrument into the place, where the opening of the meatus auditorius externally ought naturally to be, and which would be denoted, either by a slight depression, or at all events by attending to the different parts of the ear, especially, the tragus, which is situated directly over this passage. I would push in the trocar gently, in the direction of the canal formed in the bone, until the point of the instrument felt as if it had reached a vacant space. Then, withdrawing the trocar, and leaving the cannula, I would try, whether the patient could hear. I would then introduce into the cavity of the cannula itself a small, rather firm tent, of the length of the passage, or a small bougie. By means of a probe, I would push it to the end of the cannula, which I would now take out, observing to press upon the tent, which is to be left in. The rest of the treatment consists in keeping the canal pervious, making it suppurate, and healing it with common applications. One essential caution, however, would be that of keeping the part dilated long after it had healed: otherwise, it might close again, and a repetition of the operation become necessary. This happened to Heister, as he himself apprises us, and it occurred to Roonhuysen in treating imperforations of the vagina.

"If the cohesion of the parietes of the meatus auditorius externus were to extend to the tympanum inclusively, the operation would be fruitless; but, as it is impossible to ascertain this circumstance, before the attempt is made, the surgeon would incur no disgrace by relinquishing the operation, and giving up the treatment of an incurable disease. If, then, after the trocar were introduced to about the depth of the tympanum, the situation of which must be judged of by our anatomical knowledge, no cavity were met with, the operation should be abandoned; and, if in these circumstances, any one were to impute the want of success to the inefficacy of surgery, or the unskilfulness of the surgeon, he would act very unfairly.

"It is also plain, that such an operation could cure a congenital deafness, only inasmuch as it might depend upon the imperforation; for, if there should exist, at the same time, in the internal ear, any malformation, destructive of the power of the organ, the remedying of the external defect would be quite useless." (*Leschevin, in Prix de l'Acad. de Chirurgie, Tom.* 9, *p.* 127, 132.)

We find, that this author entertains a great dread of wounding the tympanum, and certainly he is right in generally insisting upon the prudence of avoiding such an accident. It will appear, however, in the sequel of this article, that under certain circumstances, puncturing the tympanum has been successfully practised, as a mode of remedying deafness. The operation, however, demands caution; for, if done so as to injure the connexion of the malleus with the membrana tympani, the hearing must ever afterwards be very imperfect.

3. *Unusual smallness of the Meatus Auditorius Externus.*

Imperforation is not the only congenital imperfection of the meatus auditorius; this passage is occasionally too narrow for the admission of a due quantity of the sonorous undulations, and the sense is of course weakened. Leschevin mentions, that M. de la Metrie found this canal so narrow in a young person, that it could hardly admit a probe. What has been observed, concerning the imperforation, is also applicable to this case. If it depends upon malformation of the bone, it is manifestly incurable; but, if it is owing to a thickening of the soft parts, within the meatus, hopes may be indulged of doing good by gradually dilating the passage with tents, which should be increased in size from time to time, and, lastly, making the patient wear for a considerable time, a tube, adapted to the part in shape. (*Leschevin, in Prix de l'Acad. de Chirurgie, Tom.* 9. *p.* 132.)

Mr. Earle has lately published a case, in which the diameter of the meatus auditorius was considerably lessened by a thickening of the surrounding parts, and especially of the cuticle, attended with a discharge from the passage, and great impairment of hearing. A cure was effected by injecting into the passage a very strong solution of the nitrate of silver, which, in a few days, was followed by a detachment of the thickened portions of cuticle. This evacuation was assisted by throwing warm water into the passage. (See *Med. Chir. Trans. Vol.* 10, *p.* 411, *&c.*) Boyer was consulted for a deafness, which arose from a malformation, which consisted of a flattening of the meatus, its opposite sides being for some extent in contact. The patient was advised to wear in the ear a gold tube of suitable shape, by which means he was enabled to hear perfectly well.

4. *Faulty shape of the Meatus Auditorius Externus.*

Anatomy informs us, that this passage is naturally oblique, and somewhat winding; and natural philosophy teaches us the necessity of such obliquity, which multiplies the reflections of the sonorous waves, and thereby strengthens the sense. This theory, says Leschevin, is confirmed by experience; for, there are persons, in whom the meatus auditorius is almost straight, and they are found to be hard of hearing. If there is any means of correcting this defect, it must be that of substituting, for the natural curvature of the passage, a curved and conical tube, which must be placed at the outside of the organ, just like a hearing trumpet. The acoustic instrument, invented by Deckers, which is much more convenient, might also prove useful. (*Op. cit. p.* 133.)

5. *Extraneous Substances, Insects, &c. in the Meatus Auditorius Externus.*

Foreign bodies met with in this situation are inert substances, which have been introduced by some external force; insects, which have insinuated themselves into the passage; or the cerumen itself, hardened in such a degree, as to obstruct the transmission of the sonorous undulations. Worms, which make their appearance in the meatus auditorius, are always produced subsequently to ulcerations in the passage, or in the interior of the tympanum, and, very often, such insects are quite unsuspected causes of particular symptoms. In the cases of surgery, published in 1778, by Acrel, there is an instance confirming the statement just offered. It is the case of a woman, who, having been long afflicted with a hardness of hearing, was suddenly seized with violent convulsions, without any apparent cause, and soon afterwards complained of an acute pain in the ear. This affection was followed by a recurrence of convulsions, which were still more vehement. A small tent of fine linen, moistened with a mixture of oil and laudanum, was introduced into the meatus auditorius, and, on removing it the next day, several small round worms were observed upon it, and, from that period, all the symptoms disappeared. To this case, we shall add another from Morgagni. A young woman consulted Valsalva, and told him, that when she was a girl, a worm had been discharged from her left ear; that another one, about six months ago, had also been discharged, very much like a small silkworm in shape. This event took place after very acute pain in the same ear, the forehead and temples. She added, that since this, she had been tormented with the same pains, at different intervals, and so severely, that she often swooned away for two hours together. On recovering from this state, a small worm was discharged, of the same shape as, but much smaller than, the preceding one, and she was now afflicted with deafness and insensibility on the same side. After hearing this relation, Valsalva no longer entertained any doubt of the membrane of the tympanum being ulcerated. He proposed the employment of an injection, in order to destroy such worms as yet remained. For this purpose, distilled water of St. John's wort, in which mercury had been agitated, was used. In order to prevent a recurrence of the inconvenience, Morgagni recommends the affected ear to be closed up when the patient goes to sleep, in autumn and summer. If this be not done, flies, attracted by the suppuration, enter the meatus auditorius, and, while the patient is unconscious, deposit their eggs in the ear. Acrel, in speaking of worms, generated in the meatus auditorius, observes, that there is no better remedy for them, than the decoction of ledum palustre, injected into the ear, several times a day. However, as this plant cannot always be procured, an infusion of tobacco in oil of almonds may be used, a few drops of which are to be introduced into the ear, and retained there by means of a little bit of cotton. This application, which is not injurious to the lining of the passage, is fatal to insects, and especially to worms. It will answer in cases where caterpillars, ants, earwigs, and other insects, have insinuated themselves into the meatus auditorius; though it is generally considered better first to endeavour to extract them. A piece of lint, smeared with honey, often suffices for this purpose, and when they cannot be extracted by this simple means, they may be taken out with a small pair of forceps. The latter method serves also for the extraction of cherry-stones, peas, or other seeds, which have been introduced into the meatus auditorius. If such substances should make too much resistance, forceps with stronger blades for breaking the extraneous bodies must be employed, and then the fragments are to be extracted piecemeal. But, in these cases, before attempting the extraction, a little oil of almonds should be injected. The presence of foreign bodies in the ear often occasions the most extraordinary symptoms, as we may see in the fourth observation of Fabricius Hildanus, Cent. 13.

After four surgeons, who had been successively consulted, had in vain exerted all their industry to extract a bit of glass from the left ear of a young girl, the patient found herself abandoned to the most excruciating pain, which soon extended to all the side of the head, and which, after a considerable time, was followed by a paralysis of the left side, a dry cough, suppression of the menses, epileptic convulsions, and, at length, an atrophy of the left arm. Hildanus cured her, by extracting the piece of glass, which had remained eight years in her ear, and had been the cause of all this disorder. Although the extraction must have been very difficult, it does not appear that Hildanus found it necessary to practise an incision behind the ear, as some authors have advised, and amongst them, Duverney, who has quoted the foregoing case. We must agree with Leschevin, that such an incision does not seem likely to facilitate the object very materially; for, it must be on the outside of the extraneous substance, which is in the bony part of the canal. The incision enables us, in some measure, to avoid the obliquity of the passage, as Duverney has observed; but it is not such obliquity of the cartilaginous portion of the canal, that can be a great impediment; for, as it is flexible, it may easily be made straight, by drawing the external ear upward. Hence, Fabricius ab Aquapendente rejected this operation, first proposed by Paulus Ægineta; and it is justly disapproved of by Leschevin. (*Prix de l'Acad. de Chir. Tom.* 9, *p.* 147, *Edit.* 12*mo.*)

Sabatier relates a case, in which a paper ball, which had been pushed into the meatus auditorius, made its way by ulceration into the cavity of the tympanum, where an abscess formed, which communicated with the interior of the cranium.—(*Dict. des Sciences Med. T.* 7, *p.* 8.)

6. *Meatus Auditorius obstructed with thickened, or hardened Cerumen.*

The cerumen, secreted in the meatus auditorius by the sebaceous glands, frequently accumulates there in large quantities, and becoming harder and harder, at length acquires so great a degree of solidity as entirely to deprive the patient of the power of hearing. Galen has remarked, *è numero eorum quæ meatum obstruunt, sordes esse quæ in auribus colligi solent.* This species of deafness is one of those kinds, which are the most easy of cure, as is confirmed by observers, especially Duverney. Formerly frequent injections, either with simple olive oil, or oil of almonds, were recommended. The injection was retained by a piece of cotton, and when there was reason to believe that the matter was sufficiently softened, an attempt was made to extract it by means of a small scoop-like instrument. Various experiments were made by Haygarth, at Chester, in 1769, from which it appears that warm water is preferable to oil. The water dissolves the mucous matter, which connects together the truly ceruminous particles, and which is the cause of their tenacity; other applications only succeeding by reason of the water which they contain.

The lodgment of hard pellets of wax, if neglected, may ultimately produce ulceration of the tympanum, and other serious mischief. Thus, in one case, Ribes and Chaussier found the handle of the malleus separated from its head, partly destroyed, and covered with the hardened cerumen that had made its way into the tympanum. (See *Dict. des Sciences Med. T.* 38, *p.* 30.)

" The symptoms, (says Mr. Saunders) which are attached to the inspissation of the cerumen are pretty well known. The patient, besides his inability to hear, complains of noises, particularly a clash or confused sound in mastication, and of heavy sounds, like the ponderous strokes of a hammer.

" The practitioner is led by the relation of such symptoms to suspect the existence of wax; but he may reduce it to a certainty by examination.

" Any means capable of removing the inspissated wax may be adopted; but syringing the meatus with warm water is the most speedy and effectual, and the only means necessary. As the organ is sound, the patient is instantaneously restored." (*Anatomy of the human Ear, with a Treatise on its Diseases, by J. C. Saunders.* 1806, *p.* 27, 28.)

In order to throw an injection into the ear with effect, a large syringe, capable of holding, at least, six or eight ounces, should be employed; and the fluid should be injected with a good deal of force, care being taken to let it enter in the natural direction, and not against one of the sides of the passage. The surgeon must also avoid pressing the pipe too deeply into the ear, so as to hurt the tympanum. As the fluid regurgitates with considerable rapidity, a small basin is to be held close up to the ear at the time of using the syringe, so as to catch the water, and hinder it from wetting the patient's clothes; for the surer prevention of which a napkin is also to be laid over the shoulder. In general it is necessary to throw the water into the ear six or seven times, or more, ere the pellets of wax are loosened, and entirely brought out; and, sometimes, the injections will not completely succeed the first day on which they are employed. The evening before the syringe is to be used, it may occasionally be best to drop a little sweet oil into the ear.

7. *Discharges from the Meatus Auditorius.*

Purulent discharges from the ear either come from the meatus auditorius externus itself, or they originate from suppuration in the tympanum, in consequence of blows on the head, abscesses after malignant fevers, the small-pox, or the venereal disease. In such cases, the little bones of the ear are sometimes detached, and escape externally, and complete deafness is most frequently the consequence. However, in a few instances, total deafness does not always follow even this kind of mischief, as I myself have witnessed on one or two occasions. There is greater hope when the disorder is confined to the meatus; as judicious treatment may now avert the most serious consequences. In Acrel's surgical cases, there is a case relative to the circumstance of which we are speaking. Suppuration took place in the meatus auditorius externus, in consequence of acute rheumatism, which was followed by vertigo, restlessness, and a violent head-ach. The matter discharged was yellowish, of an aqueous consistence, and acid smell. The meatus auditorius was filled with a spongy flesh. On introducing a probe, our author felt a piece of loose rough bone, which he immediately took hold of with a pair of forceps, and extracted. From the time when this was accomplished, the discharge diminished; and, with the aid of proper treatment, the patient became perfectly well.

The meatus auditorius, like all other parts of the body, is subject to inflammation. This is frequently produced by exposure to cold. It is hardly necessary to say, that generally topical bleeding and antiphlogistic means are indicated. The meatus auditorius should also be protected from the cold air, particularly in the winter season, by means of a piece of cotton.

Mr. Saunders observes, " When the means employed to reduce the inflammation have not succeeded, and matter has formed, it is generally evacuated, as far as I have observed, between the auricle and mastoid process, or into the meatus. If it has been evacuated into the meatus, the opening is most commonly small, and the spongy granulations, squeezed through a small aperture, assume the appearance of a polypus. Sometimes the small aperture, by which the matter is evacuated, is in this manner even closed, and the patient suffers the inconvenience of frequent returns of pain from the retention of the discharge. When the parts have fallen into this state, it will be expedient to hasten the cure by making an incision into the sinus, between the auricle and mastoid process.

" It occasionally happens, that the bone itself dies in consequence of the sinus being neglected, or the original extent of the suppuration. The exfoliating parts are the meatus externus of the os temporis or the external lamina of the mastoid process." (*P.* 24, 25.)

8. *Excrescences in the Meatus Auditorius.*

Though the membrane, lining the meatus auditorius, is very delicate, it is not the less liable to become thickened, and to form polypous excrescences. This case, however, is not common. As such tumors are ordinarily firmer in their texture than polypi of the nose, they are sometimes not so easily extracted with forceps. When they are situated near the external orifice, and admit of being taken hold of with a small pair of forceps, or a hook, they may easily be cut away, when drawn outward, and this without any reason for fearing hemorrhage. This, indeed, is usually very trivial. When the tumors are more deeply situated, Mr. B. Bell recommends the use of a ligature. Here the same plan may be pursued as will be explained in the article *Polypus.* But, it sometimes happens, that the excrescences cannot be removed in this manner; as instead of being adherent by a narrow neck, they have a broad base, which occupies a considerable extent of the passage. In such cases, the use of escharotics has been absurdly proposed; but, as these applications cannot be used without risk of injuring the membrane of the tympanum, it is better to have recourse to another method. (*Encyclopédie Méthodique; Partie Chirurgicale. Art. Auditif conduit.*) Mr. B. Bell recommends dilating the passage with bougies; but it is obvious that the pressure of such instruments would also be very likely to irritate and inflame the membrane of the tympanum.

9. *Herpes of the Meatus Auditorius.*

An herpetic ulcerous eruption sometimes affects the meatus auditorius and auricle, producing considerable thickening of the skin, and so great an obstruction of the passage, that a good deal of deafness is the consequence. Mr. Saunders remarks, that, in this case, " the ichor, which exudes from the pores of the ulcerated surface, insipissates in the meatus, and not only obstructs the entrance of sound, but is accompanied with a great degree of fœtor. This disease is not infrequent. I have never seen it resist the effect of alterative medicines," the use of injections containing the oxymuriate of quicksilver, and the application of the unguentum hydrargyri nitrati.

Mr. Saunders exhibited calomel as the alterative, and, in one instance, employed a solution of the argentum nitratum, as an injection. (*Page* 25, 26.) When the disease is obstinate, a seton should be made on the nape of the neck, or a blister be applied behind the ear.

10. *Affections of the Tympanum.*

The ear is sometimes affected with a puriform ichorous discharge, attended with a loss of hearing, proportionate to the degree of disorganization which the tympanum has sustained. Frequently, on blowing the nose, air is expelled at the meatus auditorius externus; and, when this is the case, it is evident, that the discharge is connected with an injury, or destruction of the membrana tympani. However, when the Eustachian tube is obstructed with mucus, or matter, or when it is rendered impervious, and permanently closed by inflammation, the membrana tympani may not be perfect, and yet, it is clear, no air can in this state be forced out of the external ear in the above manner. An examination with a blunt probe, or with the eye, while the rays of the sun fall into the passage, should therefore not be omitted. If the membrane have any aperture in it, the probe will pass into the cavity of the tympanum, and the surgeon feel that his instrument is in contact with the ossicula.

In this manner, the affection may be discriminated from an herpetic ulceration of the meatus auditorius externus. The causes are various: In scarlatina maligna, the membrana tympani occasionally inflames, and sloughs; all the ossicula are discharged, and, if the patient live, he often continues quite deaf. An ear-ach, in other words, acute inflammation of the tympanum is the most common occasion of suppuration in this cavity, in which, and the cells of the mastoid process, a good deal of pus collects. At length the membrana tympani ulcerates, and a large quantity of matter is discharged; but, as the secretion of pus still goes on, the discharge continues to ooze out of the external ear.

Instead of stimulating applications, inflammation of the tympanum demands the rigorous employment of antiphlogistic means. Unfortunately, it is a too common practice, in this case, to have recourse to acrid spirituous remedies. Above all things, the repeated application of leeches to the skin behind the external ear, and over the mastoid process, should never be neglected. As soon as the inflammation ceases, the degree of deafness, occasioned by it, will also disappear. This, however, does not always happen.

When an abscess is situated in the cavity of the tympanum, Mr. Saunders thinks, that the membrana tympani should not be allowed to burst by ulceration, but be opened by a small puncture. (P. 31.) However, unless there were the strongest ground for believing, that the Eustachian tube were impervious, this advice, I think, ought not to be followed, more especially as the symptoms are generally too vague to afford any degree of certainty in the diagnosis.

Sometimes the disease, of which we are treating, is more insidious in its attack: slight paroxysms of pain occur, and are relieved by slight discharges. The case goes on in this way, until, at last, a continual discharge of matter from the ear takes place. The disorder is destructive in its tendency to the faculty of hearing, and it rarely stops until it has so much disorganized the tympanum and its contents, as to occasion total deafness. Hence, Mr. Saunders insists upon the propriety of making attempts to arrest its progress,—attempts which are free from danger; and he censures the foolish fear of interfering with the complaint, founded on the apprehension, that bad constitutional effects may originate from stopping the discharge.

If the case be neglected, the tympanum is very likely to become carious; before which change, the disease, says Mr. Saunders, is mostly curable.

Mr. Saunders divides the complaint into three stages: 1. A simple puriform discharge. 2. A puriform discharge complicated with fungi and polypi. 3. A puriform discharge with caries of the tympanum. As the disease is local, direct applications to the parts affected are chiefly entitled to confidence. Blisters and setons may also be advantageously employed. Mr. Saunders's practice consisted in administering laxative medicines and fomenting the ear, while inflammatory symptoms lasted, and afterwards injecting a solution of the sulphate of zinc, or cerussa acetata.

In the second stage, when there were fungi, he removed or destroyed them with forceps, afterwards touched their roots with the argentum nitratum, or injected a solution of alum, sulphate of zinc, or argentum nitratum.

Writers describe a relaxed state of the membrana tympani, as a cause of deafness. If, says a late author, after a discharge from the meatus auditorius externus, or cavity of the tympanum, or a dropsy of the latter cavity, the hearing remains hard, there is reason to suspect, that the infirmity may depend upon relaxation of the membrane of the tympanum, or paralysis of the internal muscle of the malleus. This suspicion will be strengthened, if the deafness should increase in damp, and lessen in dry, weather; and particularly, if it be found, that the hearing is benefited by introducing into the ear dry warm tonic applications such as the smoke of burning juniper-berries, or other astringent vegetable substances. The decoction of bark, used as an injection, is also said to have done good.

The relaxation of the tympanum, alleged to proceed from a rupture of the muscle of the malleus, is deemed incurable; but it is not so with the case, which depends upon paralysis of this muscle. Here tonic injections into the tympanum, through the Eustachian tube, are recommended. (*Dict. des Sciences Med. T.* 38, *p.* 50.) Electricity, stimulating liniments and gargles, and a blister, might also be tried.

Imperfect hearing is supposed sometimes to arise from preternatural tension of the membrane of the tympanum, indicated by the patient hearing better in wet than dry weather, and by his hearing what is spoken in a low tone, near his ear, better than any thing said in a loud manner. The opinions, delivered by writers on the causes of this affection, are only uncertain conjectures. The local treatment recommended consists of injecting into the meatus auditorius, emollient decoctions, or warm milk, or introducing into the passage a dossil of soft cotton, dipped in oil of sweet almonds. Nothing certain is known respecting the proper constitutional treatment, as must be clear from our ignorance of the causes of this form of disease of the ear.

Hardness of hearing appears sometimes to be caused by a chronic thickening of the membrane of the tympanum; and it is alleged, that there are cases of this description, which proceed from syphilis, and require mercury. An issue in the arm nearest the affected ear, and emollient and slightly stimulant injections, are likewise commended. When the tympanum was so considerably thickened, that there was no chance of restoring it to a healthy state, Portal questioned whether it might not be advisable to make a small opening in it? (*Précis de Chir. Pratique, T.* 2, *p.* 430.) This operation, which is said to have been first suggested by Cheselden, will be considered in the ensuing section.

Morgagni found the cavity of the tympanum intersected by numerous membranes, which impeded the movements of the ossicula. (*Epist. an.* 6, § 4.)

Meckel does not mention any example of a deficiency of all the ossicula. (*Handb. des Pathol. Anat. B.* 1, *p.* 402.) Mersanni, however, found the incus wanting, (*Bonet Sepulch. T.* 1. *sect.* 19, *Obs.* 4, § 1.) Caldani, the malleus and incus. (*Epist. ad Haller*, T. 6, *p.* 142.) The latter case was unattended with any bad effect on the hearing; the first with deafness. In a deaf child, three years of age Bailly found the ossicula of only ⅓ their proper size. (*Bonet Sepulcr. T.* 1, *sect.* 19, *Obs.* 4, § 3.) In an example, where the fenestra rotunda was obstructed, Cotunni found the ossicula twice as large as natural. (*De labyrinthi auris contentis*, § 72, and *Meckel's Handb. des Pathol. Anat. B.* 1, *p.* 402.) A case, in which all the ossicula were wanting, is now on record. (See *Dict. des Sciences Med. T.* 38, *p.* 114.)

11. *Obstruction of the Eustachian Tube.*

This is often a cause of a considerable degree of deafness, because it is necessary for perfect hearing, that air should be conveyed from the mouth through this passage into the cavity of the tympanum, which now can no longer happen.

A degree of deafness generally attends a severe cold, which is accounted for by the Eustachian tube being obstructed with thickened mucus. Mr. Saunders tells us, that the obstruction most frequently arises from syphilitic ulcers in the throat, or sloughing in the cynanche maligna. The deafness comes on when such sores are healed, that is, when the obstruction is complete. The descent of a nasal polypus into the pharynx, and enlarged tonsils, have also been known to close the tube. (*P.* 42.)

When the Eustachian tube is obstructed, the patient cannot feel the membrana tympani crackle, as it were, in his ear, on blowing forcibly with his nose and mouth stopped. Previous ulceration, or disease, of the throat will sometimes facilitate the diagnosis.

When the Eustachian tube is obstructed with mucus, it has been proposed to employ injections, which are to be thrown by means of a syringe and catheter, into the guttural orifice of that canal. This operation, however, is alleged to be always attended with trouble, and, when the os spongiosum inferius happens to be situated near the floor of the orbit, the introduction of any instrument, like a female catheter, would be impracticable. (*Richerand Nosogr. Chir. T.* 2, *p.* 131, *edit.* 2.)

Sir A. Cooper had noticed, that hearing was only impaired, not lost, when suppurations in the tympanum had injured, and even destroyed the membrana tympani, and that the degree of deafness by no means equalled what resulted from an obstruction of the Eustachian tube. Hence, when the tube was permanently obliterated, he conceived, that a small puncture of the membrana tympani might be the means of enabling the patient to hear. This gentleman reports four cases, in which the experiment was made with success.

The operation consists in introducing an instrument, resembling a hydrocele trocar, but curved, into the meatus auditorius externus, and pushing it through the anterior and inferior part of the membrana tympani; a place rendered most eligible, on account of the situation of the chorda tympani and manubrium of the malleus, parts which should be left uninjured. The instrument must not be introduced far, lest it wound the vascular lining of the tympanum, and cause a temporary continuance of the deafness, by an effusion of blood. When the puncture is made, in proper cases, and in a judicious manner, hearing is immediately restored. A small hole in the membrana tympani now conveys the air into the cavity of the tympanum, answering the same purpose as the Eustachian tube.

The surgeon will be able to operate with more ease, if he take care to lessen the curvature of the meatus auditorius by drawing upward the external ear.

There is some chance of a relapse in consequence of the opening closing up. This consideration led Richerand to propose making the aperture with caustic, so as to destroy a part of the membrane. (*Nosogr. Chir. T.* 2, *p.* 132, *edit.* 2.) The suggestion is not likely to be adopted, on account of the inconveniences of applying caustic within the ear. Mr. Saunders is an advocate for making the opening large. However, perhaps the best method of doing the operation both effectually and safely is that lately described by Mr. Buchanan, of Hull, the chief peculiarity of whose mode consists in *drilling* the perforation. The quadrangular point of his perforator cuts the fibres of the membrana tympani across; they retract; the wound assumes an oval shape; and there is less danger of its closure again, than after the common plan of making a simple puncture. "A room (says Mr. Buchanan) with a window fronting the south, should be chosen for the place of the operation; and the patient placed on a low seat, so that the rays of the sun may fall into the meatus. The manubrium, or handle of the malleus will then be distinctly seen, pointing downwards and inwards; occupying the superior half of the membrana tympani. The surgeon being seated on a high chair, should lay his left hand on the head of the patient, and, with the right, take hold of the instrument in the same manner as he would a pen when writing: he should then cautiously and steadily enter the point of the perforator into the membrana tympani, about half way between the centre and its lower edge, and, with the thumb and index finger give the instrument half a turn one way, and then half a turn the other, and, in this manner gently push the point about a line through the membrane." (See *Engraved representation of the Anatomy of the Ear, p.* 33.) Mr. Saunders, by puncturing the tympanum, instantaneously restored the hearing of one patient who had been deaf thirty years, in consequence of a destruction of a part of his palate by syphilis. (*P.* 45.) In an instance where a young man had been deaf for eight years, apparently from obstruction of the Eustachian tube by swellings and disease about the throat, Paroisse also restored the hearing directly, by perforating the anterior and inferior part of the tympanum. (*Opuscules de Chir. p.* 309, *8vo. Paris*, 1806.) The practice has also been successfully adopted by Michaelis in one case, and Hunold has tried it in a vast number of examples, two-thirds of which succeeded. (*Dict. des Sciences Med. T.* 38, *p.* 63. Sir A. Cooper's cases are in the *Phil. Trans. for* 1802.

Puncturing the membrana tympani has been attended with some degree of success in France, where it has been tried by Itard, Celliez, and Maunoir, &c. It is not to be dissembled, however, that it is liable to failure. Dubois performed the operation in four instances, without success. (*Richerand Nosogr. Chir. T.* 2, *p.* 132.)

In most cases the patients benefited are said to have experienced pain just after the trocar was withdrawn. The organ, not being accustomed to sound, had become so extremely sensible, that it could not bear the gentlest impression of the sonorous vibrations, and the patient's first request after the perforation had been made, was, that persons near him, might speak softly. This excessive tenderness of the sense gradually subsides.

The two principal objections made to the foregoing practice, are the risk of injuring that part of the tympanum, which is connected with the malleus, and the tendency of the puncture to heal up again. (See *Dict. des Sciences Med. T.* 38, *p.* 57; *Maunoir in Journ. de Med. T.* 13; *Sabatier, Traité d'Anatomie, T.* 2, *p.* 186.) The author of the article Oreille in the latter dictionary, who cannot, however, be deemed at all partial to the operation, delivers the following judgment concerning it:—1. It is the only operation, which is likely to answer, where the tympanum is cartilaginous or ossified, and the rest of the organ is sound. 2. It will be attended with some success, where the Eustachian tube is closed, and this defect cannot be otherwise removed. 3. It will be useless where the cavity of the tympanum is filled with matter, which is too thick to escape through the puncture. 4. When deafness depends on paralysis of the auditory nerve. 5. When the infirmity arises from inflammation of the ear or nervous irritation. 6. From fevers, the Eustachian tube being pervious.

The limits of this work will not allow me to introduce the directions given by various authors for injecting fluids into the Eustachian tube. Wathen, Baron Boyer, Itard, Buchanan, and the latest surgeons, who have considered this operation, seem to agree, that it is more easily performed by passing the tube through one of the nostrils, than the mouth. Wathen's instruments are described in Phil. Trans. 1794; those of Baron Boyer in Traité des Mal. Chir. T. 6. p. 391; those of M. Itard, which deserve particular notice, in his Traité des Mal. de l'oreille; and those of another modern advocate for this operation, in *Dict. des Sciences Med. T.* 38. *p.* 108. The latter author, after stating how his tubes, which are four French inches in length, and shaped somewhat like an italic *S*, are introduced, enumerates the following as the advantages derived from their employment. 1. Fluid applications may be conveyed into the Eustachian tube, the cavity of the tympanum, and the mastoid cells, and deeply seated obstinate ulcerations within these parts cured. 2. The same parts can be cleared from any mucus by which they are obstructed. 3. Blood extravasated within the tympanum, from blows on the head, can be washed out. 4. Chalky substances, which sometimes form in the tympanum, may be brought out in the same manner. 5. Through the tube a stilet can be passed into the Eustachian tube, so as to perforate a congenital septum, or any cicatrix, obstructing the entrance of that passage. 6. When the sensibility of the auditory nerve is dull, the effect of fluids, thrown into the tympanum, can be tried. (See also *T. Buchanan's engraved Representation of the Anatomy of the Human Ear, p.* 28. *fol. Hull*, 1823.)

12. *Of perforating the Mastoid Process.*

Of all the cases of deafness, for which Arneman and others have recommended this operation, that attended with an abscess and caries of this process is the only one, in which the practice is now at all sanctioned. An instance is related by Jasser, in which the carious surface of the right mastoid process was exposed by an incision, and, an opening detected with a probe. An injection was thrown into the aperture with a syringe, when, to the astonishment of Jasser and his patient, the fluid gushed out of the right nostril. The plan was repeated for a few days, and, at the end of three weeks, the part was healed, and the hearing greatly improved. This success induced Jasser to make a perforation in the left mastoid process, the ear on that side being deaf, and to employ the injection, which was also discharged from the left nostril. The hearing, however, was not so completely restored in this as it had been in the right ear; but the wound healed up without any exfoliations. (*Journ. de Méd. Fev.* 1793.) The idea of perforating the mastoid process, was suggested long before the time of Jasser. Riolan, in various parts of his works, suggests the propriety of making a small perforation in several cases of deafness, and tinnitus aurium, attended with obstruction of the Eustachian tube. Rolfincius also advised a similar opening to be made in the mastoid process with a trocar, in cases of dropsy of the cavity of the tympanum and of the mastoid cells. Jasser, however, was the first who actually made the experiment, and his example was followed by Hagstroem, whose attempt did not succeed, the completion of the operation having been interrupted by profuse hemorrhage, and no benefit done to the hearing. The injections also appear to have caused, in this instance, alarming symptoms, violent pain in the head, loss of vision, sense of suffocation, and syncope. The fluid entered the mastoid cells, without any of it issuing, either by the nostrils or mouth. *(Op. cit.)*

The operation was successfully tried by Loffler. The injection did not pass into the mouth, yet the hearing was restored, though it was lost again when the wound closed. Hence a new opening was made, and kept from healing by means of a piece of cat-gut. The patient was afterwards able to hear when his mouth was open.

The perforation of the mastoid process was not approved of by Morgagni; indeed, it must often fail, as both Morgagni and Hagstroem have observed, on account of complete bony partitions preventing all communications between the mastoid cells; and sometimes the mastoid process, instead of being cellular, is perfectly solid, an instance of which is recorded by A. Murray.

13. *Diseases of the Labyrinth.*

These are much more diversified than might, at first, be supposed, and, if we admit the two doubtful cases, said to depend upon the state of the lymph of Cotunni, there are not less than seven different species of disease affecting the labyrinth:—1. Disease of the fenestra ovalis, and fenestra rotunda, as ulceration, thickening, &c. 2. Malformation of these apertures. 3. Malformation of the labyrinth. 4. Inflammation of the nervous membrane, which lines its cavities. 5. Alteration of the liquor of Cotunni. 6. Deficiency of the same fluid. 7. Affections of the nerve of hearing.

No doubt deafness (and that kind of it which so frequently foils the most skilful men) often arises from an insensible state of the portio mollis of the auditory nerve, or of the surfaces, on which its filaments are spread. This affection is analogous to the amaurosis, or gutta serena, in which, though every part of the eye may seem to possess its natural structure, sight is lost, because the rays of light only strike against a paralytic, or insensible retina. Mr. Saunders dissected the ears of two deaf patients, with the greatest care, but could not discover the least deviation from the natural structure. In the commencement of deafness from a paralytic affection of the auditory nerve, Sir A. Cooper remarked, that the secretion of cerumen was diminished, and, when the deafness became worse, was totally suppressed. And another particular symptom of paralysis of the auditory nerve, pointed out by the same author, is the patient's inability to hear the sound of a watch placed between the incisor teeth.

With respect to the causes of a paralytic affection of the auditory nerve, they are mostly buried in great obscurity, and some of them probably depend upon congenital imperfection of the nerve, or brain itself. It seems, however, that a part of the causes to which we allude, act mechanically, as an extravasation of blood, a steatoma, or an exostosis; while others operate on the ear by sympathy, as is the case when deafness is produced by the presence of worms in the bowels.

Mr. Saunders remarks, that all the diseases of the internal ear may be denominated nervous deafness; the term, in this sense, embracing every disease, the seat of which is in the nerve, or parts containing the nerve. Nervous deafness is attended with various complaints in different cases, noises in the head of sundry kinds, the murmuring of water, the hissing of a boiling kettle, rustling of leaves, blowing of wind, &c. Other patients speak of a beating noise, corresponding with the pulse, and increased by bodily exertion, in the same degree as the action of the heart. (*Saunders, p.* 47.)

According to this author, there is a syphilitic species of nervous deafness, attended with a sensation of some of the above peculiar noises; and one case is related, in which the hearing was completely restored, in five weeks, by a mercurial course.

Mr. Saunders relieved several cases of nervous deafness by confining patients to low diet, giving them calomel freely, repeated doses of sulphate of soda, magnesia, sometimes twice, sometimes thrice, a week, or according to circumstances, and applying blisters behind the ears at intervals of a week. The plan requires perseverance.

Electricity has been highly recommended for the cure of nervous deafness, though the prospect of benefit from it must entirely depend upon the nature of the cause of the infirmity. It is allowed to be sometimes useful in cases of incomplete paralysis of the auditory nerve; but, it cannot be of any service where the Eustachian tube, the cavity of the tympanum, or the mastoid cells, are obstructed. It is set down as hurtful, when the patients are very irritable, and subject to vertigo, bleeding from the nose, great determination of blood to the head, &c. (*Dict. des Sciences Med. T.* 38. *p.* 124.) The evidence in favour of the efficacy of galvanism, is still more scanty and questionable.

Whether in certain cases of deafness from torpor of the auditory nerve, the introduction of tonic injections into the cavity of the tympanum, through the Eustachian tube, will answer in the manner stated by a late writer, future experience must determine. (*Dict. des Sciences Med. T.* 38. *p.* 120—121.)

This article, I think, may be usefully concluded with a few general, but sensible, observations on the various kinds of deafness, made by a modern writer. According to Professor Rosenthal, all the disorders of the sense of hearing may be comprised under three principal forms.

1. Deafness (*Surditas, Cophosis*), in which the faculty of hearing articulated sounds is completely annihilated.

2. Hardness of hearing (*Dysœcia*), in which this faculty is so diminished, that articulated sounds cannot be heard, without the assistance of a particular apparatus.

3. Alteration, or diminution of hearing (*Paracusis*), in which the faculty of hearing articulated sounds, in the natural way, is imperfect for want of precision.

1. *Deafness*, Rosenthal distinguishes into two degrees, the first of which is marked by an absolute impossibility of hearing at all; the second, by a power of still distinguishing certain sounds, as whistling, the vowels, &c. The first is usually congenital, and a cause of dumbness.

The discrimination of these two degrees, Rosenthal considers of great importance in practice, and especially in institutions for the deaf and dumb; because the exceedingly fine sense of touch, with which dumb persons are sometimes gifted, is apt to be mistaken for the faculty of hearing. This fact is illustrated by some interesting experiments made by Pfingsten on deaf and dumb persons. (*Vieljahrige Erfahrung ueber die Gehoerfehler der Taubstummen, Kiel,* 1802, *p.* 32.) A deaf and dumb girl, who was at needlework in a room near the house-door, regularly gave notice whenever it was opened or shut. As the door was furnished with a little bell, which rung loud enough whenever the door moved to be plainly heard in the neighbouring room, and, with the exception of this noise, no other impulse nor shock could be distinguished, Pfingsten was surprised at the circumstance. Desirous of ascertaining how the girl really knew about the movements of the door, he caused the bell to be rung with great force without the door being opened: the child was perfectly unconscious of the noise. The bell was afterwards kept still, while a person opened and shut the door so softly, that Pfingsten himself could not hear it; yet, the child instantly gave warning, that somebody had entered. The inference was, that the chair, on which she sat, communicated to her legs and back a certain impulse, which made her conscious of the motion of the door.

The dissection of the ears of deaf and dumb persons has evinced some facts, explanatory of the cause of the loss of hearing. Amongst other things, it appears, that complete deafness, whether congenital or acquired, more frequently depends upon morbid alterations of the soft parts, than upon any irregularity in the formation of the bones. Thus, in the body of a person, who had been deaf and dumb while living, Hoffmann found the auditory nerve diminished in size, while every other part of the organ was perfectly natural. Arnemann found the nerve harder than common. Dr. Haighton met with an instance, in which the vestibulum was filled with a caseous substance. (*A case of original deafness, in Mem. of the Med. Society, Vol.* 3. *p.* 1—15.) Duverney and Sandifort found the auditory nerve strongly compressed by a steatoma. In one case, Itard found every part of the ear apparently so natural, that the deafness could not be ascribed to paralysis of the nerve. In another, the infirmity depended upon obstruction of the passages. In a third, the cavity of the tympanum, and the vestibulum, contained small portions of calcareous matter. He has also seen the tympanum filled with a thick yellow lymph, or a thin fluid enclosed in membranous cells. In the dissection of the body of a deaf and dumb person, Rosenthal noticed, amongst other remarkable circumstances, a greater hardness of the auditory, than of the facial nerve, and preternatural firmness of the medulla oblongata; thickening of the membrane of the tympanum; the bony roof of the cavity of the tympanum not thicker than paper, and just over the junction of the malleus with the incus, the bony substance was so absorbed, that an appearance like that of membrane alone remained. The mastoid cells, cavity of the tympanum, and the eustachian tubes, contained a limpid yellow fluid. In the tympanum, the periosteum was thickened, forming small cells, around the ossicula, which were of their natural structure. Nothing particular was remarked in the labyrinth.

In a small proportion of instances, the above degree of deafness has been traced to anomaly in the structure of the solid parts. Thus, Mundini found the cochlea composed of only one circle and a half. (*Opusc. Acad. Bonon,* 1791, *T.* 7. *p.* 422.) Valsalva found the stapes adherent to the fenestra ovalis, (*De Aure Humanâ, cap.* 11.); and Reimarns the ossicula entirely wanting. (*Kunstriebe der Thiere, p.* 57.)

In the first degree of deafness above described, which, when congenital, must excite suspicion of serious malformation of the organ, and abolition of the nervous influence, and when acquired, indicates a complete injury of the functions of the nerve, the prognosis, as Rosenthal observes, must be unfavourable. Nor can it be otherwise in the second *congenital* degree of the disease, though only a partial imperfection of the organ and nerve can here be supposed. On the other hand, when the latter degree is *acquired,* there is more prospect of relief, because merely a partial alteration in the soft parts is to be suspected.

2. *Hardness of hearing.* Rosenthal also distinguishes several degrees of, what is termed, hardness of hearing. In the first, the patient cannot hear a distant noise, and especially high tones; but, he can perceive, though it is true, not in a very distinct manner, articulated sounds, when the voice is a good deal raised. In the second degree, he hears and distinguishes both high and low tones very well, and also words, but only when the voice is somewhat raised.

These two cases are better understood, inasmuch as it is tolerably well ascertained, that the immediate cause of the infirmity is some alteration in that part of the organ, which serves as a conductor for the vibrations of sound, or else an increased sensibilityof the nerve; all the internal ear being in other respects right.

Amongst alterations of the conducting parts of the organ, Rosenthal comprehends:

1. A total obliteration of the meatus auditorius externus, its imperforation, or complete absence. These cases may almost always be detected by a superficial examination, the patient only hearing when some solid bodies are placed between his teeth, while his dull perception of sounds does not appear to be much lessened when the ear is covered.

2. Diseases of the cavity of the tympanum, as inflammation of its membranous lining, caries of its parietes, or collections of blood, pus, or other fluid, in its cavity. Rosenthal thinks there can be no doubt, that inflammation and suppuration in the tympanum are much more frequent, than is generally supposed, the former affection being often mistaken for a slight attack of rheumatism. In dissecting aged subjects, he has frequently found the membrane of the tympanum thickened and opaque, and he could only impute this appearance to previous inflammation.

After detailing a case illustrative of the symptoms of inflammation within the tympanum, and a few observations on caries and collections of fluid in that cavity, Rosenthal notices the *hardness of hearing, connected with nervous irritability,* in the treatment of which case, he insists upon the advantage, that would result from a knowledge of the particular species of morbid excitement prevailing in the patient. But, as nothing very certain can be made out on this point, and only conjectures can follow some dissections of bodies, that the affection consists either in a determination of blood to the part, or in a partial paralysis of the auditory nerve, the exact nature and form of which are quite incomprehensible, it is absolutely necessary to attend solely to the diagnosis of the nervous affection in general. This diagnosis will be facilitated; 1st, If the patient has been previously very sensible to the impression of certain tones, or sound in general. 2dly, If the power of hearing has been lost all on a sudden, without any mark of inflammation. 3dly, If the affection coincides with other nervous disorders.

3. *Alteration or Diminution of Hearing.* Between the most perfect hearing, congenital or acquired, and this point of diminution of the faculty of hearing, Rosenthal observes, there are a great many degrees, the cause of which is the more difficult to comprehend, as the circumstances of structure, which enable every part to perform its functions with freedom and perfection, are not yet made out. If, says he, it were in our power to determine what is truly the regular structure of each part, we should then be furnished with a means of judging correctly of the anomalies of function, the changes in which would be indicated quite as clearly, as in the eye, by shades of organization, absolutely in the same way, as we judge of the modifications, which the image of objects must undergo at the bottom of the ocular mirror, by the greater or less convexity of the cornea, or lens, or the consistence of the other humours.

In the present state of physiological and pathological knowledge of the ear, therefore, Rosenthal conceives, that little can be attempted with respect to a scientific classification of these cases of altered, or diminished hearing. As the cavity of the tympanum and its contents are the parts, which have principal influence over the intensity of sound, and a great share in the propagation of articulated sounds, their faulty condition must here be chiefly the subject for consideration. And, amongst their numerous defects, traced by dissection, and already specified in the foregoing columns, Rosenthal particularly calls the attention of the reader,

1. To alterations of the membrane of the tympanum, whether proceeding from congenital malformation, or situation, or from thickening, ossification, perforation, or laceration of the same part;

2. The lodgment of some fluid in the cavity of the tympanum, more frequently produced, than is commonly supposed, by obstruction of the Eustachian tube. In most new-born infants, Rosenthal has also found the cavity of the tympanum filled with a thick, almost gelatinous fluid, which for some days is not absorbed, and is probably the cause of the indifference, evinced by new-born children, to sounds, which are even so intense as to be offensive to the ears of an adult.

3. Alterations of the membrane of the fenestra rotunda, such as its imperfect formation, or erroneous situation, its thickened state, &c.

But, it is remarked by Rosenthal, that as the difference in the intensity of sound may occasion a modification in the sensations of the ear, the merely conducting parts of the auditory apparatus must not be forgotten, as the external ear and the meatus auditorius externus, which regulate the quantity of sonorous waves, striking the auditory nerve. However, the malformations of the meatus and the state of the ceruminous secretion within it, are observed by Kritter and Lentin (*Ueber das Schwere Gehoere, L.* 19, *Leipz.* 1794.) to have more effect on the hearing, than defects of the auricle itself, the whole of which, as we have stated, may be lost without any material deafness being produced. Lastly, Rosenthal calls our attention to the nervous action, or influence, which, whether too much raised, or depressed, may equally render the hearing dull; and some useful information may for the most part be derived from attending to the patient's general sensibility. (See *Journ. Complem. T.* 6, *p.* 21, *&c.*) *Duverney de l'Organe de l'Ouie,* 12*mo.* 1683; *P. Kennedy, A Treatise on the Eye, and on some of the Diseases of the Ear,* 8*vo. Lond.* 1713. *A. D. Dienert, Quæstio, &c. an absque Membranæ Tympani apertura topica injici in concham possint, Paris,* 1748. *Mémoire sur la Théorie des Maladies de l'Oreille, et sur les moyens que la Chirurgie peut employer pour leur curation, in prix de l'Acad. de Chir. T.* 9, *p.* 111, *&c. Edit.* 12*mo. I. D. Arnemann, Bemerkungen über die Durchborung des Processus Mastoideus in gewissen Fallen der Taubheit,* 8*vo. Gött.* 1792. *G. R. Trampel von den Krankheiten des Ohres in Arnemann's Magazin. für die Wundarzneiwissenschaft, B.* 2, *p.* 17, *&c.* 8*vo. Gött.* 1798. *Richerand, Nosogr. Chir. T.* 2, *p.* 135, *&c. Edit.* 4. *A. Cooper, in the Phil. Trans. for* 1802. *Saunders on the Anatomy and Diseases of the Ear,* 1806. *Desmonceaux, Traité des Maladies des Yeux et des Oreilles,* 2 *Tom.* 8*vo. Paris,* 1806. *Lassus, Pathologie Chirurgicale, T.* 1, *p.* 84, *Edit.* 1809. *W. Wright, An Essay on the Human Ear, its Anatomical Structure, and incidental Complaints,* 8*vo. Lond.* 1817. *Dict. des Sciences Med. art. Oreille, T.* 38, 8*vo. Paris,* 1819. *Rosenthal, Essai d'une Pathologie de l'Organe de l' Ouie, in Journ. Complementaire du Dict. des Sciences Méd. T.* 6, *p.* 17, 8*vo. Paris,* 1820. *T. Buchanan, An Engraved Representation of the Anatomy of the Human Ear. Fol. Hull,* 1823. *For an account of malformations of the organ, see Meckel's Handbuch der Pathol. Anat. B.* 1, *p.* 400, *&c.* 8*vo. Leipz.* 1812.)

ECCHYMOSIS. (from εκχυω, to *pour out*) A superficial, soft swelling, attended with a livid or blue colour of the skin, produced by blood extravasated in the cellular substance.

The causes of ecchymosis are falls, blows, sprains, &c. which occasion a rupture of the small vessels on the surface of the body, and a consequent effusion of blood, even without any external breach of continuity. Ecchymosis is one of the symptoms of a contusion. (See *Contusion.*) A considerable ecchymosis may originate from a very slight bruise, when the ruptured vessels are capable of pouring out a large quantity of blood, and particularly when the parts contain an abundance of loose, cellular substance. In general, ecchymosis does not make its appearance immediately after the blow, or sprain, and sometimes not till several hours after the application of the violence; at least, it is not till this time that the black, blue, and livid colour of the skin is most conspicuous. A black-eye, which is only an ecchymosis, is always most disfigured six or eight hours after the receipt of the blow.

In the article *Bleeding*, we have noticed how an ecchymosis may arise from the blood getting out of the vein into the adjacent cellular substance.

Common cases of ecchymosis may generally be easily cured, by applying discutient lotions, and administering one or two doses of any mild purgative salt. The best topical applications are vinegar, the lotio muriatis ammoniæ; spirit. vin. camph. and the liquor ammon. acet.

The object is to avert inflammation, and to promote the absorption of the extravasated fluid.

In cases of ecchymosis, I have seen such success attend the practice of dispersing collections of extravasated blood, by means of absorption, that the plan of evacuating it by an incision, seems to me to be seldom necessary. When an opening is made, and air is admitted, the portion of blood, which cannot be pressed out, soon putrefies, and extensive inflammation and suppuration, are the frequent consequences.

The quick and powerful action of the absorbent vessels in removing extravasations of blood, can now be no longer called in question, when we daily see it proved in modern practice, that the largest aneurismal swellings are thus speedily diminished and removed, after the operation of tying the arteries, from which such tumors arise.

I wish, however, the preceding observations merely to convey a general condemnation of the practice of opening swellings containing extravasated blood; for, no surgeon is more assured, than I am myself, that there are particular exceptions, in which the plan is highly proper and necessary. Thus, whenever a case of extensive ecchymosis, or a large tumor of extravasated blood, either excites suppuration, or creates excessive pain from distention, it is better to practise a free opening. So it sometimes happens, in cases of aneurism, that the skin breaks after the artery has been tied, and some of the blood escapes; but the remainder putrefies, and soon becomes blended with purulent matter in the sac. Here the making of a free incision for the discharge of the irritating contents of the swelling, with due attention to every caution, delivered in the article *Aneurism*, will often be followed by beneficial effects.

ECTROPIUM. (from εκτρεπω, to *turn.*) A turning out, or an eversion of the eyelids.

According to Scarpa, there are two species of this disease; one, produced by an unnatural swelling of the lining of the eyelids, which not only pushes their edges from the eyeball, but also presses them so forcibly, that they become everted; the other, arising from a contraction of the skin of the eyelid, or its vicinity, by which means the edge of the eyelid is first removed for some distance from the eye, and afterwards turned completely out, together with the whole of the affected eyelid.

The morbid swelling of the lining of the eyelids, which causes the first species of ectropium, (putting out of present consideration a similar affection incidental to old age), arises mostly from a congenital laxity of this membrane, afterwards increased by obstinate chronic ophthalmies, particularly that of a scrophulous nature, in relaxed, unhealthy subjects; or else the disease originates from the small pox affecting the eyes.

While the disease is confined to the lower eyelid, as it most commonly is, the lining of this part may be observed rising in the form of a semilunar fold, of a pale red colour, like the fungous granulations of wounds, and intervening between the eye and eyelid, which latter it in some measure everts. When the swelling is occasioned by the lining of both the eyelids, the disease assumes an annular shape, in the centre of which the eyeball seems sunk, while the circumference of the ring presses, and everts the edges of the two eyelids so as to cause both great uneasiness and deformity. In each of the above cases, on pressing the skin of the eyelids with the point of the finger, it becomes manifest, that they are very capable of being elongated, and would readily yield, so as entirely to cover the eye-ball, were they not prevented by the intervening swelling of their membranous lining.

Besides the very considerable deformity, which the disease produces, it occasions a continual discharge of tears over the cheek, and, what is worse, a dryness of the eye-ball, frequent exasperated attacks of chronic ophthalmy, incapacity to bear the light, and, lastly, opacity and ulceration of the cornea.

The second species of ectropium, or that arising from a contraction of the integuments of the eyelids, or neighbouring parts, is not unfrequently a consequence of puckered scars, produced by the confluent small pox; deep burns; or the excision of cancerous, or encysted tumors, without saving a sufficient quantity of skin; or, lastly, the disorder is the effect of malignant carbuncles, or any kind of wound attended with much loss of substance. Each of these causes is quite enough to bring on such a contraction of the skin of the eyelids, as to draw these parts towards the arches of the orbits, so as to remove them from the eye-ball, and turn their edges outward. No sooner has this circumstance happened, than it is often followed by another one equally unpleasant, namely, a swelling of the internal membrane of the affected eyelids, which afterwards has a great share in completing the eversion. The lining of the eyelids, though trivially everted, being continually exposed to the air, and irritation of extraneous substances, soon swells, and rises up, like a fungus. One side of this fungus-like tumor covers a part of the eyeball; the other pushes the eyelid so considerably outward, that its edge is not unfrequently in contact with the margin of the orbit. The complaints, induced by this second species of ectropium, are the same as those brought on by the first; it being noticed, however, that, in both cases, whenever the disease is inveterate, the fungous swelling of the inside of the eyelids, becomes hard, coriaceous, and, as it were, callous.

Although in both species of ectropium, the lining of the eyelids seems equally swollen, yet the surgeon can easily distinguish to which of the two species the disease belongs. For, in the first, the skin of the eyelids, and adjoining parts, is not deformed with scars, and by pressing the everted eyelid with the point of the finger, the part would with ease cover the eye, were it not for the intervening fungous swelling. But, in the second species of ectropium, besides the obvious cicatrix and contraction of the skin of the eyelids, or adjacent parts, when an effort is made to cover the eye with the everted eyelid, by pressing upon the latter part with the point of the finger, it does not give way, so as completely to cover the globe, or only yields, as it ought to do, for a certain extent; or it does not move in the least from its unnatural position, by reason of the integuments of the eyelids having been so extensively destroyed, that their margin has become adherent to the arch of the orbit.

In addition to the forms of the disease, mentioned by Scarpa, Mr. Guthrie enumerates a case, depending on chronic inflammation, accompanied with contraction of the integuments of the eyelid, but *without any manifest cicatrix*. It is described by him as usually taking place after a long continuance of *lippitudo*, and proceeding from the excoriation, contraction, and hardening of the skin, " the result of the passage of the vitiated secretions over it, and which, by dropping on it, increase the irritation." (*On the Operative Surgery of the Eye, p.* 50—55.) This form of the disease, according to Mr. Guthrie, is rarely attended with such a thickening of the inner membrane of the eyelid, as to require removal with the knife, or scissors; for, it subsides with the removal of the complaint. (*P.* 60.)

According to Scarpa, the cure of ectropium cannot be accomplished with equal perfection in both its forms, the second species being, in some cases, absolutely incurable. For, as in the first species of ectropium, the disease only depends upon a morbid thickening of the internal membrane of the eyelids, and the treatment merely consists in removing the redundant portion, art possesses many efficacious means of accomplishing what is desired. But, in the second species of ectropium, the chief cause of which arises from the loss of a portion of the skin of the eyelids, or adjacent parts, which loss no known artifice can restore, surgery is not capable of effecting a perfect cure of the malady. The treatment is confined to remedying, as much as possible, such complaints as result from this kind of eversion, and this can be done in a more or less satisfactory manner, according as the loss of skin of the eyelid is little, or great. Cases, in which so much skin is deficient, that the edge of the eyelid is adherent to the margin of the orbit, Scarpa abandons as incurable. How far the case can be rectified, he thinks, may always be estimated, by remarking to what point the eyelid admits of being replaced, on being gently pushed, with the end of the finger, towards the globe of the eye, both before and after the employment of such means as are calculated to effect an elongation of the skin of the eyelid; for, it is to this point, and no further, that art can reduce the everted part, and permanently keep it so replaced.

When the first species of ectropium is recent, the fungous swelling of the lining of the eyelid not considerable, and, consequently, the edge of the eyelid not much turned out, and in young subjects (for in old ones the eyelids are so flaccid, that the disease is irremediable) Scarpa prefers destroying the fungous surface of the internal membrane of the eyelid by the repeated application of the argentum nitratum. Mr. Guthrie touches the fungous portion of the conjunctiva every four days with a probe dipped in sulphuric acid, and gently applies every day, or every second day the sulphate of copper, at the same time not omitting some minor remedies, which he also employs in cases proceeding from contraction of the skin independent of any cicatrix, and which I shall presently notice. (*On the Operative Surgery of the Eye, p.* 70.) In recent cases, where the patient is weak and irritable, (or a child) Beer commences the treatment with simply applying every day the tincture of opium, which, after a time, is to be strengthened by the addition of naptha. To the relaxed conjunctiva he afterwards applies escharotic eyesalves, and, last of all, the nitrate of silver, and muriate of antimony. Where the part is hard and callous, he precedes the employment of caustic by scarifications. (*Lehre, &c. B.* 2, *p.* 136.)

For remedying the considerable and inveterate form of the first species of the disease, Beer and Scarpa are advocates for cutting away the whole of the fungous swelling closely from the muscular substance, on the inside of the eyelid. The following is Scarpa's description of the operation.

The patient being seated, with his head a little inclined backward, the surgeon, with the index and middle finger of his left hand, is to keep the eyelid steadily everted, and holding a small pair of curved scissars, with convex edges, in his right, he is completely to cut off the whole fungosity of the internal membrane of the eyelid, as near as possible to its base. The same operation is then to be repeated on the other eyelid, should that be affected with the same disorder. If the excrescence should be of such a shape, that it cannot be exactly included within the scissars, it must be raised as much as possible, with forceps, or a double pointed hook, and dissected off at its base, by means of a small bistoury with a convex edge. This last mode is preferred by Beer to the use of scissars, and, I confess, that it has always appeared to me the most convenient. The bleeding, which seems, at the beginning of the operation, as if it would be copious, stops of itself, or as soon as the eye is bathed with cold water. The surgeon is then to apply the dressings, which are to consist of two small compresses, one put on the upper, the other on the lower arch of the orbit, and over these the uniting bandage, in the form of the monoculus, or so applied as to compress and replace the edges of the everted eyelids, in order to make them cover the eye. On the first removal of the dressings, which should take place about twenty-four or thirty hours after the operation, the surgeon will find the whole, or almost the whole, of the eyelid, in its natural position. The treatment should afterwards consist in washing the ulcer on the inside of the eyelid twice a day with simple water, or barley-water, and confect. rosæ, until it is completely well. If, towards the end of the cure, the wound should assume a fungous appearance, or the edge of the eyelid seem to be too distant from the eyeball, the wound on the inside of the eyelid must be rubbed several times with the argentum nitratum, for the purpose of destroying a little more of the membranous lining, so that, when the cicatrization follows, a greater contraction of it may take place, and the edge of the eyelid be drawn still nearer the eye. Proper steps must be taken, however, for resisting the principal cause on which the ectropium depends, particularly, chronic ophthalmy, a relaxed and varicous state of the conjunctiva, &c. (See *Ophthalmy.*)

In England, the excision of the fungous thickened portion of the conjunctiva, in cases of ectropium, has been very much relinquished for the employment of caustic. The difficulty and almost total impossibility of dissecting off every particle of the fungus render the practice of excision much less certain, than the treatment with caustic. Thus, we see, that Scarpa confesses its occasional failure, and the necessity of then having recourse to the latter plan. Demours also lets the employment of caustic follow the use of the knife. (*Mal. des Yeux*, *p.* 98.) In the ectropium from a relaxed fungous state of the conjunctiva, the consequence of purulent ophthalmia, Dr. Vetch begins with a light careful application of the argentum nitratum to the whole granulated villous surface. The everted part is then to be returned, and secured in its place with a compress, and straps of plaster and a bandage. Every time the eye is cleaned, the same things are to be repeated, and, in the course of a few days, the tendency to protrude will disappear. (*On Diseases of the Eye*, *p.* 228.)

In the second species of ectropium, or that produced by an accidental contraction of the skin of the eyelids, or neighbouring parts, Scarpa observes, that if a contraction of the integuments has proved capable of everting the eyelid, the excision of a piece of the internal membrane of the part, and the cicatrix which will follow, must also be capable, for the same reason, of bringing back the eyelid into its natural position. But, since nothing can restore the lost skin, the shortened state of the whole eyelid, in whatever degree it exists, must always continue, even after any operation the most skilfully executed. Hence the treatment of the second species of ectropium, he says, will never succeed so perfectly as that of the first, and the replaced eyelid will always remain shorter than natural, in proportion to the quantity of integuments lost. It is true, that, in many cases, the eversion seems greater than it actually is, in regard to the small quantity of skin lost or destroyed; for, when the disease has once begun, though the contraction of the skin may be trivial, in consequence of the little quantity of it deficient, still the swelling of the lining of the eyelid, which never fails to increase, at last brings on a complete eversion of the part. In these cases, the cure may be accomplished with such success, as is surprising to the inexperienced; for, after the fungous swelling of the internal membrane of the eyelid has been cut off, and the edge of the part approximated to the eyeball, the shortening of the eyelid, remaining after the operation, is so trivial, that it may be considered as nothing, in comparison with the deformity and inconvenience occasioned by the ectropium. Whenever, therefore, the retraction of the skin of the everted eyelid, and the consequent shortness of it, are such, as not to prevent its rising again and covering the eye, if not entirely, at least moderately, Scarpa directs the surgeon to cut away the internal membrane of the everted eyelid, as already explained, so as to produce a loss of substance on the inside of the everted eyelid. In inveterate cases of ectropium, in which the lining of the eyelids has become hard and callous, Scarpa applies to the everted eyelid, for a few days before the operation, a soft bread and milk poultice, in order to render the part flexible, and more easily separated, than it could be in its former rigid state.

The division of the cicatrices, which have given rise to the shortening and eversion of the eyelid, as Scarpa observes, does not procure any permanent elongation of this part, and consequently it is of no avail in the cure of the present disease. We see the same circumstance occur after deep and extensive burns of the skin of the palm of the hand and fingers: whatever pains may have been taken, during the treatment, to keep the hand and fingers extended, no sooner is the cicatrization thus completed, than the fingers become irremediably bent. The same thing happens after extensive burns of the skin of the face and neck. Fabricius ab Aquapendente, who well knew the inutility of making a semilunar cut in the skin of the eyelids, for the purpose of remedying their shortening and eversion, proposes, as the best expedient, to stretch them with adhesive plasters, applied to them and the eyebrow, and tied closely together. Whatever advantage may result from this practice, the same degree of benefit may be derived from using, for a few days, a bread and milk poultice, afterwards oily embrocations, and, lastly, the uniting bandage, so put on as to stretch the shortened eyelid in an opposite direction to that produced by the cicatrix; a practice which Scarpa thinks should always be carefully tried, before the operation is determined upon.

The surgeon, with a small convex-edged bistoury, is to make an incision of sufficient depth into the internal membrane of the eyelid, along the tarsus, carefully avoiding the situation of the puncta lachrymalia. Then, with a pair of forceps, he should raise the flap of the divided fungous membrane, and continue to detach it, with the bistoury, from the subjacent parts, all over the inner surface of the eyelid, as far as where the membrane quits this part, to be reflected over the front of the eye, under the name of *conjunctiva.* The separation being thus far accomplished, the membrane is to be raised still more with the forceps, and cut off with one, or two strokes of the scissars, at the lowest part of the eyelid. The compresses and bandage, to keep the eyelid replaced, are to be applied, as above directed. On changing the dressings, a day, or two, after the operation, the eyelid will be found, in a great measure, replaced, and the disfigurement, which the disease caused, greatly amended. The operation is rarely followed by bad symptoms, such as vomiting, violent pain, and inflammation. However, should they occur, the vomiting may be relieved by means of an opiate clyster, and, as for the pain and inflammation, attended with great tumefaction of the eyelid operated upon, these complaints may be cured by applying a poultice, or bags filled with emollient herbs, at the same time employing internal antiphlogistics, until the inflammation and swelling have subsided, and suppuration has commenced on the inside of the eyelid, on which the operation has been done. After this, the treatment is to consist in washing the part, twice a day, with barley-water and confect. rosæ, and, lastly, in touching the wound a few times with the argentum nitratum, in order to keep the granulations within certain limits, and to form a permanent cicatrix, proper for maintaining the eyelid replaced. (*Scarpa sulle Malattie degli Occhi.*)

In cases, in which the eversion is considerable, Sir W. Adams has never found the simple incision of the fungus, as practised by Scarpa, sufficient to effect a radical cure, and he therefore tried a new mode of operating. In his first attempts, he employed a very small curved bistoury, the point of which he carried along the inside of the eyelid, at its outer angle, downwards and outwards, as far as the point of reflection of the conjunctiva would admit. He then pushed it through the whole substance of the everted eyelid and its integuments, and cut upwards through the tarsus, making an incision nearly half an inch in length. With a curved pair of scissars, he next snipped off a piece of the edge of the tarsus, about one third of an inch in width, and he afterwards removed with the same instrument the whole of the diseased conjunctiva. When the bleeding had ceased, Sir W. Adams passed a needle and ligature through the whole substance of the two divided portions, and brought them as accurately into contact as possible. Finding, however, that too much integument had been left at the lower part of the incision, he employed, in future operations, instead of the scalpel, a pair of straight scissars, with which he cut out an angular piece of the lid, resembling the letter V. Latterly, Sir W. Adams has found it advantageous to leave about a quarter of an inch of the lid adjoining its external angle, and after shortening the part as much as necessary, he brings the edges of the incision together with a suture. (See *Practical Observations on the Ectropium, &c. p.* 4 *and* 5, *Lond.* 1812.)

On the subject of the foregoing proposal M. Roux observes; "What Sir W. Adams says, with a view of enhancing the value of his own method, about the frequent recurrence of ectropium, when the conjunctiva is simply cut out, is a gratuitous assertion, contradicted by experience. I have already, in a very great number of cases, undertaken the cure of ectropium in the common way: the operation always succeeded as much as the degree, or other circumstances, of the disease allowed; and I have not yet observed an instance of a relapse." (*Voyage fait à Londres en* 1814, *ou Parallèle de la Chirurgie Angloise avec la Chirurgie Francoise, p.* 291.) If this new operation, however, will cure the ectropium, caused by the contraction of cicatrices, as its inventor describes, or produce great improvement, as the experience of Mr. Travers confirms, (*Synopsis of the Diseases of the Eye, p.* 235.) it is clear, that, though it may not be necessary in ordinary cases, its usefulness will not be entirely lost. Mr. Guthrie acknowledges that it may be highly useful in the ectropium from the contraction of a cicatrix. (*On the Operative Surgery of the Eye, p.* 71.) The contracted scar must of course be divided, in addition to the other proceedings.

In the form of ectropium, described by Mr. Guthrie as arising from a hardened and contracted state of the integuments of the eye, but without any cicatrix, he observes, that the indications are; 1st, to relieve the contraction of the skin externally; 2dly, to restore and retain the eyelid in its proper situation, until the unnatural curvature of the cartilage has been overcome, and the chronic inflammation removed. For fulfilling the first indication, he recommends washing the external parts with warm water, so as to leave the skin as clean as possible. It is then to be carefully dried, and repeatedly anointed with the ung. zinci, for three or four days. Being thus protected from the irritation, it becomes softer, and, in a favourable state to yield to mild extension. For accomplishing the second indication, Mr. Guthrie applies the sulphuric acid: the eyelid having been cleansed so as to prevent its slipping, the conjunctiva is to be gently wiped dry, and everted as much as possible, so that the part where it begins to be reflected over the eyeball may be seen. An assistant is to raise the upper eyelid a little, and the patient to look upwards. The blunt end of a common silver probe is then to be dipped in the sulphuric acid, and rubbed over the conjunctiva, so that every part of it may be touched with the acid. The round point of the probe is to be carried as far as where the membrane begins to be reflected over the eyeball, but no further. The punctum lachrymale, caruncle, and semilunar fold, are to be avoided; but, the external angle, as well as every other part, except what is reflected over the eye, is to be carefully rubbed. The acid will turn the touched portion of the conjunctiva white; and in order to prevent the acid from affecting the eyeball, a stream of water is now to be directed over the eyelid with an elastic gum syringe. If the conjunctiva should not be turned sufficiently white, its application may be repeated. The use of the acid is to be repeated every fourth day; "and, when applied in the manner directed, it does not cause a slough, but a general contraction of the part, which is, however, only perceptible after two or three applications, by its effect in inverting the lid, which gradually begins to take place. After six, or eight applications, the cure will be more than half accomplished, and, in most cases of this species of eversion, the thickening of the conjunctiva will have subsided." The ung. zinci is to be constantly applied to the skin, and the ung. hydrarg. nitr. in the proportion of one part to four or six of the ung. cetacei, to the edge of the eyelid. After the eyelid has returned two thirds of the way towards its natural position, the intervals between the applications of the acid must be longer, lest the contraction within the eyelid be carried too far, and an inversion of it produced. After the eversion is cured, the lippitudo may yet partly remain, and demand the use of the ung. hydrarg. nitr. or other gentle stimulants. (See *Scarpa's Osservazioni sulle Malattie degli Occhi; Ed.* 5, *cap.* 6. *Richter's Anfangsgr. der Wundarzneykunst, B.* 2, *p.* 473, *&c. Wenzel's Manuel de l'Oculiste. Pellier, Recueil d'Obs. sur les Maladies des Yeux. Sir W. Adams, Pract. Observ. on Ectropium, or Eversion of the Eyelids, with a Description of a new operation for the cure of that Disease; on the modes of forming an artificial pupil; and on Cataract,* 8*vo. Lond.* 1812. *M. Bordenave,* "*Mémoire* *dans lequel on propose un nouveau procédé pour traiter le renversement des Paupieres," in Mém. de l'Acad. Royale de Chirurgie, T.* 13, *p.* 156 *et seq. Edit.* 12*mo. It was in this memoir, that the proposal of removing a portion of the inside of the eyelid for the cure of ectropium was first made. Here may also be found the best historical account of the different methods of treatment, which have prevailed from the earliest periods of surgery. Consult also Parallèle de la Chirurgie Anglaise avec la Chirurgie Françoise, par P. J. Roux, p.* 289—292; *Paris,* 1815. *G. J. Beer, Lehre von den Augenkrankheiten, B.* 2, *p.* 133, *&c.* 8*vo. Wien,* 1817. *Benj. Travers, Synopsis of the Diseases of the Eye, p.* 234, 356, *&c.* 8*vo. Lond.* 1820. *Demours, Traité des Mal. des Yeux, p.* 98. *G. J. Guthrie, Lectures on the Operative Surgery of the Eye,* 8*vo. Lond.* 1823.

ECZEMA, or ECZE'SMA (from εκζεω, *to boil out,*) is characterized by an eruption of small vesicles on various parts of the skin, usually close, or crowded together, with little or no inflammation round their bases, and unattended by fever. It is not contagious. (*Bateman's Synopsis, P.* 250, *Ed.* 3.) There are several varieties of this disease, the most remarkable of which is the *eczema rubrum* from the irritation of mercury. This form is attended with quickened pulse and a white tongue; but the stomach and sensorium are not materially disturbed. (See *Mercury.*)

EFFUSION. (from *effundo, to pour out.*) In surgery, means the escape of any fluid out of the vessel, or viscus, naturally containing it, and its lodgment in another cavity, in the cellular substance, or in the substance of parts. Thus, when the chest is wounded, blood is sometimes effused from the vessels into the cavity of the pleura; in cases of false aneurisms, the blood passes out of the artery into the interstices of the cellular substance; in cases of fistulæ in perinæo, the urine flows from the bladder and urethra into the cellular membrane of the perineum and scrotum; and, when great violence is applied to the skull, blood is often effused even in the very substance of the brain.

Effusion also sometimes signifies the natural secretion of fluids from the vessels; thus surgeons frequently speak of the coagulable lymph being effused on different surfaces. (See *Extravasation.*)

ELECTRICITY. Among the aids of surgery, electricity once held a conspicuous and important situation. It has, however, met with a fate, not unusual with remedies too much cried up and too indiscriminately employed; that of having fallen into an undeserved degree of neglect.

Whatever its effects may be on the system, it certainly possesses this advantage over other topical remedies, that it may be made to act on parts very remote from the surface.

Electricity, as a topical remedy, for surgical diseases, is chiefly used in, amaurosis, deafness, some chronic tumors, and abscesses, weakness from sprains, or contusions, paralysis, &c.

In cases of suspended animation, electricity is sometimes an important auxiliary for the restoration of the vital functions. (See *J. Curry's Obs. on Apparent Death, &c. Ed.* 2, 1815.)

ELEVATOR. An instrument for raising depressed portions of the skull.

Besides the common elevator, now generally preferred by all the best operators, several others have been invented; as, for instance, the tripod elevator, and another, which was first devised by M. J. L. Petit, and afterwards improved by M. Louis.

EMBROCATIO ALUMINIS. ℞. Aluminis ℥ij. Aceti, Spiritûs vinosi tenuioris, sing. ℔ss. For chilblains, and diseased joints.

EMBROCATIO AMMONIÆ. ℞. Liq. ammon. ℥i. Ætheris sulphurici ℥ss. Spir. Lavandulæ ℥ij. M. For sprains and bruises.

EMBROCATIO AMMONIÆ ACETATÆ CAMPHORATÆ. ℞. Linim. Camph. Liq. ammon. acet sing. ʒvj. Liq. Ammon. ℥ss. M. For sprains, bruises, and chilblains, not in a state of suppuration.

EMBROCATIO AMMONIÆ ACETATÆ. ℞. Liq. ammon. acet. Lin. sapon. sing. ℥j. M. For bruises, with inflammation.

EMBROCATIO CANTHARIDIS CUM CAMPHORA. ℞. Tinct. Canth. Spirit. camph. sing. ʒj. M. This may be used in any case, in which the object is to stimulate the skin. It should be remembered, however, that the absorption of cantharides will sometimes bring on strangury.

EMBRYOTOMIA. (from εμβρυον, *a fœtus,* and τεμνω, *to cut.*) The operation of cutting into the womb, in order to extract the fœtus. (See *Cæsarean Operation.*)

EMPHYSEMA. (εμφυσημα from Φυσαω, *to inflate.*) A swelling, produced by air in the cellular substance. The common cause is a fractured rib, by which the vesicles of the lungs are wounded, so that the air escapes from them into the cavity of the thorax. But, as the rib at the moment of its being fractured, is pushed inwards, and wounds the pleura, which lines the ribs and intercostal muscles, part of the air most commonly passes through the pleura, and the lacerated muscles into the cellular membrane, on the outside of the chest, and thence it is diffused through the same membrane over the whole body, so as to inflate it sometimes in an extraordinary degree. This inflation of the cellular membrane has been commonly looked upon, as the most dangerous part of the disease; but very erroneously, as will appear in the sequel. (*Hewson, Med. Obs. and Inquiries, Vol.* 3.)

Emphysema is most frequent after a fractured rib, because there is a wide laceration of the lungs, and no exit for the air; it is less frequent in large wounds with a knife, or broad sword, because the air has an open and unimpeded issue; it is again more frequent in deep stabs with bayonets, or small swords; but it is not so peculiarly frequent in gun shot wounds, as the late Mr. John Bell supposed, (*On Wounds of the Breast, P.* 265, *Ed.* 3.) and, in fact, is not nearly so common in them, as in cases of stabs, particularly where the ribs are not splintered.

Emphysema has also been known to arise from a rupture of the larynx and trachea, produced by a blow, or kick, as we find exemplified in the case reported by Dr. L. O'Brien. (See *Edinb. Med. and Surg. Journ. No.* 72.)

The symptoms, attending emphysema, are generally of the following kind. The patient at first complains of a considerable tightness of the chest, with pain, chiefly in the situation of the injury, and great difficulty of breathing. This obstruction of respiration gradually increases, and becomes more and more insupportable. The patient soon finds himself unable to lie down in bed, and cannot breathe, unless when his body is in an upright posture, or he is sitting a little inclined forward. The countenance becomes red and swollen. The pulse, at first, weak and contracted, becomes afterwards irregular. The extremities grow cold, and, if the patient continue unrelieved, he soon dies, to every appearance suffocated.

The emphysematous swelling, wheresoever situated, is easily distinguished from œdema, or anasarca, by the crepitation, which occurs on handling it, or a noise, like that which takes place on compressing a dry bladder half filled with air.

The tumor is colourless and free from pain. It does not of itself descend into depending parts, though by pressure it may be made to change its situation. It is elastic, that is to say, it may be pressed down, but it rises up again as soon as the pressure is discontinued. The swelling never retains the impression of the end of the finger, or, in the language of surgery, never *pits*. The part affected is not heavy. The tumor first makes its appearance in one particular place; but, it soon extends itself over the whole body, and causes an extraordinary distention of the skin. (*Richter's Anfangsgr. der Wundarzn. B.* 1, *p.* 451.)

The wound of the pleura and intercostals may sometimes be too small to suffer the air to get readily into the cellular membrane, and inflate it, but may confine a part of it in the cavity of the thorax, so as to compress the lungs, prevent their expansion, and cause the same symptoms of tightness of the chest, quick breathing, and sense of suffocation, which water does in the hydrops pectoris, or matter in the empyema. (*Hewson.*)

To understand, why the air passes at all out of the wound of the lungs, we must advert to the manner, in which inspiration and expiration are naturally carried on. It is well known, that in the perfect state, the surface of the lungs always lies in close contact with the membrane lining the chest, both in inspiration and expiration. The lungs themselves are only passive organs, and are quite incapable, by any action of their own, of expanding and contracting, so as to maintain their external surface always in contact with the inside of the thorax, which is continually undergoing an alternate change of dimensions. Every muscle, that has any share in enlarging and diminishing the capacity of the chest, must contribute to the effect of adapting the volume of the lungs to the cavity, in which they are contained, as long as there is no communication between the cavity of the pleura, and the external air. In inspiration, the thorax is enlarged in every direction, the lungs are expanded in the same way, and the air entering through the windpipe into the air-cells of these organs, prevents the occurrence of a vacuum.

But, in cases of wounds, when there is a free communication between the atmosphere and inside of the chest, no sooner is this cavity expanded, than the air naturally enters it at the same time, and for the same reasons, that the air enters the lungs through the trachea, and the lung itself remains proportionally collapsed. When the thorax is next contracted, in expiration, the air is compressed out of the lung, and also, out of the bag of the pleura, through the external wound, if there be a direct one, in which circumstance, the emphysematous swelling is never extensive.

But, in the case of a fractured rib, attended with a breach in the pleura costalis, pleura pulmonalis, and air-cells of the lungs, there is no direct communication between the cavity of the chest and the external air; in other words, there is no outward wound in the parietes of the thorax. There is, however, a preternatural opening formed between the air-cells of the lungs and the cavity of the chest, and also another one between the latter space, and the general cellular substance of the body, through the breach in the pleura costalis. The consequence is, that when the chest is expanded in inspiration, air rushes from the wound in the surface of the lungs, and insinuates itself between them and the pleura costalis. The lungs collapse in proportion, and the place, which they naturally occupied, when distended, is now occupied by the air. When, in expiration, the dimensions of the chest are every where diminished, the air, now lodged in the bag of the pleura, cannot get back into the aperture in the collapsed lung, because this is already full of air, and is equally compressed on every side, by that which is confined in the thorax. Were there no breach in the pleura costalis, this air could not now become diffused; the muscles of inspiration would next enlarge the chest, remove the pressure from the surface of the wounded lung, more air would be sucked out of it, as it were, into the space between the pleura costalis and pleura pulmonalis, and this process would go on, till the lungs of the wounded side were completely collapsed. But, in the case of a fractured rib, or narrow stab, in which there is also a breach in the pleura costalis, without any free vent outward, for the air, which gets out of the lung into the cavity of the pleura, as soon as the expiratory powers lessen the capacity of the chest, this air, not being able to pass back through the breach in the collapsed lung, is forced through the laceration, or wound, in the pleura costalis, into the common cellular substance.

It is through the communicating cells of this structure, that the air becomes most extensively diffused over the whole body, in proportion as the expiratory muscles continue in their turn to lessen the capacity of the chest, and pump the air, as it were, through the breach in the pleura costalis, immediately after it has been drawn out of the wound of the lung, in inspiration. (See *John Bell on Wounds of the Breast, and Halliday on Emphysema*, 1807.)

To prove that the confinement of air in the chest is the cause of the dangerous symptoms attending emphysema, Hewson adverts to the histories of some remarkable cases, published by Littre, Mery, W. Hunter, and Cheston. (See *Mem. de l'Acad. Royale des Sciences, for* 1713, *Med. Observations and Inquiries, Vol.* 2, *and Pathological Inquiries.*)

In Littre's case, the patient, who had been wounded in the side with a sword, could not breathe, without making the most violent efforts, especially during the latter part of his disease: he died on the fifth day.

In Mery's instance, the fourth and fifth true ribs were broken by a coach passing over the chest; the patient's respiration was much impeded from the first, and became more and more difficult till he died, which was on the fourth day after the accident.

In Dr. Hunter's case, the patient had received a considerable hurt on his side by a fall from his horse. He had a difficulty of breathing, which increased in proportion as the skin became elevated and tense; it was laborious as well as frequent. His inspiration was short, and almost instantaneous, and ended with a catch in the throat, which was produced by the shutting of the glottis: after this he strained to expire for a moment without any noise, then suddenly opening the glottis, he forced out his breath with a sort of groan, and in a hurry, and then quickly inspired again; so that his endeavours seemed to be to keep his lungs always full; inspiration succeeded expiration as fast as possible. He said, his difficulty of breathing was owing to an oppression or tightness across his breast, near the pit of the stomach. He had a little cough, which exasperated his pain, and he brought up blood and phlegm from his lungs. He was relieved by scarifications, and recovered.

In Mr. Cheston's case, the man had received a blow on the chest. He had a constant cough, bringing up, after many ineffectual efforts, a frothy discharge, lightly tinctured with blood; he seemed to be in the greatest agonies, and constantly threatened with suffocation. His pulse was irregular, and sometimes scarcely to be felt, his face livid, and, when he was sensible, which was only now and then, he complained of a pain in his head. On passing a bandage round his chest, with a proper compress to prevent the discharge of air into the cellular membrane, and to confine the motion of the thorax, the patient cried out, that he could not suffer it. A strong compression by the hand alone affected him in the same way. Notwithstanding bleeding, repeated scarifications, and other means, his sense of suffocation, and difficulty of breathing increased. On the fourth day, the air no longer passed into the cellular membrane, when on a sudden inclining his head backward, as it were, for the admission of more air than usual, his breathing became more difficult and interrupted, he turned wholly insensible, and soon afterwards died.

Littre, Mery, and Cheston, opened their patients after death.

Besides a wound of the lungs and fractured rib, Littre found a considerable quantity of blood in the cavity of the thorax, and was sensible of some fetid air escaping, on his first puncturing the intercostals and pleura. The wounded lobe was hard and black, and the other two of the same side were inflamed.

In Mery's patient, no blood was extravasated, nor was there any thing preternatural, except the fractured ribs, the wound of the pleura, and that of the lungs.

Cheston found a fracture of the tenth and eleventh ribs, and a wound of the lungs. The lungs below the wound were livid, and more compact than usual; but every thing else was natural, no extravasation, no inflammation, no internal emphysema.

Hewson made several experiments on animals, tending to prove, that air in their chests produced great difficulty in breathing, such as occurs in cases of emphysema; and, in one case, which he examined after death, air was actually discharged on puncturing the thorax.

The object of Mr. Hewson's paper is to recommend making an opening in the chest, for the purpose of giving vent to the air confined in that cavity, just as is done for the discharge of pus, in cases of empyema, or of water, in those of hydrops pectoris.

In wounds of the lungs, says this author, whether occasioned by fractured ribs, or other causes, when symptoms of tightness and suffocation come on, so far should we be from dreading the emphysematous swelling of the cellular membrane, that we should rather consider it as a favourable symptom, showing that the air is not likely to be confined in the thorax; and so far should we be from compressing the wound to prevent the inflation, or emphysema, that we should rather dilate it (if not large enough already) or perform the paracentesis thoracis. We may judge of the necessity of this operation from the violence of the symptoms, such as the oppressed breathing, &c. For when these are not considerable, and the air passes out of the chest with sufficient freedom, the operation is then unnecessary.

If the disease is on the right side, the best place for performing the operation, says Mr. Hewson, will be on the fore-part of the chest, between the fifth and sixth ribs; for, there the integuments are thin, and, in the case of air, no depending drain is required. But, if the disease is on the left side, it will be more advisable to make the opening between the seventh and eighth, or eighth and ninth ribs, in order that we may be sure of avoiding the pericardium. As large penetrating wounds are inconvenient on account of the air entering by the aperture in such a quantity, *as to prevent the expansion of the lungs*, a small wound will be eligible, especially as air does not require a large one for its escape. Mr. Hewson recommends dissecting cautiously with a knife, in preference to the coarse and hazardous method of thrusting in a trocar.

There is one error prevailing in Mr. Hewson's paper, for which he has been justly criticised by Mr. John Bell; viz. the idea that it is possible and proper to make the collapsed lung expand by making an opening in the chest. Bromfield and B. Bell have both imbibed the same erroneous opinions, and proposed plans for exhausting the air and expanding the lung. It is very certain that it is impracticable to make the collapsed viscus expand, until the breach in it is closed, and this closure is greatly promoted by the quiet state, in which the collapsed lung remains; a state, also, the most favourable for the stoppage of any bleeding from the pulmonary vessels.

The true object then of making an opening into the thorax, when the symptoms of suffocation are violent, is not to obtain an expansion of the lung on the affected side, nor to take the pressure of the air from it; but, to remove the pressure caused on the opposite lung by the distention of the mediastinum, and, at the same time, to diminish the pressure of the air on the diaphragm. The lung on the affected side must continue collapsed, and it is most advantageous, that it should do so. The opposite lung is that, which for a time must of itself carry on respiration, and it is known to be fully adequate to this function, provided the quantity of air, on the other side of the chest, does not produce too much pressure on the mediastinum, and diaphragm.

Mr. John Bell concludes his remarks on this subject, with advising the following practice:—

1st. When the crackling tumor begins to form over a fractured rib, small punctures should be made with the point of a lancet, as in bleeding; and if the point be struck deep enough, the air will rush out audibly. But, as (supposing the lung is not adherent to the inside of the chest) this air was in the thorax, before it came into the cellular substance, it is plain, that the thorax is still full, and that the lung of that side is already collapsed and useless, and must continue so. The purpose, therefore, of making these scarifications, and, especially, of making them so near the fractured part, is not to relieve the lungs, but merely to prevent the air spreading more widely beneath the skin.

2nd. If the air should have spread to very remote parts of the body, as to the scrotum, and down the thighs, it will be easier to make small punctures in those parts, to let out the air directly, than to press it along the whole body, till it is brought up to the punctures made on the chest, over the wounded part.

3rd. If, notwithstanding free punctures, and pressing out the air in this way, you should find by the oppression, that either air, or blood, is accumulating within the cavity of the thorax, so as to oppress not the wounded lung only, which was of course collapsed and useless from the first, but the diaphragm, and through the diaphragm to affect also the sound lung; then a freer incision must be made, through the skin and muscles, and a small puncture should be cautiously made through the pleura, in order to let out the air, or blood, confined in the thorax.—(*John Bell, Op. cit. p.* 278.)

In all these cases, copious and frequently repeated venesection is generally proper.

After a few days, the wound, in the collapsed lung, is closed by the adhesive inflammation, so that the air no longer passes out of it into the cavity of the chest, and the outer wound may therefore be healed. What air is already there is ultimately absorbed, and the lung, expanding in proportion, resumes its original functions.

The application of a bandage round the chest is sometimes practised in cases of emphysema, and its utility, when the ribs are broken, has been highly spoken of by Mr. Abernethy. "Pressure by bandage (says he) not only hinders the air from diffusing itself through the cellular substance, but serves to prevent it from escaping out of the wounded lung, and, of course, facilitates the healing of the wound, which would be prevented by the constant transmission of air. Its early application, therefore, will often prevent a very troublesome symptom, whilst, at the same time, by keeping the fractured bones from motion, it greatly lessens the sufferings of the patient." (*Abernethy's Surgical Works, Vol.* 2, *p.* 179.) Where emphysema is complicated with a fractured rib, the latter injury is unquestionably a reason in favour of a bandage. But, whether the pressure of the roller will be useful, or hurtful, with respect to the emphysema itself, or the state of the lungs, and respiration, may be questionable. As for its tendency to resist the diffusion of air in the common cellular membrane, this circumstance does not appear to me important, because the air, thus diffused, much as it disfigures the patient, is nearly harmless, at least as long as the interlobular texture of the lungs remains uninflated; a danger, also, which no bandaging, as far as I can judge, has any tendency to prevent. Neither will a bandage have so much effect in hindering the diffusion of air, as scarifications, with this important additional consideration, that punctures, or small incisions, made over the broken rib, prevent the spreading of the air by letting it escape, while a bandage can only do so by more or less resisting its escape from the cavity of the pleura, which mode of operation in some cases would dangerously interfere with the continuation of respiration by the lung of the opposite side. At the same time, I believe, that when the air extravasated within the injured side of the chest is not in such quantity, as to oppress the sound lung, and a rib is broken, a bandage will generally afford great relief. Indeed, it is but justice to Mr. Abernethy to state, that he does not recommend the employment of a bandage in all cases of emphysema. "Patients (says he) will not always be able to wear a bandage, when one lung is collapsed, particularly if any previous disease has existed in the other, as it equally confines the motions of the ribs on both sides, and as every possible enlargement of the chest becomes necessary for the due admission of the air into the lung, which still executes its functions. Under these circumstances, if the emphysema continues, (and its continuance must always denote that the wound in the lung is not closed,) I should esteem it the best practice to make a small opening into the chest, so that the external air might have a free communication with that cavity; and then the injured lung must remain motionless till its wound is healed, and the mediastinum, will, in every state of the thorax, preserve its natural situation." (*Abernethy, Vol. cit. p.* 183.)

The utility of a free incision, and scarifications, is well illustrated in a case recorded by Larrey. The emphysema arose from a wound of the lungs by a lance. The whole body was prodigiously swelled; the integuments so distended, that the limbs were inflexible, the eyes buried; and the lips so enlarged that nothing could be introduced into the mouth. The pulse and respiration were scarcely perceptible, and the voice feeble and interrupted. The lance had entered obliquely under the lower angle of the scapula, and though the external and internal orifices of the wound were not parallel, the surgeon had applied adhesive straps, and closed the external one. Hence, the air, as it escaped from the lungs, distended the cellular texture. Larrey immediately removed the dressings, and, with a bistoury, made the openings in the pleura and skin parallel. Cupping glasses were then applied over the wound, and quickly filled with air and blood. The lips of the wound were now brought together, and kept so with a suitable bandage. Cupping glasses and scarificators were applied to various parts of the body, and, in others, incisions were made with a scalpel. The patient recovered. (See *Mém. de Chir. Militaire, T. 4.)*

Emphysema has been known to arise from the bursting of a vomica, and ulceration of the surface of the lungs; but, the air, which escapes, in this instance, cannot find its way into the cavity of the thorax, because the inflammation, which precedes the abscess and ulceration of the air-cells, closes those which are adjacent, and produces an adhesion of the edges of the vomica, or ulcer, to the inner surface of the chest, so as entirely to separate the two cavities. We are not acquainted with any instance of the symptoms, imputed to the confinement of air in the chest, originating from suppuration and ulceration of the surface of the lungs; but, Palfyn, Dr. Hunter, and the author of the article *Emphysema*, in the Encyclopédie Méthodique, Partie Chirurgicale, have seen cases, in which emphysema originated from abscesses of the lungs, attended with adhesion to the pleura, and ulcerations in the situation of such adhesion. In these instances, the pus having made its way through the pleura and intercostal muscles, the air escapes also through the same track, so as to pass into the cellular membrane on the outside of the chest.

A violent effort of respiration, has sometimes, produced a certain degree of emphysema, which first makes its appearance about the clavicles, and afterwards spreads over the neck and adjacent parts. The efforts of labour have been known to occasion a similar symptom; but, no bad consequences followed. (*Medical Communications, Vol. 1, p. 176; Blackden in Med. Facts and Experiments, Vol. 2, and Wilmer's Obs. in Surgery, p.* 143.)

Louis has described an emphysema of this sort, which, on account of its cause, and the indication, furnished by it to the practitioner, is highly important. It took place in a young girl, who died suffocated, from a bean falling into her windpipe, and he considers it, as a pathognomonic symptom of such an accident, concerning the existence of which it is so essential not to commit any mistake. (See *Bronchotomy.*) It made its appearance on both sides of the neck, above the clavicles, and came on suddenly, on the third day after the accident. The inspection of the body proved, that the lungs and mediastinum were also in an emphysematous state. The retention of the air, confined by the foreign body, produced, says Louis, at each attempt to expire, and especially, when the violents fits of coughing occurred, a strong propulsion of this fluid towards the surface of the lung, into the spongy substance of this viscus. Thence, the air passed into the cellular texture, which unites the surface of the lung to the pleura pulmonalis; and, by communications from cells to cells, it caused a prodigious swelling of the cellular substance, between the two layers of the mediastinum. The emphysema, increasing, at length made its appearance above the clavicles. This tumefaction of the lung, and surrounding parts, in consequence of air getting into their spongy, and cellular texture, is an evident cause of suffocation, and, the swelling seems so natural an effect of the presence of a foreign body in the trachea, that one can hardly fail to think it an essential symptom, though no author has made mention of it. (*Mém. de l'Acad. de Chir. Tom.* 4, *in 4to.*) The emphysematous swelling, sometimes formed in the axilla, in the reduction of a dislocated shoulder, (See *Dislocation*) was accounted for by Desault and Bichat, on the same principle as the foregoing case, viz. a rupture of one of the air-cells, by the patient's efforts to hold his breath during the reduction of the bone. How far the explanation of the cause may be true, has been questioned (See *Dict. des Sciences Med. T.* 12, *p.* 15); the fact itself admits of no doubt, and is both curious and interesting

The example, lately recorded by Dr. Ireland, as one of idiopathic emphysema following pneumonia, bears so strong a resemblance to the case above cited from M. Louis, that I cannot refrain from suspecting, that it may have been one of the same nature. (See *Trans. of the King's and Queen's College of Physicians, Vol.* 3, *Art.* 4.)

An emphysematous swelling of the head, neck, and chest, has also been noticed in typhoid fevers. Dr. Huxham relates an instance, of this sort, in a sailor of a scorbutic habit. *(Medical Observations and Inquiries, Vol.* 3, *Art.* 4.) Another example in a case of bilious fever, is recorded in a periodical work. (See *London Med. Repository, No.* 75.) A case of spontaneous emphysema being likewise described by Dr. Baillie (See *Trans. for the Improvement of Med. and Chir. Knowledge, Vol.* 1, *p.* 202.)

A curious example of what has been called, a spontaneous emphysema, is recorded by Mr. Allan Burns: "The patient was a strong athletic man, who, about six years previous to his application at the Royal Infirmary, had received a smart blow on the neck, from the keel of a boat. This injury was soon followed by the formation of a firm tense tumor, on the place, which had been hurt. The swelling increased very slowly, during the five years immediately succeeding its commencement; but, during the sixth, it received a very rapid addition to its bulk. At this time, it measured nearly six inches in diameter, seemed to be confined by a firm and dense covering, and the morbid parts had an obscure fluctuation. From the first to the last, the tumor had been productive of very little pain.

"Judging from the apparent fluctuation, that the tumor was encysted, it was resolved, at a consultation, to puncture the swelling, draw off its contents, and then pass a seton through it. By plunging a lancet into it, only a very small quantity of blood, partly coagulated, and partly fluid, was discharged,—a quantity so trifling, that, after its evacuation, the size of the tumor was not perceptibly reduced. A seton was passed through the swelling. At this time the man was in perfect health.

"About ten hours after the operation, the patient was seized with extremely violent rigors, followed by heat, thirst, pain in the back, excessive pain in the tumor, and oppressive sickness.

"An emetic was prescribed, but, instead of producing vomiting, it operated as a cathartic. To remove the irritation the seton was withdrawn. The pain in the tumor, however, and the general uneasiness continued to increase, and thirty hours subsequent to making the puncture, air began to issue from the track of the seton; and, afterwards the cellular membrane of the neck, and of the other parts of the body in succession, became distended with a gaseous fluid. In the course of a few hours, after the commencement of the general emphysema, the man died.

"Twelve hours after death, when the body was free from putrefaction, it was inspected. The emphysema was neither increased, nor diminished since death, and some idea may be formed of its extent, when the scrotum was distended to the size of the head of an adult. Even the cavities of the heart, and the canals of the blood-vessels, contained a considerable quantity of air. We could discover no direct communication between the tumor and the trachea or lungs, although such was carefully sought for." (*A. Burns on the Surgical Anatomy of the Head and Neck*, *p.* 51—53.)

From such cases, we may infer, with the preceding writer, that from the mere rupture of a few of the bronchial cells, occasioned by irregular action of the lungs, or by some other internal cause, a spontaneous diffusion of air may take place in the cellular texture of the body. Such examples are dependent on the same cause as the emphysema from injury of the lungs; only the rupture of the bronchial cells in the former cases is less obvious.

A partial emphysema is sometimes seen in cases of gangrene. Here, however, it is hardly necessary to observe, the air is the product of putrefaction, and the disorder has not the smallest connexion with any injury, or disease of the air-cells of the lungs.

C. C. Puysch, De Emphysemate Haller, Disp. Chir. 2, 567, *Halæ*, 1733. *H. A. Nics, De Miro Emphysemate, 4to. Duisb. ad Rhen.* 1751. *Hewson's Paper in Medical Observations and Inquiries, Vol.* 3. *Mém. de l'Acad. Royale des Sciences, for* 1713. *Dr. Hunter, in Medical Observations and Inquiries, Vol.* 2. *Cheston, in Pathological Inquiries. Abernethy's Surgical Works, Vol.* 2. *Richter Von der Windgeschwulst, in Anfangsgr. der Wundarzneykunst, B.* 1, *p.* 451, *&c. John Bell on Wounds, Ed.* 3, *Edinb.* 1812. *Halliday on Emphysema*, 1807. *Allan Burns on the Surgical Anatomy of the Head and Neck, p.* 52, *&c. Trans. of a Society for the Improvement of Medical and Chir. Knowledge, Vol.* 1. *p.* 262. *Wilmer's Observations in Surgery, p.* 143. *F. C. Waitz, De Emphysemate, 4to. Lips.* 1803. *Richerand Nosographie Chirurgicale, T.* 4, *p.* 164, *Edit.* 2. *Lassus Pathologie Chir. T.* 2, *p.* 321, *&c. Edit.* 1809. *Dict. des Sciences Méd. T.* 12, *p.* 1, *&c. J. Hennen, Principles of Military Surgery, p.* 376. *Ed.* 2, *8vo. Edinb.* 1820. *C. Bell, Surgical Obs. Vol.* 1, *p.* 161, *&c.*

EMPLASTRUM AMMONIACI CUM ACETO. ℞. Ammoniaci purif. ℥ij. Acidi Acetici, ℥iij. Ammoniacum in aceto liquefactum evapora in vase ferreo ad emplastri crassitudinem.

EMPLASTRUM AMMONIACI SCILLITICUM. ℞. Gumm. ammoniaci, ℥j. Aceti Scillitici, q. s. ut fiant emplastrum, quo pars affecta tegatur.

Mr. Ford found this last plaster useful in some scrofulous affections. It may be rendered more stimulating by sprinkling it with squills. (*Ford on the Hip-joint, p.* 59.) It was recommended by Swediaur; *London Medical Journal, Vol.* 1, *p.* 198.

EMPLASTRUM AMMONIACI CUM HYDRARGYRO. Discutient.

EMPLASTRUM AMMONIACI CUM CICUTA. ℞. Gum. ammon. ℥iij. Extracti Conii, ʒij. Liq. Plumb. acet. ʒj.

Dissolve the ammoniacum in a little vinegar of squills, then add the other ingredients, and boil them all slowly to the consistence of a plaster. Discutient.

EMPLASTRUM AMMONIÆ. ℞. Sapon. ʒij. Emplastr. Plumbi. ʒss. Ammon. mur. ʒj.

The two first articles are to be melted together, and when nearly cold, the muriated ammonia, finely powdered, is to be added. This plaster stimulates the skin, excites the action of the absorbents, and disperses many chronic swellings and indurations.

EMPLASTRUM CANTHARIDIS. (See *Blister.*)

EMPLASTRUM GALBANI COMPOSITUM. L. P. *Olim emplastrum lithargyri comp.*) Properties discutient.

EMPLASTRUM HYDRARGYRI. L. P. (*Olim emplastrum litharg. cum hydrargyro.*) Properties discutient.

EMPLASTRUM PLUMBI. L. P. (*Olim emplastrum lithargyri, ar diacholon plaster.*)

EMPLASTRUM RESINÆ. L. P. (*Olim emplastrum lithargyri cum resina.*) The common adhesive, or sticking plaster.

EMPLASTRUM SAPONIS. The plaster commonly used for fractures. It is also frequently applied to bruised parts, and to many indurations of a chronic nature.

EMPYEMA. (from ἐν, *within*, and πύον, *pus*, or *matter*.) A collection of purulent matter in the cavity of the chest.

The ancients made use of the word, "empyema" to express every kind of internal suppuration. It was Ætius, who first restricted the term to collections of matter in the cavity of the pleura, or membrane lining the chest; and all the best modern surgeons invariably attach this meaning alone to the expression.

The operation for empyema properly means the making of an opening into the thorax, for the purpose of giving vent to the matter, collected in the cavity of the pleura, though the phrase with several writers denotes making an incision into the chest, in order to let out any effused, or confined fluid, whether matter, blood, an aqueous fluid, or even air. The necessity for having recourse to such an operation, however, does not often present itself. I would not wish to be supposed to assert, that inflammation of the lungs, pleura, mediastinum, diaphragm, and even of the liver, does not sometimes terminate in suppuration. Certainly, the latter event is occasionally produced; but, when it does happen, the matter does not always make its way into the cavity of the chest: frequently external abscesses form, or the pus is either coughed up, or discharged with the stools.

Acute and chronic abscesses not unfrequently form in the cellular substance between the pleura and the ribs and intercostal muscles. A swelling occurs between two of those bones; the skin does not undergo any change of colour; a fluctuation is distinguishable, and sometimes an extensive œdema is observable.

With respect to abscesses, formed in the cellular substance, connecting the pleura costalis to the intercostal muscles, they rarely burst into the chest, the pleura always being considerably thickened. However, in order to keep them from spreading extensively, as well as to obviate any possibility of their breaking inwards, the best rule is to make an early, and, if possible, a depending opening. The motions of respiration then both promote the exit of the matter, as well as the contraction of the cavity, in which it was lodged; and the disease, if unattended with caries, generally terminates favourably.

It often happens, however, that the ribs are carious, and then the cure is more tedious and difficult. A modern writer, indeed, informs us that, when the inside of the rib is extensively carious, or when the caries is near the junction of the bone to the spine, the fistula is incurable. (*Lassus Pathologie Chirurgicale*, *T.* 1, *p.* 128, *Edit.* 1809.) On the other hand, another surgeon of vast experience recommends us to endeavour to separate the diseased bone, either by cutting it away, or employing the trepan. (*Pelletan Clinique Chir. T.* 3, *p.* 253.) Were a part of a diseased rib to admit of being sawn away, Mr. Hey's convex saw would be a more proper instrument for the purpose, than a trepan.

An abscess of the preceding kind may be so situated, and attended with such a pulsation, as greatly to resemble an aneurism of the origin of the aorta. An interesting case of this description is detailed by Pelletan. (*Clinique Chir. T.* 3, *p.* 254), and another was seen by Baron Boyer. (*Traité des Mal. Chir. T.* 7, *p.* 333.)

When the surface of the lungs and that of the pleura costalis have become adherent to each other, in the situation of the abscess, so as to constitute what is termed *encysted empyema*, the pus, disposed by a law of nature to make its way to the surface of the body, generally occasions ulceration of the intercostal muscles, and collects on the outside of them. An abscess of this kind comes on with a deep-seated pain in the part affected; an œdematous swelling, which retains the impression of the finger; and a fluctuation, which is at first not very distinct, but, from day to day, becomes more and more palpable, and, at length, leads the surgeon to make an opening.

If this be not done when the fluctuation becomes perceptible, the abscess may possibly insinuate itself into the cavity of the pleura, in consequence of the adhesion being in part destroyed by ulceration. Sabatier affirms, that the case may take this course, even when the abscess has been punctured, and while a free external opening exists; and this experienced surgeon has adduced a fact in confirmation of such an occurrence. (See *Médecine Opératoire*, *Tom.* 2, *p.* 249.)

In a few instances, the surface of the lung ulcerates, and the matter is voided from the trachea. But, in the majority of examples, the pus makes its way outwards through the pleura costalis. If inflammation occurs in the anterior mediastinum, and ends in suppuration, the abscess may possibly burst into neither of the cavities of the chest; but, make its way outwards, after rendering the sternum carious, as happened in the example, recorded by Van Swieten. (*Comment on Boerhaave's* 895*th Aphorism.*)

But, though collections of matter in the anterior mediastinum are influenced by the general law, whereby abscesses in general tend to the surface of the body, and though it be true, that they rarely burst inwardly into the cavity of the pleura, the contrary may happen, as is proved by the 9th case in La Martinière's memoir on the operation of trepanning the sternum. Here the event was the more extraordinary, as there was already an external opening in the abscess.

External injuries, such as the perforation of the sternum with a sword, (*Vanderwel*, *Obs.* 29, *Cent.* 1.) a contusion, a fracture, or a caries of this bone, may give rise to an abscess in the anterior mediastinum. Galen has recorded a memorable example, where the abscess was the consequence of a wound of the forepart of the chest. After the injury, which was in the region of the sternum, seemed quite well, an abscess formed in the same situation, and being opened healed up. The part, however, soon inflamed and suppurated again. The abscess could not now be cured. A consultation was held, at which Galen attended. As the sternum was obviously carious, and the pulsation of the heart was visible, every one was afraid of undertaking the treatment of the case, since, it was conceived, that it would be necessary to open the thorax itself. Galen, however, engaged to manage the treatment, without making any such opening, and he expressed his opinion, that he should be able to effect a cure. Not finding the bone so extensively diseased, as was apprehended, he even indulged considerable hopes of success. After the removal of a portion of the bone, the heart was quite exposed (as is alleged), by reason of the pericardium having been destroyed by the previous disease. After the operation, the patient experienced a speedy recovery.

J. L. Petit met with an abscess in the anterior mediastinum, in consequence of a gun-shot wound in the situation of the sternum. The injury had been merely dressed with some digestive application; no dilatation, nor any particular examination of the wound had been made. The patient, after being to all appearances quite well, and joining his regiment again, was soon taken ill with irregular shiverings, and other febrile symptoms. Petit probed the wound, and found the bone affected. As there was a difficulty of breathing, he suspected an abscess either in the diploe, or behind the sternum, and, consequently, he proposed laying the bone bare, and applying a trepan. The operation gave vent to some sanious matter, and, as soon as the inner part of the sternum was perforated, a quantity of pus was discharged. The patient was relieved, and afterwards recovered. (*Petit*, *Traité des Mal. Chir. T.* 1, *p.* 80.)

Another instance, in which an abscess behind the sternum was cured by making a perforation in that bone opposite the lower part of the cavity, in which the matter collected, is recorded by De la Martinière. (*Mem. de l'Acad. de Chir. T.* 12, *Ed.* 12*mo.*)

When, in consequence of inflammation, an abscess forms deeply in the substance of the lungs, the pus more easily makes it way into the air-cells, and tends towards the bronchiæ, than towards the surface of the lungs. In this case, the patient spits up purulent matter. When the opening, by which the abscess has burst internally, is large, and the pus escapes from it in considerable quantity at a time, the patient is in some danger of being suffocated. However, if the opening be not immoderately large, and the pus, which is effused, be not too copious, a recovery may ensue. Abscesses in the substance of the diaphragm, and collections of matter in the liver, may also be discharged by the pus being coughed up from the trachea, when the parts affected become connected with the lungs by adhesions, and the abscesses of the liver are situated on its convex surface. When the collection of matter in the liver occupies any other situation, the abscess frequently makes its way into the colon, and the pus is discharged with the stools. Several cases of this kind are related by authors: Sabatier has recorded two in his Médecine Opératoire; Le Dran makes mention of others; and Pemberton, in his book on the Diseases of the Abdominal Viscera, p. 36, relates additional instances of a similar nature.

I shall now proceed to the consideration of empyema strictly so called. Sometimes it is a consequence of a penetrating wound of the chest; occasionally it proceeds from the bursting of one or more vomicæ; in a few examples, it arises from the particular way in which abscesses of the liver burst; (*Journ. de Med. T.* 3, *p.* 47. *Morgagni, Epist.* 30, *art.* 4), but, in the greater number of instances, it originates from pleuritic inflammation, especially that of the chronic kind. (*Boyer, Traité des Mal. Chir. T.* 7, *p.* 352.) Empyema very rarely takes place in both sides of the chest, but is almost always limited to one cavity of the pleura.

According to Baron Boyer, when empyema arises from thoracic inflammation, pleuritis, or pneumonia, the symptoms, characterizing it, are always preceded by those of the disease, of which the effusion of pus upon the diaphragm is the effect. Inquiry must, therefore, be made whether the patient has pleurisy, or peripneumony, the symptoms of which have lasted longer than a fortnight; and whether, after a transient amendment, there have been frequent shiverings, followed by a low continued fever, with nightly exacerbations. Now, these first circumstances justify the belief, that the inflammatory disorder has terminated in suppuration, and that the symptoms afterwards experienced depend upon effusion of matter in the chest. Some of these arise from the mechanical action of the pus upon the lungs, heart, and parietes of the chest, and belong also to other effusions in the thorax; the rest may be said to be the effects of ulceration and suppuration of the parts on the animal economy, and, therefore, particularly belong to empyema.

First, of the common symptoms, respiration is difficult, short, and frequent; the patient suffers great oppression, and experiences a sense of suffocation, and of weight upon the diaphragm. He cannot move about, even for a short time, without being quite out of breath, and threatened with syncope. He has an almost incessant, and very fatiguing cough, which is sometimes dry, sometimes attended with expectoration. (*Boyer, Traité des Mal. Chir. T.* 7, *p.* 356.)

No surgical writer, with whom I am acquainted, has treated, with more discrimination, than Mr. Samuel Sharp, of the symptoms produced by collections of matter in the chest. He remarks, that it has been almost universally taught, that, when a fluid is extravasated in the thorax, the patient can only lie on the diseased side, the weight of the incumbent fluid on the mediastinum becoming troublesome, if he places himself on the sound side. For the same reason, when there is fluid in both cavities of the thorax, the patient finds it most easy to lie on his back, or to lean forwards, in order that the fluid may neither press upon the mediastinum, nor the diaphragm. But, it is noticed by Mr. Sharp, that, however true this doctrine may prove in most instances, there are a few, in which, notwithstanding the extravasation, the patient does not complain of more inconvenience in one posture, than another, nor even of any great difficulty of breathing. (See *Le Dran's Obs.* 217, and *Marchetti,* 65.)

On this account, observes Mr. Sharp, it is sometimes less easy to determine, when the operation is requisite, than if we had so exact a criterion, as we are generally supposed to have. But, says he, though this may be wanting, there are some other circumstances, which will generally guide us with a reasonable certainty. He states, that the most infallible symptom of a large quantity of fluid in one of the cavities of the thorax, is a preternatural expansion of that side of the chest, where it lies; for, in proportion as the fluid accumulates, it will necessarily elevate the ribs on that side, and prevent them from contracting so much in expiration as the ribs on the other side. This change is said to be most evident, when the surgeon views the back of the chest. (*Boyer, Vol. cit. p.* 357.) Mr. Sharp also refers to Le Dran's Obs. 211, vol. 1, in order to prove, that the pressure of the fluid on the lungs may sometimes be so great, as to make them collapse, and almost totally obstruct their function. When, therefore, says Mr. Sharp, the thorax becomes thus expanded, after a previous pulmonary disorder, and the case is attended with the symptoms of a suppuration, it is probably owing to a collection of matter. The patient, he observes, will also labour under a continual low fever, and a particular anxiety from the load of fluid.

Besides this dilatation of the cavity by an accumulation of the fluid, the patient will be sensible of an undulation, which is sometimes so evident, that a bystander can plainly hear it in certain motions of the body. Mr. Sharp adds, that this was the case with a patient of his own, on whom he performed the operation; but, the fluid in this instance, he says, was very thin, being a serous matter, rather than pus. Sometimes, when the practitioner applies his ear close to the patient's chest, while this is agitated, a noise can be heard, like that produced by shaking a small cask, not quite full of water. (See *Dr. Archer's Case in Trans. of the Fellows, &c. of the King's and Queen's College of Physicians in Ireland, Vol. 2, p. 2.*) In this instance, the fluid resembled whey.

According to the same author, it will also frequently happen, that though the skin and intercostal muscles are not inflamed, they will become œdematous in certain parts of the thorax; or, if they are not œdematous, they will be a little thickened; or, as Boyer states, the intercostal spaces are widened, and, when the empyema is considerable, instead of being depressed, as they are in thin persons, they project beyond the level of the ribs. (*Mal. Chir. T. 7. p. 357.*) These symptoms, joined with the enlargement of the thorax, and the preceding affection of the pleura, or lungs, seem unquestionably to indicate the propriety of the operation. But, observes Mr. Sharp, amongst other motives to recommend it upon such an emergency, this is one, that if the operator should mistake the case, an incision of the intercostal muscles would neither be very painful, nor dangerous. (See *Critical Inquiry into the present State of Surgery, sect. on Empyema.*)

" The difficulty of lying on the side, opposite to the collection of pus," says Le Dran, " is always accounted a sign of an empyema. This sign, indeed, is in the affirmative; but, the want of it does not prove the negative; because, when there is adhesion of the lungs to the mediastinum, the patient may lie equally on both sides." (*Le Dran's Obs. p.* 108, *Edit.* 2.) The explanation of this circumstance, offered by Le Dran, is, that when the cyst, in which the matter is contained, is between the mediastinum and the lungs, the mediastinum gradually yields to the volume of the pus, in proportion as it is formed, and the cyst in which it is contained becomes dilated; " whence habitude becomes a second nature." Whereas, in an empyemal person, in whom the lung is not adherent to the mediastinum, and who lies on the side opposite to that, on which the collection of pus is situated, the mediastinum is on a sudden loaded with an unusual weight of fluid. (*P.* 111.)

Richerand contends, that the difficulty of breathing, which patients with extravasated fluid in the chest experience in lying upon the side, opposite to that on which the disease is situated, never originates, as has been commonly taught and believed, from the fluid pressing upon the mediastinum and opposite lung. " I have (says he) produced artificial cases of hydrothorax, by injecting water into the thorax of several dead subjects, through a wound made in the side. This experiment can only be made on subjects, in which the lungs are not adherent to the parietes of the chest. In this way, from three to four pints of water were introduced. I then cautiously opened the opposite side of the chest: the ribs and lungs being removed, the mediastinum could be distinctly seen, reaching from the vertebræ to the sternum, and supporting, without yielding, the weight of the liquid, in whatever position the body was placed.

" It is evident, then, that patients, with thoracic extravasations, lie on the diseased side, in order not to obstruct the dilatation of the sound side of the respiratory organs, one part of which is already in a state of inaction. It is for the same reason, and in order not to increase the pain by the tension of the inflamed pleura, that pleuritic patients lie on the diseased side. The same thing is observable in peripneumony; in a word, in all affections of the parietes of the chest." (*Richerand Nosogr. Chir. T.* 4, *p.* 168, 169, *Edit.* 2.)

It appears to me, that there may be some truth in the foregoing statement; but, the experiments are far from being conclusive, with respect to the assertion, that, in cases of empyema, hydrothorax, &c. the fluid on one side of the chest does not compress the opposite lung. In the first place, the quantity of fluid is frequently much larger, than that which Richerand injected. Secondly, although the mediastinum may not be apt to yield at once to the weight of a liquid suddenly injected into one side of the thorax; yet, it may do so by the gradual effect of disease. Thirdly, many of the phenomena of emphysema seem adverse to Richerand's inference.

Although surgeons should be aware, that patients with empyema can sometimes lie in any position, without particular aggravation of the difficulty of breathing, yet, it ought to be distinctly understood, that the generality of patients with this disease cannot place themselves on the side, opposite to that, on which the collection of pus is situated, without their respiration being very materially obstructed. Another circumstance, also, which deserves to be mentioned while we are treating of the symptoms of empyema, is, that the œdema of the integuments is sometimes not confined to the thorax, but extends to more remote parts, on the same side of the body as the collection of matter. Both the foregoing remarks are confirmed by an interesting case, which has been published by Mr. Hey, of Leeds.

Sept. 3, 1788, Mr. Hey was desired to visit John Wilkinson, who had been ill ten days of the influenza. The patient was found labouring under a fever, attended with cough, difficulty of breathing, and pain in the left side of the thorax. He was bled once; had repeated blisters applied to the chest; and took nitre and antimonials, with a smooth linctus to allay his cough. He was repeatedly relieved by these means, especially by the application of the blisters; but repeatedly relapsed. At last, he became so ill, that he breathed with the utmost difficulty, and " could not lie on the right side, without danger of immediate suffocation."

Mr. Hey found the patient in the state just now described on the 17th of September. " His face and especially his eyelid were a little swollen on the left side." The left side of the thorax was larger, than the right, and its integuments were œdematous. Upon pressing the intercostal muscles, they felt distended; they yielded a little to a strong pressure, but rebounded again. The abdomen, especially, at its upper part, appeared to be fuller than in the natural state. (See *Hey's Practical Obs. in Surgery, p.* 476.) This last symptom is also particularly noticed by Boyer. (*Mal. Chir. T.* 7, p. 357.)

Another remarkable symptom, which is occasionally produced by collections of matter in the chest, is an alteration in the position of the heart. I have seen a patient in St. Bartholomew's hospital, who had so large a quantity of matter in the left bag of the pleura, that it completely displaced the heart, which pulsated against the inside of the chest, at a considerable distance to the right of the sternum. This man's life might probably have been saved, had paracentesis thoracis been performed in time. Some suspected an aneurism from the throbbing on the right of the sternum; and the case was not fully understood till after death, when the body was opened. A little attention to the symptoms, however, might have convinced any man of moderate understanding, that it was an empyema, and that making an opening, for the discharge of the matter, afforded the only rational chance of preserving life. There had been pain and inflammation in the chest, followed by shiverings; there was very great difficulty of breathing; the heart, which previously used to beat in the usual place, no longer did so; but now, pulsated on the right side of the thorax.

That the heart should be displaced in this manner by any large collection of fluid in the right cavity of the thorax, one would naturally expect; but it is an occurrence, that has not been much noticed by surgical writers. Baron Larrey, however, has related a highly interesting case, where the heart was not only pushed considerably to the right of the sternum, but, its action was so much impeded by the derangement of its position, that the pulse in the large arteries was thereby rendered extremely feeble. In this instance, also, the diaphragm had descended so low down, as to force some of the small intestines into the cavity of the pelvis. (*Mémoires de Chirurgie Militaire, T. 3, p.* 447, *&c.*) Pelletan has also recorded an example, in which a collection of fluid in the left cavity of the chest displaced the heart, the pulsations of which were perceptible betwixt the third and fourth ribs of the right side, near the sternum. (*Clinique Chir. T. 3, p.* 276.) Baron Boyer speaks of one case, in which the displacement of the heart was so extensive, that its pulsations were felt near the right axilla. (*Traité des Mal. Chir. T. 7, p.* 357.) In the anatomical collection at Strasburgh, is also a preparation exhibiting the displacement of the heart into the right side of the chest, by matter in the left pleura, the left lung being nearly annihilated. (*Lobstein compte de son Muscum Anat. p.* 39, *8vo.* 1820.) The heart is sometimes thrust downwards by collections of fluid in the chest, and its pulsation is distinguishable in the epigastrium. (*Hodgson on the Diseases of Arteries and Veins, p.* 95.)

When the cavity of the pleura contains fluid, and the surgeon strikes the thorax repeatedly with the ends of his fingers, a dull sound is said to be produced, quite different from what would occur, were the chest in its natural state. But, as Boyer remarks, this symptom, to which so much importance has of late been attached, being common to extravasations in the thorax, and several other diseases, will not denote empyema, unless combined with other signs of this affection. Nor will any useful information be derived from the above percussions, except the practitioner has had a good deal of experience in them, and they are repeatedly practised with the patient in different positions. (*Mal. Chir. T.* 7, *p.* 357.)

The symptoms of empyema are frequently very equivocal, and the existence of the disease is generally somewhat doubtful. Panarolius opened a man, whose left lung was destroyed, at the same time that the thorax contained a considerable quantity of pus. Although the patient had been ill for two months, he had suffered no difficulty of breathing, and had had only a slight cough. Le Dran met with a case of nearly the same kind. A patient, who had been for three days affected with a considerable oppression, and an acute pain on the left side of the chest, got somewhat better. He felt no material difficulty of breathing, on whatever side he lay. The only thing, which he complained of, was the sense of a fluctuation in his thorax, and a little obstruction of his respiration, when he was in a sitting posture. These symptoms did not seem sufficiently decided to justify the operation, and it was delayed. The febrile symptoms continued with cold sweats, and the patient died on the eighth day. Five pints of pus were found collected in the chest. (See *Le Dran's Observations in Surgery, p.* 109, 110, *Edit.* 2.)

The symptoms, more particularly depending upon empyema itself, that is to say, upon the disease and suppuration within the chest, are nearly the same as those, which accompany all large deep-seated abscesses. The fever, attending the thoracic inflammation, which ends in suppuration, gradually diminishes, but does not entirely cease. On the contrary, it soon changes into hectic, attended with flushings of the cheeks, heat of the palm of the hands, and exacerbations every evening, and after meals. In the night, the upper parts of the body are covered with perspiration; the patient is tormented with insatiable thirst; his appetite quite fails; his debility becomes extreme; he is subject to frequent fainting fits; diarrhœa ensues; and the finger nails become curved, shining, and of the yellow tinge, observable all over the body. At length, the utmost emaciation, and the facies Hippocratica, come on, frequently attended with dilated pupils, and enfeebled vision, and indicating the approach of death.

As the operation of empyema, and some other particulars, relating to this subject, are treated of in another part of this Dictionary, (See *Paracentesis of the Thorax*) it will only be necessary for me here to subjoin a list of works, which may be advantageously consulted for information on empyema. *A. Vater, et J. E. Mutillet, Empyema, e vomica pulmonis, rupta in cavitatem pectoris dextram effusa, indique pulmo hujus lateris compressus penitusque ab officio remotus, Wittemb.* 1731, (*Haller, Disp. ad Morb.* 2, 4031.) *Gerardus le Maire, Diss. de Empyemate, 4to. Lugd.* 1735. *Sharp's Critical Enquiry into the Present State of Surgery, sect. on Empyema. Le Dran's Observations in Surgery. J. L. Petit, Traité des Maladies Chirurgicales, Tom.* 1, *Chap.* 3, *Des Plaies de la Poitrine. Warner's Cases in Surgery, Chap.* 6, *Edit.* 4. *Mémoire sur l'Opération du Trépan au Sternum par M. de la Martinière in Mém. de l'Acad. Royale de Chirurgie, Tom.* 12, *p.* 342, *Edit.* 12*mo. L. G. Van Malcote, De Empyemate, Teneramund.* 1783. *Sabatier, Médecine Opératoire, Tom.* 2, *p.* 247, *&c., Edit.* 1. *A. O'Flaherty, De Empyemate,* *Montp.* 1774. *Andouard de l'Empyeme, Cure Radicale Obtenue par l'Opération, &c.* 8*vo. Paris*, 1808. *Callisen, Systema Chirurgiæ Hodiernæ, Vol.* 2, *p.* 363, *Edit.* 1798. *Flajani, Collezione d'Osservazioni, &c., di Chirurgia, T.* 3, *p.* 185, *&c.* 8*vo. Roma*, 1802. *Richerand, Nosogr. Chir. T.* 4, *sect. des Maladies de l'Appareil respiratoire. Léveillé, Nouvelle Doctrine Chir. T.* 2, *p.* 575, *&c. Hey's Practical Observations in Surgery, Ed.* 3. *Lassus Pathologie Chirurgicale, T.* 1, *p.* 122, *&c. Larrey, Mémoires de Chirurgie Militaire, T.* 3, *p.* 442, *et T.* 4, *p.* 356, *&c. Pelletan, Clinique Chir. T.* 3, *p.* 236, *&c. J. Hennen, Principles of Military Surgery, p.* 384, *&c. Ed.* 2, 8*vo. Edinb.* 1820. *Boyer, Traité des Mal. Chir. T.* 7, *p.* 351, *&c.* 8*vo. Paris*, 1821.

ENCANTHIS. (from εν, and κανθος, the angle of the eye.)

The encanthis, at its commencement, is nothing more, says Scarpa, than a small, soft, red, and sometimes rather livid, excrescence, which grows from the caruncula lachrymalis, and, at the same time, from the neighbouring semilunar fold of the conjunctiva. The inveterate encanthis is ordinarily of considerable magnitude; its roots extend beyond the caruncula lachrymalis, and semilunar fold, to the membranous lining of one or both eyelids. The patient experiences very serious inconvenience from its origin, and interposition between the commissure of the eyelids, which it necessarily keeps asunder, on the side towards the nose.

The encanthis keeps up a chronic ophthalmy, impedes the action of the eyelids, and in parcular, prevents the complete closure of the eye. Besides, partly by compressing, and partly by displacing the orifices of the puncta lachrymalia, it obstructs the free passage of the tears into the nose.

According to Scarpa, this excrescence, on its first appearance, is commonly granulated, like a mulberry, or is of a ragged and fringed structure. Afterwards, when it has acquired a certain size, one part of it represents a granulated tumor, while the rest appears like a smooth, whitish, or ash-coloured substance, streaked with varicose vessels, sometimes advancing as far over the conjunctiva, covering the side of the eye next to the nose, as where the cornea and sclerotica unite. In this advanced state, the encanthis constantly interests the caruncula lachrymalis, the valvula semilunaris, and the membranous lining of one, or both eyelids. In addition to the roots, which in such circumstances connect the excrescence with the caruncula lacrymalis, the semilunar fold, and the conjunctiva of the globe of the eye, the encanthis emits an appendage, or prominent, firm elongation, along the inside of the upper, or lower eyelid, in the direction of its edge. The middle, or body, of the encanthis divides near the cornea, as it were, like a swallow's tail, to form two appendages, or elongations, one of which extends along the inner surface of the upper eyelid by the margin of which it is covered, while the other shoots, in a direction from the internal towards the external angle, along the inside of the lower eyelid, which also conceals it beneath its edge.

The body of the encanthis, or that middle portion of the whole excrescence, which reaches, from the caruncula lachrymalis, and semilunar fold, inclusively, over the conjunctiva almost to the junction of the sclerotica with the cornea, sometimes forms a prominence, as large as a small nut, or chestnut. At other times, it is of considerable size, but depressed, and broken down, as it were, at its centre. Still, however, the body of the encanthis preserves that granulated appearance, which prevailed at first; while one, or both the appendages, on the inside of the eyelids, appear rather like a fleshy than a granulated substance.

On turning out the inside of the eyelids, these appendages, or elongations of the encanthis, form a prominence projecting forward. When both eyelids are equally affected, and turned inside out, the appendages conjointly represent, as it were, a ring, the back of which rests on the globe of the eye.

Sometimes, the encanthis assumes a cancerous malignancy. This character is evinced by the dull red, leaden, or (as Beer says) the blueish-red colour of the excrescence; by its excessive hardness, and the lancinating pains, which occur in it, and extend to the forehead, the whole eyeball, and the temple, especially, when the tumor has been slightly touched. It is, also, evinced by the propensity of the excrescence to bleed, by the partial ulcerations on its surface, which emit a fungous substance, and a thin, and exceedingly acrid discharge. The disease is constantly attended with epiphora, and preceded by a scirrhous induration of the caruncle. The eyeball, and neighbouring bones, which are of a spongy texture, are said to participate very soon in the disease, the lower eyelid also becoming everted. (*Beer, Lehre von den Augenkr. B.* 2, *p.* 187, 188.) This form of encanthis only admits of palliative treatment; unless, indeed, an effort be made to extirpate it entirely, together with the whole of what is contained in the orbit, and, even then, the event is dubious.

Beer joins Scarpa in the statement, that the operation rarely proves successful, and adds, that it is always followed by an incurable weeping, and a considerable eversion of the lower eyelid. (*Vol. cit. p.* 189.) Fortunately, the truly cancerous encanthis is uncommon; Mr. Guthrie has not seen it; (*Operative Surgery of the Eye, p.* 117.) and Mr. Travers, who was a surgeon to the London Eye Infirmary several years, never met with an instance of it. (*Synopsis of Diseases of the Eye, p*, 103.)

The benign encanthis, how large soever it may be, is always curable by extirpation. Those instances, which are small, incipient, and granulated, like a mulberry, or of a fringed structure, which originate either from the caruncula lachrymalis, or the semilunar fold of the conjunctiva; or from both these parts together, and even in part from the internal commissure of the eyelids, may be raised by means of a pair of forceps, and cut off from the whole of their origin, closely to their base, with the curved scissars with convex edges. In the performance of this operation it is unnecessary to introduce a needle and thread through this little excrescence, as some are wont to do, for the purpose of raising it, and destroying more accurately all its origins, and adhesions. The same object is fulfilled by means of forceps, without inconveniencing the patient with a puncture of this kind, and drawing a thread through the part, in order to make a noose. However, in cutting out an encanthis of this small size, care should be taken not to remove, together with that portion of the excrescence which originates from the caruncula lachrymalis, any more of this latter body, than what is absolutely necessary for the precise eradication of the disease, in order that no irremediable weeping may be occasioned.

When the little excrescence has been detached from all its roots, says Scarpa, the eye must be washed several times with cold water in order to cleanse it from the blood, and then it is to be covered with a piece of fine linen, and a retentive bandage. On the 5th, 6th, or 7th day, the inflammation arising from the operation entirely ceases, and the suppuration from the wound is accompanied with the mucous appearance already described. The little wounds are then to be touched with a piece of alum, scraped to a point like a crayon, and the vitriolic collyrium, containing the mucilage of quince seeds, is to be injected into the affected eye several times a day. If these means should not bring about the wished-for cicatrization; but, on the contrary, the small wounds situated on the caruncula, and internal commissure of the eyelids, should become stationary, and covered with proud flesh, the argentum nitratum ought to be applied to them. The conjunctiva, however, should be avoided as much as possible, especially, if at all wounded. When the fungous granulations have been destroyed, the cure may be perfected by the collyrium already mentioned, or rather by introducing, thrice a day, between the eyeball, and internal angle of the eyelids, the powder of tutty, and the armenian bole. Bidloo extols very much powdered chalk, either alone, or in conjunction with burnt alum. (*Exercit. Anat. Chir. Decad* 2.)

Excision is equally applicable to the inveterate encanthis, which is of considerable size, and broken down at its body, or which forms a prominence, as large as a nut, or chestnut, with two fleshy appendages extending along the inner surface of one, or both eyelids. The application of a ligature to such an excrescence ought never to be regarded as a method of cure; for the large, inveterate encanthis never has a sufficiently narrow neck to admit of being tied. On the contrary, when the tumor is voluminous, its roots, invariably, extend to the caruncula lachrymalis, the semilunar fold, and the conjunctiva covering the eyeball, oftentimes, nearly as far as the cornea. In this state, also, the encanthis has one, or two fleshy appendages, which reach along the membranous lining of one, or both eyelids. Hence, though the ligature were to produce a separation of the body of the encanthis, one, or both the appendages would still remain to be extirpated. This second operation could only be accomplished with the knife. In this disease, there is no foundation for the fear of hemorrhage, to which the advocates for the ligature attach so much importance; for, cases are recorded of considerable, inveterate encanthes being removed, without the least untoward occurrence from loss of blood. To these, Scarpa observes, he could add a great number of his own, so that no doubt can now be entertained on this point.

Pellier relates a case, in which an encanthis was followed by a dangerous hemorrhage, though it had been cut out by an expert oculist. He enters, however, into no detail concerning the nature of the complaint, nor the way, in which the operation was performed; circumstances from which one might deduce the reason of this unusual accident. Indeed, the same author adds, "I have often performed this operation for such excrescences, and have never met with a similar occurrence." (*Receuil d'Observ. sur les Maladies de l'Œil*, *Part* 2, *Obs.* 118.)

When the encanthis is large, and inveterate, with two extensive fleshy elongations, one on the inside of the upper eyelid, and the other on that of the lower one, we are to proceed in the following manner. The patient being seated, an assistant is to turn out the inside of the upper eyelid, so as to make one of the appendages of the encanthis project outward. By means of a small bistoury, a deep incision is next to be made into the elongation, in the direction of the margin of the eyelid; and then having taken hold of, and drawn it forwards with a pair of forceps, we are to separate it, throughout its whole length, from the inside of the upper eyelid, proceeding from the external, towards the internal angle of the eye, as far as the body, or middle of the encanthis. We are then to do the same to the lipomatous appendage on the inside of the lower eyelid. Afterwards the body of the encanthis is to be elevated, if possible, with a pair of forceps; but when this instrument will not answer the purpose, a double hook must be employed. This middle portion is now to be detached, partly with the bistoury, and partly with the curved scissars from the subjacent conjunctiva, on the globe of the eye, from the semilunar fold, and from the caruncula lachrymalis; dividing the substance of this last part more, or less deeply, according to the depth and hardness of the large, inveterate encanthis. Here it is proper to state distinctly, that when we have to deal with an old, large tumor of this nature, deeply rooted in the caruncula lachrymalis, it is not regularly in our power to preserve a sufficient quantity of the substance of this part, to prevent the tears from dropping over the cheek, after the wound is healed.

The eye is to be repeatedly washed with cold water.

The rest of the treatment, consequent to the extirpation of a large encanthis, is almost the same as what was explained in speaking of the small incipient case. Bathing the eye very frequently in the lotion of mallows, and employing anodyne, detergent collyria, are the best local means, until the mucous appearance, preceding suppuration, has taken place on the surface of the wound. Then we may have recourse to mild astringent ointments and collyria. The mildest topical applications are generally the best, both in the first stage of suppuration, as well as afterwards, particularly, when, together with the encanthis, we have removed a considerable piece of the conjunctiva, which covered the eyeball towards the nose, and was intimately connected with the body of the excrescence.

Consult *Scarpa sulle Malattie degli Occhi.*

Ed. 5, *Cap.* 12; *Richter, Anfangsgr. der Wundarzn. Band* 2, *p.* 473, *&c. Edit.* 1802. *G. J. Beer, Lehre von den Augenkr. B.* 2, *p.* 187, *8vo. Wein.* 1817. *B. Travers, A Synopsis of the Diseases of the Eye, p.* 103, *&c. G. T. Guthrie, Lectures on the Operative Surgery of the Eye, 8vo. Lond.* 1823, *p.* 117, *&c.*

ENCEPHALOCELE. (from εγκεφαλον, the brain, and κηλη, a tumor.) A hernia of the brain. (See *Hernia Cerebri.*)

ENCYSTED TUMORS. (See *Tumors Encysted.*)

ENEMA. The following are some of the most useful glysters, employed in the practice of surgery.

Cathartic.

℞. Decocti Hordei ℔j.
Sodæ Muriatis ℥j.—Misce.

℞. Decocti Avenæ ℔j.
Olei Olivæ ℥ij.
Magnesiæ Sulphatis ℥j.—Misce.

Anodyne.

℞. Mucilaginis Amyli, Aquæ distillatæ sing. ℥ij. Tincturæ Opii guttas XL.—Misce.

℞. Olei Olivæ ℥iv. Tincturæ Opii guttas XL.—Misce.

The two latter glysters are particularly useful in cases in which there is great irritation about the rectum, bladder, or urethra. They have great effect in diminishing spasmodic affections of this canal and the neck of the bladder.

Tobacco,

Employed in cases of strangulated Hernia.

℞. Nicotianæ ʒj. Aq. ferventis ℔j. The plant is to be macerated ten minutes, and the liquor then strained for use. One half should be first injected, and soon afterwards the other, unless the glyster should operate with dangerous violence, as it sometimes does in particular constitutions.

ENTEROCELE. (from εντερα, the bowels, and κηλη, a tumor.) A hernia, in which the contents of the tumor are intestine.

ENTERO-EPIPLOCELE. (from εντερα, the bowels, επιπλοον, the omentum, and κηλη, a tumor.) A hernia, in which the contents of the swelling are both intestine and omentum.

ENTROPIUM. (from εν and τρεπω, to turn.) An inversion of the eyelids. (See *Trichiasis.*)

EPIGLOTTIS SHOT AWAY. The practice of Baron Larrey furnishes a curious example, in which the epiglottis of a French soldier was shot off at the battle of Alexandria, on the 21st of March, 1801. The ball entered at the angle of the jaw, crossed the throat obliquely, and came out at the opposite side of the neck. The base of the tongue was grazed, and the epiglottis shot away; the patient spit it up after the accident, and showed it to the surgeon, who first saw him.

The patient was not in much pain; but, his voice was hoarse, feeble, and scarcely audible.

When he first attempted to swallow, he was seized with a convulsive suffocating cough, attended with vomiting. Annoyed by thirst, which the extreme heat of the weather and the irritation of the wound excited, he incessantly repeated his attempts to drink; but, always with the same result. Four days were passed in this deplorable condition. He already experienced violent complaints in his stomach; continual loss of sleep; he had a small accelerated pulse; and was beginning to look thin.

Such was the state of this wounded soldier, when Larrey saw him on the fifth day. After making a few inquiries about what had passed after the accident, attempting to make the patient drink, and examining the interior of the mouth, Larrey was convinced, that the paroxysms of suffocation, and the inability to swallow depended upon the permanent opening of the glottis, the lid of which had been shot away. The prognosis of the injury was exceedingly unfavourable, and there can be no doubt, that, if the patient had been abandoned to the resources of nature, he would have died in the course of a few days. The indications were equally difficult to fulfil: the most urgent was to appease the hunger and thirst, with which this poor soldier was afflicted. Larrey, fortunately, was provided with an elastic gum tube, constructed for the œsophagus. This instrument was introduced with the usual precautions, into the pharynx, and by means of it, the patient was given some drink, which relieved him much, and afterwards some rich broth. The patient was fed in this manner for six weeks, at the end of which time, he was able, without the assistance of the tube, to swallow thick panado, and thickened rice, made into little balls. The powers of speech and deglutition in time became much more perfect; in consequence, as Larrey imagines, of an enlargement of the arytenoid cartilages, and an expansion of that part of the base of the tongue which lies next to the glottis, having formed a sort of substitute for the epiglottis. (*Mémoires de Chirurgie Militaire, T.* 2, *p.* 145—149.)

The foregoing case illustrates, in a convincing manner, the importance and utility of elastic gum tubes for conveying nourishment and medicines down the œsophagus in wounds about the throat. All practitioners, and, especially, military surgeons, should be duly impressed with the necessity of having such instruments always at hand. The patient, whose case is above recited, owed his preservation altogether to this means, without which he must have been starved to death.

In the 4th vol. of the above work, P. 247, is recorded another case, in which a gun-shot wound, that took away the epiglottis, and broke the os hyoides, was successfully treated.

EPIPHORA. (from επιφερω, to carry with force.) By this term is meant an accumulation of tears on the anterior part of the eye; in consequence of which, the person afflicted is not only under the necessity of frequently wiping them away, but vision is injured by the morbid refraction, which they produce of the rays of light that enter the pupil. *Stillicidium lachrymarum* is distinguished by modern writers from epiphora: the cause of stillicidium lies in some obstacle to the absorption and conveyance of the tears from the lacus lachrymarum into the sac. Epiphora, on the other hand, consists in a superabundant secretion of tears, and is a disease of the secreting, not of the excreting parts, of the lachrymal organs. (See *W. M'Kenzie's Valuable Essay on the Diseases of the Lachrymal Organs, p.* 47, *8vo. Lond.* 1819, *and Beer, Lehre von den Augenkr, B.* 2.)

EPIPLOCELE. (from επιπλοον, the omentum, and κηλη, a tumor.) A hernia, formed by a protrusion of the omentum. (See *Hernia.*)

EPULIS. (from επι, upon, and ȣλα, the gums.) A small tubercle on the gums. It is said sometimes to become cancerous. The best plan of cure is to extirpate it with a knife.

ERETHISMUS. (from ερεθιζω, to irritate.) The state of irritation, attending the early stage of acute diseases. Mr. Pearson has described a state of the constitution, produced by mercury acting on it as a poison. He calls it the *mercurial erethismus*, and mentions, that it is characterized by great depression of strength, anxiety about the præcordia, irregular action of the heart, frequent sighing, trembling, a small, quick, sometimes intermitting pulse, occasional vomiting, a pale contracted countenance, a sense of coldness; but the tongue is seldom furred, nor are the vital and natural functions much disturbed. In this state, any sudden exertion will sometimes prove fatal. Mr. Pearson advises, with a view of preventing the dangerous tendency of this affection, the immediate discontinuance of the use of mercury; and exposing the patient to a dry cool air. The incipient erethismus may often be averted by the camphor mixture with large doses of the volatile alkali, if mercury be also left off. Sarsaparilla is also beneficial, when the stomach will bear it. (*Pears on Lues Venerea, page* 156, *&c. Edit.* 2.)

ERYSIPELAS. (from ἐρύω, to draw, and ϖέλας, adjoining.) St. Anthony's fire; so called, from its tendency to draw the neighbouring parts into the same state, or, in other words, from its propensity to spread.

Erysipelas may be defined to be an inflammatory, cutaneous, and trivially elevated swelling, attended with a redness, which disappears, and leaves a white spot for a short time after being touched with the end of the finger, and the affection, which is not like phlegmon regularly circumscribed, is characterized by a remarkable propensity to spread.

The part is generally of a bright red colour, clear, and shining. The tumor is not accompanied by throbbing, and a burning heat and tingling are felt, rather than acute pain. In many instances, vesications arise; a circumstance, which led Dr. Willan to include the disease in the order *Bullæ*. However, if we mean this arrangement to extend to what is named *local*, or *accidental erysipelas*, as well as to the *idiopathic* forms of the disorder, there cannot be a doubt of its inaccuracy, many examples of erysipelas from local irritation being characterized neither by fever, nor vesications.

Desault preferred the division of erysipelas into *phlegmonous*, *bilious*, and *local*; (*Chir. Journ. Vol.* 2.) an arrangement which seems founded on experience, and correct observation. Mr. Pearson also divides the complaint into three forms, viz. the *phlegmonous*, *œdematous*, and *gangrenous*; (*Principles of Surgery, Chap.* x.) Burserius notices, 1. The *idiopathic*, or *primitive* erysipelas, or that which arises spontaneously from an internal cause, unpreceded by any other disease. 2. *Symptomatic*, or *secondary* erysipelas, depending on another affection, by which its progress is completely influenced. 3. *Accidental* erysipelas, or that which is casually excited by some external manifest cause. (*Instit. Med. Prac. T.* 2. *C.* 2. *8vo. Lips.* 1798.)

In the *bilious* erysipelas, which would be classed, as an *idiopathic* case, the swelling is trifling, and often imperceptible, the skin of a rose-colour, generally a little verging towards yellow. The sensation, which the patient experiences, is neither that of tension nor pulsation, but a painful smarting, similar to what results from the application of hot water, or from exposure to the burning rays of the sun.

Towards the period of the invasion of this disease, and often several days previously, the appetite is lost, the mouth bitter, the tongue moist, and covered with a yellow mucus. Nausea and sometimes bilious vomitings come on. The patient becomes weak and dejected, and is affected with wandering pains and considerable heat, without any particular dryness of the skin or violent sense of thirst. Sometimes the disease begins with fever, more or less violent, preceded by shivering and violent pain in the head.

In the *phlegmonous erysipelas*, the skin is more raised than in the preceding species, the swelling harder and deeper, and of a darker colour. There is generally a slight degree of tension of the integuments, with pungent pain, and occasionally a sensation of throbbing. On the first days of the attack, there is neither bitterness in the mouth, nor nausea, the skin and tongue become dry, and are accompanied with a violent sense of thirst; the pulse is full and hard, indicating plethora. This form of erysipelas most frequently occurs in the face, usually affecting only one side of it; sometimes it seizes one of the extremities; and, in both cases, it is ushered in by a smart feverish attack. (*Bateman, Synopsis of Cutaneous Diseases, P.* 126, *Ed.* 3.)

At the expiration of a few days, particularly when the disease has been treated by bleeding and an antiphlogistic regimen, the tongue becomes foul and moist at its edges, bitterness of the mouth and nausea supervene, and the disease, in its progress, presents little difference from bilious erysipelas. (*Parisian Chirurgical Journal, Vol.* 2, *p.* 24, *&c.*)

The following is a description of phlegmonous erysipelas, as it sometimes appears when it attacks the head.

The attack is mostly preceded by shiverings, complaints about the region of the heart, and other symptoms very similar to those which indicate the approach of an intermittent fever. The heat is often accompanied with a little delirium, and almost always with drowsiness of a more or less evident kind. The swelling generally makes its appearance on the second night, or third day of the fever, attacking the forehead, the cheeks, the nose, or eyelids. This swelling is elastic and smooth; but it is not distinctly circumscribed, and it gradually spreads over such parts of the face as were not at first affected. The skin becomes of a bright red colour; occasionally having a tendency to a livid hue; in other instances having a mixture of yellow. These colours disappear when pressure is made on the part affected, but very soon reappear when such pressure is discontinued. The patient experiences a burning heat, and a disagreeable pricking in the part, rather than any acute pain; sometimes he complains of a very troublesome itching. The surface of the tumor is shining, and, as it were, semi-transparent: but without hardness, tension, or any sensation of throbbing. The eyelids are often so swollen that the patient cannot see, and the whole countenance is exceedingly disfigured. On more or less of the erysipelatous tumor vesications arise about the fourth, or fifth day; they are filled with a transparent serous fluid, and bear a great resemblance to those which are occasioned by boiling water. They commonly burst, or subside on the fifth, or sixth; the fluid, which is discharged, sometimes excoriating the neighbouring parts. Frequently, there is even a slight ulceration at their base, which ulceration, in the worst sort of cases, assumes a gangrenous appearance, and falls rapidly into a state of complete mortification. When the disease takes a more favourable course, the fever now begins to abate; the vesications dry up; and, at the end of eight or twelve days, the cuticle peels off, and the scabs, situated in places which were occupied by the vesications, fall off. The degree of danger depends materially on the delirium and other symptoms indicating an affection of the brain. When phlegmonous erysipelas attacks the face, the termination of the disorder in suppuration is very rare. (*Bateman, Vol. cit. p.* 127.)

According to several writers, the seat of erysipelas in the greater number of cases is the very surface of the cutis; its most vascular and nervous part. (*Dict. des Sciences, Med. T.* 13, *p.* 255.) Perhaps, it may be true, that the disorder commences here, and is most intense: yet, there can be no doubt, that the affection generally extends more deeply, and affects the subjacent cellular membrane, particularly in cases of phlegmonous erysipelas. The affection of the cellular membrane, however, is very different from what happens in phlegmonous inflammation. In true erysipelas, healthy pus is rarely found enclosed in a circumscribed cavity; and when there is any secretion of purulent matter, a feel is communicated, on compressing the part, almost like that which a sponge would give. In such cases, the cellular substance is frequently gangrenous.

It does not appear to me, that any very exact information has yet been established respecting the causes of erysipelas. We absolutely know nothing about the *immediate* cause; the prevailing ideas concerning the *predisposing* causes are vague; and only those causes, termed *exciting*, appear entitled to much confidence. They are:

1. Violent passions, such as anger, acute grief, &c.

2. Exposure to the heat of the sun, or that of the fire, too long continued.

3. The impression of cold damp air.

4. The action of various vegetable, mineral, and animal poisons.

5. Wounds, contusions, fractures, the stings of insects, &c.

In most cases, erysipelas would seem to be intimately dependent on the state of the constitution. Thus, persons in the habit of drunkenness, and other kinds of intemperance, and who, in a state of intoxication, meet with local injuries, often have erysipelatous inflammation in consequence of them. Other subjects, who lead more regular lives, experience, when they meet with similar injuries, healthy phlegmonous inflammation.

The opinion of Hippocrates and Galen, with respect to the origin of this disorder from a congestion of the bile, is universally known to all initiated in the profession of surgery. This old doctrine has been, in some measure, revived by Tissot, and other believers in the humoral pathology, who attribute the cause of erysipelas to an acrid humor, commonly a bilious one, diffused through the mass of the blood. But, while I cannot discern any evidence of the truth of this theory, observation obliges me to confess, that the complaint seems frequently to be connected with a wrong state of the chylopoietic viscera, and especially of the liver.

A further proof, that erysipelas is mostly dependent on constitutional causes, is, that the affection most frequently happens in autumn, or in any season, when hot weather is succeeded by cold and wet.

Erysipelas frequently attacks both sexes; but women are thought to be rather more subject to it than men, and the reason for this circumstance, generally mentioned, is the greater delicacy and tenderness of the skin in females. But, it would be quite as rational to suspect their weaker and more irritable constitutions, and their sedentary mode of life. In lying-in hospitals, and other charities for the reception of children, new-born infants are often afflicted with a species of erysipelas, which begins in the umbilical region, and thence extends to the pudenda. This case, which sometimes terminates in gangrene, and proves fatal, has been ascribed by some writers to injury done to the navel-string during labour, and by others to the bad air frequently allowed to accumulate in establishments of the above description; a cause, which too often renders complaints, which are at first trivial, ultimately fatal.

Sometimes, the complaint is scarcely cured in one place, when it makes its appearance in another, and when this tendency is evinced in a great degree, the case is termed *erysipelas ambulans, vel erraticum.* La Motte has published a striking instance of this form of the disease. A child, between nine and ten years of age, was attacked with erysipelas of the scalp, forehead, and ears, which afterwards extended to the neck and then to the shoulders, while the scalp and face became free from it: in proportion as the disease spread downwards, all the upper parts got well, so that, in the end, there was no portion of the surface of the body, which had escaped, even down to the fingers and toes, the parts last of all effected. (*Obs. Chir.*)

A very uncommon variety of disease is an *universal erysipelas.* No disorder is more subject, than the present, to relapses; but a remarkable thing, sometimes attending the return of the complaint, is its being sometimes strictly *periodical.* In chlorotic women, the erysipelatous attack is occasionally made every month just at the period when the menses should take place. (*Hoffman.*) This periodical nature of erysipelas has been observed in men: Larry knew two male patients, one of whom used to be attacked with erysipelas twice a year at the time of the equinox; the other had only one attack annually, which was wont to happen in the beginning of the spring. My friend, Mr. Maul of Southampton, lately informed me of an erysipelas, which was both periodical and universal, affecting a lady several times, at intervals of two years.

A doctrine has been started, that erysipelas is sometimes propagated by contagion. (*Wells, in Trans. for the Improvement of Med. and Surg. Knowledge, Vol. 2, Art.* 17, 1800. *A. Riberi, Sulla Cangrena Contagiosa, o Nosocomiale; con alcuni Cenni sopra una Resipela Contagiosa. 8vo. Torine*, 1821.) But, as Dr. Bateman has truly remarked, such cases are, at all events, extremely rare, and perhaps never happen in well-ventilated and cleanly houses. (*Synopsis, &c. p.* 131.) In places of an opposite description, the infection of many individuals together might be explained by the operation of the same exciting causes upon them all, without any supposition of contagion.

The characters which distinguish erysipelas from phlegmon are:

1. The inflammatory swelling, which takes place in the former, is not so elevated as in the latter, and is never plainly circumscribed.

2. In most cases, the surface of the skin seems as if it were burnt.

3. The redness, though of a bright description, disappears on pressure.

4. The sense of throbbing, and darting pain, attendant on phlegmon, is not observable.

5. The inflamed part is free from tension, and appears as if it were affected with œdema, or rather with emphysema; only one can perceive no crepitation.

It must not be inferred from these differences, that erysipelas is to be considered as a disease essentially distinct from those, which are called inflammatory, as it has some characters in which it manifestly approaches them. Like phlegmonous inflammations, it may be excited by any local irritation. Like other inflammations, it may end in suppuration, though of a less perfect sort, than that in which phlegmon ends, and rarely contained in a circumscribed cavity. The pulse, in phlegmonous erysipelas, is frequent, hard, sometimes full; and when the patients are bled, their blood has the same appearance, and is covered with the same kind of inflammatory crust, as blood taken away in other kinds of inflammation.

It is proper, however, to notice, that practitioners are not universally agreed with respect to the nature of the pulse in erysipelas: it is, according to some, particularly Mr. Pearson, soft, frequent, and often irregular. But, if due attention be paid, this difference will be found to depend on particular circumstances. In the *phlegmonous* erysipelas, the pulse will always be fuller, than in the *bilious*. In the impure air of hospitals, and in all places, where the air is impregnated with carbonic acid gas, and other noxious gases, we find, that various affections decidedly inflammatory, especially those which are attendant on wounds, affect the body, and the sanguiferous system in particular, in a very different manner from what is observed when the patients are living in a more salubrious air. All inflammations assume a character more or less unfavourable, in consequence of the influence of bad air. This is particularly manifest in cases of erysipelas. In such instances, living in an impure atmosphere has a singular effect in augmenting the sense of weakness and dejection, and may even go so far as to produce a total alteration of the state of the pulse. But, if attention be paid to the disease in a situation where the atmosphere is purer, it will be found to put on a very different shape. The symptoms of dejection, of nervous irritation, and of cerebral disturbance, are much less conspicuous, and the state of the pulse, especially in patients who have not been previously debilitated by other diseases, bears a great resemblance to that which takes place in an inflammation of the chest.

Besides bad air, there are other circumstances, which may have a share in producing an alteration of the symptoms. Thus, while inflammations of another kind, such as pleurisy and acute rheumatism, particularly affect robust persons, in whom the vital principle exists with a great deal of energy, erysipelas is prone to attack persons who are aged, or of delicate and depraved constitutions. The latter is also seen making its appearance as a symptom, in weakened parts, which have in a certain degree been deprived of their tone, as is the case with œdematous parts. It is not surprising, that, in these different cases, in which the tone of the system has already suffered, the state of the pulse, in persons affected with erysipelas, should seem different from what it is in individuals, who are more healthy and robust.

Treatment of Erysipelas.

The treatment of *idiopathic* erysipelas varies according to the causes, symptoms, complications, and anomalies of the disease, and may be divided into *internal* and *external*. That the mode of relief must be very different in *phlegmonous* erysipelas from what it is in other varieties of the disorder, must be plain to every body, who has the least knowledge of the nature of diseases in general.

Common cases of *acute*, or *phlegmonous* erysipelas, yield to mild purgatives, and a light vegetable diet, with which remedies practitioners usually conjoin diaphoretics and the saline mixture. Whether bleeding is right, or not in this species of erysipelas, is a point, on which different sentiments prevail. I believe, however, that venesection in the milder forms of the complaint is now pretty generally allowed to be unnecessary. Nor is it necessary to repeat bleeding in any case of erysipelas so frequently as is done in other inflammatory diseases. We ought to be guided, however, in this respect by the state of the pulse, and other symptoms, never forgetting the patient's age, strength, and other important considerations. Cæteris paribus, the patient will bear bleeding better in the country, and in an open, pure air, than in a large city, and, especially, in an hospital. And, as has been truly remarked, unless there be a considerable tendency to delirium, or coma, blood-letting can seldom be repeated with advantage, at least, in large towns. (*Pearson's Principles of Surgery; Bateman's Synopsis, p.* 132, *Ed.* 3.) Instead of this practice the latter author judiciously recommends local bleeding and blistering, but *not* *upon*, or *very near the diseased surface*, whereby he avoids producing the troublesome sores, the frequency of which in former times, after taking blood from erysipelatous parts, led Mr. B. Bell to pronounce a general condemnation of the method. Alexander of Tralles, and Paré had a high opinion of the beneficial effects of plenty of fresh, cool air in cases of erysipelas, and the truth of this sentiment is acknowledged by all the best physicians and surgeons of the present day.

Cullen, whose theories induced him to regard erysipelas as a species of putrid fever, combined with evacuants the use of bark, wine, and other antiseptics. But, as Dr. Bateman observes, the administration of cinchona and opium, in cases of *acute* or *phlegmonous* erysipelas, is certainly unnecessary, and appears to be of equivocal safety. However, the sulphate of quinine, a preparation of bark, is at present beginning to be much prescribed in cases of erysipelas, and has gained a good deal of reputation by its real or supposed efficacy.

In the *bilious* erysipelas, whatever degree of heat or fever might exist, Desault gave, in the first instance, a grain of tartarized antimony dissolved in a considerable quantity of fluid; and the symptoms generally diminished as soon as the effects of the medicine had ceased. He had seen them entirely subside, although the medicine produced no other sensible alteration, in the animal economy, than an increase of the insensible perspiration and urine: sometimes the symptoms resisted these evacuations, and he was obliged to have recourse once or twice, or even more frequently, to the use of the emetic drink. When the erysipelas was cured, and the bitterness in the mouth and fever had subsided, two or three purges of cassia and manna, with a grain of emetic-tartar, were exhibited: during the cure, the patient was ordered to drink freely of a diluting ptisan, acidulated with oxymel: and as soon as the symptoms were mitigated, the diet of the patient was allowed to be more nourishing and generous; for, when it was too spare, the case was remarked never to proceed so favourably, particularly in hospitals, where the air, generally speaking, is unhealthy. In the bilious erysipelas, Desault observed, that the cases of the patients, who had been bled previously to their admission into the hospital, were invariably the most serious and obstinate, particularly, when the bleeding had been frequently repeated.

In cases of bilious erysipelas, many modern practitioners would be bolder with antimonials, than Desault, first, by imitating Richter, and giving an emetic at the commencement of the attack, and then by exhibiting more freely either antimonial powder, or tartarized antimony, with a dose or two of calomel.

In *phlegmonous* erysipelas, Desault was an advocate for bleeding in the beginning of the disorder, and, this practice he followed up by the administration of tartarized antimony and evacuants.

In cases of *idiopathic* erysipelas, whether *phlegmonous* or *bilious*, external applications have been deemed useless, or hurtful, by a large proportion of practitioners, amongst whom is Desault. In the early stage of the disease, Dr. Bateman has found powdery substances, like flour, starch, chalk, &c. increase the heat and irritation, and afterwards when the fluid of the vesications oozes out, such substances produce additional irritation, by forming with the concreting fluid hard crusts upon the tender surface. This practice is also condemned by Mr. Pearson. The only plan, perhaps, which is unobjectionable, as a means of allaying the irritation produced by the discharge from the vesication, is that advised by Dr. Willan, and which consists in fomenting, or washing the parts from time to time with milk, bran and water, or a decoction of elder-flowers and poppy-heads. In the early stage of the inflammation, Dr. Bateman has found great relief derived from moderate tepid washing, or the application of the diluted liquor ammon. acet. (*Synopsis of Cutaneous Diseases, p.* 133, *Ed.* 3.)

Though Desault forbids local remedies in cases of *idiopathic* erysipelas, he does not extend the prohibition to examples, either of bilious or phlegmonous erysipelas, from a contusion, wound, or an ulcer; regimen and internal medicines, according to Desault, here being insufficient, unless topical applications are employed to abate the local irritation, and excite suppuration. With this view, he commends cataplasms, but he deems one caution essential, viz. that the application of the poultice should not extend much below the contused surface, or the edges of the wound. If any application be permitted on the rest of the erysipelatous surface, he thinks, that it should be the liquor plumbi acetatis dilutus made weak. (*Parisian Chirurg. Journ. Vol.* 2.)

Mr. Pearson prefers mild warm cataplasms, composed of the powders of aniseed, fennel, camomile flowers, &c. mixed with a fourth part, or an equal quantity, of bread, and a proper quantity of milk. Linseed powder, he says, may sometimes prove a convenient addition.

Little more need here be said, respecting the treatment of *secondary*, or *symptomatic* erysipelas. Generally less important, than the other disease, with which it is associated, its management is quite subordinate to that of the latter affection. Thus, when erysipelas makes its appearance round a wound, or ulcer, the practice only requires to be somewhat modified according to the circumstances, state, and nature of the injury, or sore.

As for what is termed *accidental* erysipelas, or that caused by casual local irritation, applied directly to the skin, as from acrid substances, heat, friction, the sting of insects, &c. the removal of the cause, the employment of cold, or even ice-cold lotions, and other antiphlogistic means, are the only measures essentially necessary.

Cases of universal erysipelas have been successfully treated by warm-bathing, aperient medicines, and small doses of the acetate of potassa. (*Dict. des Sciences Med. T.* 13, *p.* 266.)

In the *œdematous* erysipelas, perhaps, bleeding is never admissible. The loss of even a very small quantity of blood may have the most fatal consequences. One should also be exceedingly sparing of other evacuations. A determination to the skin should in particular be kept up by antimonials, and irritation and pain soothed by administering the æther sulphuricus, camphor, opium, &c. When the disorder seems to shift its situation to any internal part, and, particularly, to the brain, blisters should be applied between the shoulders, to the head or legs, without the least delay. And, it is in the œdematous erysipelas more especially, that the patient's strength should be supported by tonic remedies, wine, bark, the sulphate of quinine, and cordials.

In cases of *phlegmonous* erysipelas, if the inflammation continues in an unabated form beyond the seventh, or eighth day, suppuration is to be apprehended. Here Boyer recommends the employment of emollient applications, and immediately a fluctuation is distinguishable (or even what he terms " *un empâtement purulent*") he advises the surgeon to make such incisions as may be necessary for the discharge of the matter. He also states, that the incisions should be made at several depending points. (See *Boyer's Traité des Maladies Chirurgicales, T.* 2, *p.* 22.) It appears from the observations of Mr. A. C. Hutchison, formerly surgeon to the Naval Hospital at Deal, that seafaring men are very liable to phlegmonous erysipelas of the extremities, particularly, of the legs. The cause is ascribed to the irritation of the salt water, and the friction of their loose coarse trousers. In this description of patients, the disease frequently proceeds rapidly to the gangrenous state, and the consequence is the loss of many lives and limbs. Even when the danger of mortification is avoided, abscesses often occur, which spread between the muscles and under the integuments to a surprising extent: " from the ankle to the trochanter, and over the glutæi muscles." In the first few cases, which came under the care of Mr. Hutchison, this gentleman's plan of treatment, in addition to the usual medical means, consisted of *local bleeding by means of cupping glasses*, followed by fomentations. Subsequently, however, he has adopted *the method of making several free incisions with a scalpel on the inflamed surface*, in a longitudinal direction, *through the integuments*, and *down to the muscles, as early in the disease as possible*, and *before any secretions have taken place. These incisions may be about an inch and a half in length, two or three inches apart, and vary in number from six to eighteen*, according to the extent of surface, which the disease is found to occupy. Mr. Hutchison states, that these incisions will yield between fifteen and twenty ounces of blood, and give relief to the tense skin, at the same time that they form channels for the escape of fluid, and the prevention of bags of matter. After the operation, fomentations, or saturnine lotions, are employed.

By the preceding kind of treatment, Mr. Hutchison thinks the fatal termination of the disease may be rendered less frequent, and gangrenous mischief wholly prevented. He supports this assertion by observing, that he never lost a case in the Deal Hospital for the last five years, during which the practice was followed. (See *Med. Chir. Trans. Vol.* 5, *p.* 278, *&c.*)

On the proposal of this new treatment, I shall make very little comment, because I have seen but one instance of the practice, and in that case, which affected the arm, extensive sloughing was not prevented by it. What? are all the principles of surgery now so changed, and is the nature of the human body and constitution so altered, that inflamed parts are to be soothed by maiming and wounding them, or to use the author's words, by making " from six to eighteen incisions" in them? I would beg leave to ask, whether from six to eighteen deep cuts down to the muscles could ever be made in an uninflamed part, without producing inflammation? It is to be remarked, however, that formerly Mr. Hutchison, before his adoption of this plan, used to apply to the part affected cupping glasses, which every surgeon knows will often of themselves irritate so much by their pressure, independently of the scarifications, as to make the sound skin inflame, and sometimes slough. We must not wonder, therefore, that his early treatment of phlegmonous erysipelas did not answer. As we have mentioned above, on the authority of Boyer and other eminent surgeons, incisions may undoubtedly become necessary in erysipelas; but, not before there is matter to be discharged. When once its existence is ascertained, the employment of the knife cannot too speedily follow.

With regard to the treatment of the *gangrenous* erysipelas, nothing more need be said than what is contained in the article on mortification.

Consult *Desault's Parisian Chirurgical Journal, Vol.* 2. Also *Œuvres Chir. de Desault par Bichat, T.* 2, *p.* 581, *&c. Encyclopédie Méthodique, Partie Chir. art. Erysepéle. Cullen's First Lines of the Practice of Physic, Vol.* 1. *Pearson's Principles of Surgery. Some Parts of Hunter's Treatise on the Blood, Inflammation, &c. Richerand, Nosogr. Chir. T.* 1, *p.* 118, *&c. Edit.* 2. *Lassus, Pathologie Chir. T.* 1, *p.* 8, *&c. Edit.* 1809. *Traité des Maladies Chir. par M. le Baron Boyer, T.* 2, *p.* 6, *et seq. A. C. Hutchison in Med. Chir. Trans. Vol.* 5, *p.* 278, *&c. and Practical Obs. in Surgery,* 1816. *T. Bateman, A Practical Synopsis of Cutaneous Diseases, p.* 125, *&c. Ed.* 3. *Dict. des Sciences Med. Vol.* 13, *p.* 253, *&c.*

ERYTHEMA. (from ερυθρος, red.) A redness of any part. A mere rash or efflorescence, not accompanied by any swelling, vesication, or fever, circumstances which, according to Dr. Bateman, distinguish it from erysipelas. (*Synopsis of Cutaneous Diseases, p.* 119, *Ed.* 3.) Its six varieties are described in the latter work. For the erythema mercuriale, see *Mercury*. The term is often wrongly applied to eruptions, attended with redness, and distinct papular and vesicular elevation, as we see in the instance of mercurial erythema, which Dr. Bateman says should be named *eczema*.

ESCHAR. (from εσχαροω, to form a scab, or crust.) This term is applied to a dry crust, formed by a portion of the solids deprived of life. When any living part has been burnt by the actual, or potential, cautery, all that has been submitted to the action of this application, loses its sensibility and vital principle, becomes hard, rough on the surface, and of a black, or grey, colour, forming what is properly named an *eschar*, a slough, produced by caustics, or actual fire.

ESCHAROTICS. (from εσχαροω, to form a crust over.) Applications, which form an eschar, or deaden the surface on which they are put. By escharotics, however, surgeons commonly understand the milder kinds of caustics, such as the *hydrargyri nitrico-oxydum, subacetate of copper*, &c.

EXÆRESIS. (from *εξαιρεω*, to remove.) One of the divisions of surgery adopted by the old surgeons; the term implies the removal of parts.

EXCORIATION. (from *excorio*, to take off the skin.) A separation of the cuticle; a soreness, merely affecting the surface of the skin.

EXFOLIATION. (from *exfolio*, to cast the leaf.) The separation of a dead piece of bone from the living, is termed, *exfoliation*.

One part of a bone is never separated from another by the rotting of the dead part, for what comes away is as firm as it ever was. Exfoliation takes place with most expedition in bones, which have the fewest cells, and whose texture is the closest. Before any part of a bone can be thrown off by exfoliation, it must be dead. But, even then, till the process of exfoliation begins, the bone adheres as strongly as ever, and would remain for years, before it could be separated by putrefaction alone. The human bones are composed of two substances, viz. a true animal matter, and an earthy one, the phosphat of lime, which are only mixed with each other. A dead bone acts on the system, in the same manner, as any other extraneous body. It stimulates the adjacent living parts, in consequence of which, such a process is begun, as must terminate in its being thrown off. The effects of this stimulus are first, that the living adjacent bone becomes more vascular; a circumstance, which always takes place, when a part has more to do, than is just sufficient for the support of life. Secondly, that the earth of the living part, where it is in contact with the dead bone, is absorbed; and there the bone becomes softer, and adheres by its animal matter only. As Mr. Wilson has stated, "before any mark of separation is seen on the surface, the living bone surrounding the dead, for the extent of a mere line, has become as soft as if it had been steeped in acid." (*On the Skeleton and Diseases of the Bones, p.* 281, *8vo. London,* 1820.) Thirdly, that the living animal part is at last absorbed along the surface of contact: this part of the process commences, however, long before the last is finished; and both of them begin at the surface; though, in their course, they do not every where take place in an equal degree at the same time. Fourthly, in proportion to the waste, made by the last part of the process, granulations arise from the living surface, and fill up the intermediate space, so that there is no vacuum. These different stages together constitute ulceration. When any part of a bone is once loose, it is pushed to the surface in the same manner, as most other inanimate bodies would be, and this stage is partly mechanical, and partly a continuation of ulceration. A proof of the third stage, above mentioned, may be derived from cases, in which people die, while exfoliation is going on. A small groove, or worm eaten canal, can then be discovered, which becomes gradually deeper, and follows the irregularities of the living and dead surfaces. After the application of the trepan, a circular piece of bone is frequently thrown off, which is always less than the space from which it came. This, as Mr. Hunter observed, would never be the case, were there not a loss of substance.

"Although (says Mr. Wilson) in general the absorption takes place in the living bone, it still appears, that, under peculiar circumstances, the absorbing vessels have the power of acting on and removing the substance of dead bone. This happens after the dead part has been separated from the living, and when from its shape, and the form of the living surrounding bone, it is prevented from obtaining a passage to the surface of the body; as in exfoliations of the cranium, when the inner table of the exfoliated part is broader and wider, than the outer table." (*On the Skeleton, &c. p.* 282.) In very hard bones, the colour of the dead, exfoliating portion is generally white; but, in softer bones, it is yellow, dark, and sometimes black. (*Wilson, op. cit.*)

It was anciently believed, that whenever a bone was denuded, the exposed surface must necessarily exfoliate, and, this being taken for granted, the old surgeons used to put immediately in practice whatever they thought best calculated to bring on an exfoliation as quickly as possible. For this purpose, the actual cautery was usually applied to the part of the bone, which was uncovered, and, as under such treatment, a portion of the bone was of course killed, and then exfoliated, the prejudiced practitioner believed, that he had only accelerated a process, which must of necessity have followed in a more slow and tedious manner.

According to Mr. Hunter, neither caustics, nor the actual cautery, hasten exfoliation; they only produce death in a part of the bone, which is the first step towards exfoliation, and if they ever hasten exfoliation, when the bone is already dead, it must be by producing inflammation in the adjacent living bone; a change that makes it exert a power, of which it was previously incapable.

Exfoliation is not a necessary consequence of a bone being laid bare, and deprived of its periosteum. If the bone be in other respects uninjured, healthy, and enjoy a vigorous circulation of blood through its texture, granulations will be generated on the surface of such bone, and they will cover and firmly adhere to it, without the smallest exfoliation being thrown off; especially, in young subjects. But, if caustic, stimulating, or drying applications be made use of, or the bone be left for a considerable time exposed, the circulation in the superficial portion of it will necessarily be disturbed and destroyed, and that part of the surface, through which the circulation ceases to be carried on, will be separated, and cast off, by the process of exfoliation.

If any application to an exfoliating portion of bone be at all efficacious, it must be one, which will stop the mortification in the affected bone, and promote the absorption of those particles of phosphate of lime, which form the connexion between that which is living and that which is actually dead. And as the bone dies from the same causes, as the soft parts mortify, we should at least follow in practice the same principles which we adopt in the latter instance; and though, from the inferior vascularity, and vital power of bones, we cannot expect surgery to have as much control over their affections, as over those of the soft parts, yet, every good will thus be obtained, which it is possible to acquire. Attention to such principles will at least teach us to refrain from making the death of part of a bone more extensive, than it would be, if the cautery, caustics, and strong astringents, were not employed.

The best mode of attempting to prevent an exfoliation from occurring at all in a bone, that has been exposed by a wound, is, to cover the part again, as soon as possible, with the flesh, which has been detached from it. This, as I shall hereafter notice, (*see Head, Injuries of*,) may generally be practised with advantage, when the scalp has been detached from the cranium, provided the flap have still even the most limited connexion with the rest of the integuments.

When the exposed bone cannot be covered, it should be dressed with the mildest and simplest applications, with plain lint, or lint spread with the unguentum cetaceum.

The dead pieces of bone, when very tedious in exfoliating, when wedged in the substance of the surrounding living bone, and when so situated as to admit of being safely sawn, or cut away, may sometimes be advantageously removed in this manner. (See *Caries and Necrosis*.) In such operations, Mr. Hey's saws may be employed with great convenience; and where these are not applicable, that invented by Mr. Machell, and described in Sir A. Cooper's Surgical Essays, or another devised by Graefe, and explained by Schwalb (*De Serra Orbiculari*, *4to. Berol.* 1819), deserve to be recollected.

In speaking of necrosis, I shall have occasion to notice the efficacy of blisters, kept open with the savin cerate, in quickening the process by which dead portions of bone are loosened, as particularly pointed out by the late Mr. Crowther, in his work on the white swelling.

Tenon published three Memoirs on the Exfoliation of Bones. The two first are inserted at pages 372, *and* 403, *Mem. de l'Acad. des Sciences*, 1758; *the third at p.* 223 *of the same Work, for* 1760. *P. Poissonier, An recenti vulnere nudatis ossibus exfoliatis? conclusio negans, 4to. Parisii,* 1760. *Journ. de Méd. par M. Roux, T.* 31, *p.* 801, *T.* 32, *p.* 181, *T.* 33, *p.* 168, *T.* 36, *p.* 537, *T.* 38, *p.* 153, *T.* 39, *p.* 432. *Theden, Neue Bermerkungen, &c. kap.* 3, *8vo. Berlin,* 1782. *Trans. for the Improvement of Med. and Chir. Knowledge, Vol.* 2, *p.* 277, *&c. Wiedman in his excellent book, entitled "De Necrosi Ossium," has given an account of the various opinions of several distinguished writers, concerning the way, in which a dead portion of bone is separated from the living part; and he has refuted many erroneous doctrines set up by Hippocrates, Van Swieten, B. Bell, &c. See p.* 23, *et seq. op. cit. Dict. des Sciences Méd. art. Exfoliation. J. Thompson's Lectures on Inflammation, p.* 394, 398. *P. Boulay, sur l'Exfoliation des Os,* 4*to. Paris,* 1814. *J. Wilson, on the Structure and Physiology of the Skeleton, and on the Diseases of the Bones, &c. p.* 230, *&c. 8vo. Lond.* 1820. *Liston's Essay on Caries, &c. in Edinb. Med. Surg. Journ. No.* 78.

EXOMPHALOS. (from ἐξ, out of, and ὀμφαλος, the navel.) A hernia at or near the navel.

EXOPHTHALMIA. (from ἐξ, out, and οφθαλμος, the eye.)

In the case, to which the most judicious surgical writers apply the terms, *exophthalmia ophthalmoptosis, ptosis bulbi oculi,* the eye-ball is of its natural size, and free from disease: it merely changes its situation, and partly or completely protrudes from the orbit. It is only confusing the subject to consider, as specimens of this disease, the cases, in which the globe of the eye is affected with enlargement, and on that account projects from the orbit in a preternatural degree, as happens in hydrophthalmia, staphyloma, and cancerous diseases of the eye. When the globe of the eye is pushed entirely out of the orbit, it generally lies upon the temple, or cheek, and vision is totally destroyed. There are instances, however, in which a considerable degree of sight was recovered, notwithstanding the exophthalmia was complete, and had lasted several years. (*Hope in Phil. Trans. for* 1744. *Richter's Bibl.* 4 *Band. p.* 343.)

There are three descriptions of causes, which may occasion exophthalmia.

1. The first and least common is a violent concussion of the head. A man fell from a height of about fifteen or sixteen feet, and pitched upon his head. The right eye was forced out of its socket, and hung over the cheek. The patient was deprived of his senses immediately after the accident, and affected with coma. There was a contusion over the right parietal bone; but no fracture. The eye spontaneously resumed its natural position, a short time after the accident, and, in the course of a month, with the assistance of low diet, and repeated bleeding, the cure was completed. (*Mém. de l'Acad. de Chirurgie, T.* 1, *p.* 198, *4to.*) It is alleged, that the eye has been forced out of the orbit in a violent fit of sneezing. But, such cases, says Richter, are very uncommon, and always imply a considerable relaxation of those parts, which serve to retain the eye in its socket, or some other predisposing causes, to which attention should be paid in the treatment. (*Richter, Anfangsgr. der Wundarz. B.* 3, *p.* 407, *Ed.* 1795.)

2. A far more frequent cause of exophthalmia is a thrust in the eye with an instrument, which is narrow enough to pass between the orbit and the eye-ball, so as to push the latter out of its place.

A stick, a tobacco pipe, (*White's Cases in Surgery, p.* 131.) a foil, &c. may cause the accident. Repeated experience proves, says Richter, that, in such cases, though the optic nerve and muscles of the eye may be forcibly stretched; the interior parts of the organ seriously injured; and the dislocated eye generally deprived of the faculty of seeing, yet, when the organ is replaced as speedily as possible, it not only sometimes recovers its natural motion, but also its original power of vision. (See *Scultet. Appendix, Obs.* 69. *Covillard, Obs.* 27. *Borellus, Centur.* 3, *Obs.* 54. *Rhodius, Centur.* 1, *Obs.* 84. *White's Cases, p.* 131.) But, before we reduce the eye, Richter advises us always to examine the instrument, which was pushed into the orbit; as, when it is brittle, a fragment of it may remain behind in the socket, and require to be extracted by means of the finger or a probe. When the weapon is pointed and hard, it sometimes pierces the bones of the orbit, and enters the brain, nose, or antrum. In the first case, which is often difficult to ascertain immediately, though after a time it is generally rendered plain enough by the symptoms induced, the consequences are mostly fatal. In the two other cases, although the danger is not pressing, yet the surgeon should be very attentive, in the event of suppuration, to procure and maintain a ready outlet for the matter.

There is generally little difficulty in replacing the eye. Frequently it returns of itself into its natural situation again, as soon as any trivial obstacles to its reduction are removed; and in other instances, it easily admits of being put into its proper place with the hand. The indication, says Richter, is always accomplished with more facility, the sooner it is attempted. When the protrusion has existed several days, and the eye and other parts in the orbit are already inflamed, Richter recommends us to endeavour to diminish the inflammation by general antiphlogistic means, and external emollient applications, before we try to replace the eye, and the reduction of this organ is afterwards to be effected in a gradual manner. When the optic nerve, and one or more of the muscles of the eye are torn, no hope can be entertained, that the eyesight and motion of the organ will ever be regained. But, this degree of injury, as Richter observes, cannot always be immediately detected, because the optic nerve and muscles are concealed by the conjunctiva; and, if the nature of the case were known, still it would be advisable to replace the eye-ball, and endeavour to prevent the disfigurement, which its loss would unavoidably produce. But, says Richter, it is necessary, especially if the parts behind the eye-ball have suffered severely, to use such means, as will ensure a ready escape for the matter, which may possibly form. Though Richter offers the opinion, it is difficult to conceive how the violence of the injury of the conjunctiva, muscles, and nerve, can ever render it most prudent not to reduce the part, until after suppuration has taken place. Richter thinks, that a surgeon may the more readily make up his mind to this conduct, as many cases have proved, that the eyeball, even after being dislocated from the orbit a long while, has been easily replaced. In other instances, the parts which connect the eye with the orbit, may be so torn and injured, that it will be most advisable to extirpate the organ.

Richter maintains, however, that this should never be done, when there is the least chance of saving the eye. If the bones in the orbit be fractured, the reduction must not be made until the indications, which this complication presents, have been fulfilled.

When, says Richter, the instrument, with which the eye has been pushed out of its socket, is blunt and thick, like a finger, a stick, a foil, &c. the eyeball itself always sustains a violent contusion, which brings on vehement inflammation, and lessens or destroys all hope, that, after the reduction, the eyesight will be restored. Sometimes, in these cases, an extravasation of blood in the orbit occurs, the iris is lacerated, the cornea burst, and a part of the humors of the eye discharged. Although, under such circumstances, it is scarcely to be expected, that the eyesight can be recovered, yet, it is proper to reduce the eye, because should the organ be destroyed by suppuration, or the loss of its humors, the deformity may be obviated by an artificial eye, which is not the case, when the eye has been cut away. It is also to be considered, that the mischief often seems to be worse, than it really is, and the eyesight is sometimes regained contrary to all expectation.

After the reduction of the eye, the first care of the surgeon should be to prevent and diminish inflammation. In some cases, the inflammation is slight; while, in others, especially, when the eyeball has been severely struck, it is extremely violent. All the usual antiphlogistic means, both general and topical, are to be employed, and, of the latter, Richter says, astringents are the best, as the inflammation arises from the contusion and stretching, which the parts have suffered. The possible consequences of inflammation, such as suppuration, opacity of the cornea, &c. are to be treated according to the rules laid down in other parts of this dictionary. (See particularly *Cornea, Opacity of; Hypopium; Ophthalmy.*) In general, the sight is restored in proportion as the inflammation is diminished. Should this not happen, after the ophthalmy has been entirely removed, the surgeon must try what effect such remedies, as stimulate the nerves, will have upon the optic nerve. An account of the most eligible medicines, for this purpose, will be found in the article *Amaurosis.*

3. The third cause of exophthalmia is a preternatural tumor in the orbit, or neighbouring parts. The swelling, as it enlarges, gradually pushes the eyeball out of its socket. The tumors, which may be formed in the orbit, are of several kinds. The principal, however, are encysted swellings, which contain either fat, an aqueous fluid, a pappy substance, or a thick matter. Sometimes, the cellular substance in the orbit is affected with induration and swelling, so as to force the eye partly or completely out of this cavity.

According to Mr. Travers, adipose swellings occupy the interspace of the recti muscles, emerge between the globe and the orbitar circumference, and have an oblong figure. When the conjunctiva is freely divided, the fatty mass is easily drawn forwards with a hook, and dissected out. (*Synopsis of Diseases of the Eye, p.* 225.)

An abscess in the orbit may cause a protrusion of the eyeball. (*Pellier.*) Exostoses in the orbit may have the same effect. Sir Astley Cooper has related one case, which proved fatal, in consequence of the exostosis making its way to the brain through the orbitar process of the os frontis. (*Surgical Essays, Part* 1, *p.* 157.) Mr. Guthrie has seen two instances: in one, the disease attained the size of a large marble, and then became stationary; in the other, it was much larger, and a portion of it had been ineffectually removed by means of a hot iron, which increased the inconvenience, without giving any relief. Hence, if an operation were deemed advisable, Mr. Guthrie would prefer the cautious use of a small chisel or saw. (*Operative Surgery of the Eye*, *p.* 154.) This author is at the same time aware of the case, in which M. Brassant brought about the exfoliation of a considerable part of an extososis of the os planum and internal angular process with caustic, so that the eye returned into its place, and the cure was completed. (*Mém. de l'Acad. de Chir. T.* 5. *p.* 171, 4*to.*) In the records of surgery may be found many examples, in which the displacement of the eye was produced by a tumor, that grew out of the frontal sinus. (See *Langenbeck's Neue Bibl. B.* 2, *p.* 247.) In some cases, in consequence of suppuration in the antrum, the lower part of the orbit is raised, and the eye forced out of its place. Fungous diseases of the antrum are very liable to occasion the same mischief. (See *Parisian Chirurgical Journal*, *Vol.* 1, *p.* 104, *&c.*)

Schmidt records two cases of exophthalmia, produced by an hydatid of the lachrymal gland. One had a fatal termination; but, in the other, a puncture gave vent to an ounce of clear fluid, and cured the protrusion of the eye; but, the eyesight was lost. (*Ueber die Krankheiten des Thränenorgans*, *p.* 54. Farther particulars of the latter case may be seen in Mr. Guthrie's work, *p.* 157.)

Not long ago, Langenbeck extracted from the sinus frontalis of a girl, a large hydatid, which had forced the outer table considerably forwards, and depressed the orbitar process of the os frontis so far, that the eyeball was propelled as low as the extremity of the nose. After the front of the sinus had been perforated, and the hydatid removed, there was a cavity left two inches and a half in depth. (*Neue Bibl. B.* 2, *p.* 247, *Hanover*, 1819.) My friend Mr. Lawrence some time ago mentioned to me a remarkable case, which presented itself at the London Eye Infirmary: it was an exophthalmia, which arose from a collection of hydatids in the orbit, and was cured by making an incision, and afterwards promoting their discharge. In all these examples, the eyeball is displaced from the orbit gradually, and vision is at length impeded. Instances, however, are on record, where the sight was never lost, though the eye was protruded for years. (See *Richter's Chirurg. Bibliothek.* 4 *Band.* 2 *Stück*, *p.* 243. *White's Cases in Surgery*, *p.* 135.) In an instance lately reported, the sight was not at all lessened, and the iris retained its natural mobility. (*Langenbeck*, *Neue Bibl. B.* 2, *p.* 245.)

Experience proves, also, that after the reduction, the motion of the eye, and power of seeing may be regained, in cases, where the eye has been gradually pushed out of the orbit, and been displaced a considerable time, even as long as several years, during all which period vision was lost. (*Acrell*; *Brocklesby in Med. Obs. and Enquiries*, *Vol.* 4, *p.* 371.) Langenbeck relates a very curious case of exophthalmia from a steatoma in the orbit, where, though vision was entirely prevented during the displacement, the pupil was of its regular shape, and the iris capable of motion: after the extirpation of the tumor, the eyesight became so good, that the patient could discern the smallest objects. (*Neue Bibl. B.* 2, *p.* 249.) In order to reduce the eye into its natural position, it is necessary to remove the cause, by which its protrusion is occasioned. Suppuration and fungous tumors in the antrum must be treated according to directions laid down in the article *Antrum.* After the cure of such diseases, the antrum is often reduced to its natural dimensions, and in this circumstance, the orbit may become so wide, that the eyeball will return into it again. Should this not happen, the extirpation of the organ will be proper. The induration and swelling of the cellular substance in the orbit may be sometimes dispersed by means of mercury. (*Louis, sur Plusieurs Maladies du Globe de l'Œil, in Mém. de l'Acad. Royale de Chirurgie*, *T.* 13, *Ed.* 12*mo.*) When such treatment fails, we are recommended to extirpate the eye. (*Richter*, *Anfangsgr. der Wundarzn. B.* 3, *p.* 413.) Exostoses, situated in the anterior part of the orbit, may sometimes be removed. The continental surgeons generally advise us to expose the tumor by an incision, and to apply caustic, or the actual cautery to it, in order to kill the protuberant part of the bone, and make it exfoliate. In this country, most practitioners would prefer the employment of cutting instruments for removing such exostoses. When however, the tumor lies deeply in the orbit, if it cannot be got at, and it should resist the effect of mercurial medicines and mezereon, we are directed to extirpate the eye. (*Richter op. et loco cit.*) Abscesses in the orbit ought to be opened, and after this has been done, the eye generally returns into its proper position. (*Pellier.*) When encysted tumors in the orbit admit of being extirpated in the customary manner, the plan should be adopted; but, when this cannot be done, Richter's advice may be followed, which is to open them, press out the contained matter, and afterwards extract the cyst. Considerable difficulty, however, frequently attends every effort to remove the whole cyst, and, unless this be done, a permanent cicatrization cannot be expected. (See *Travers's Synopsis*, *p.* 225. See *Tumors Encysted.*)

On account of the vicinity of the brain, and the communication between the parts within the orbit, and the dura mater, the extirpation of tumors from that cavity is not exempt from risk of fatal consequences, as two cases, recently published by Langenbeck, fully prove. (*Neue Bibl. B.* 2, *p.* 241—244.) A young lady was referred to Mr. Lawrence and myself this spring, (1821.) by Mr. Maul of Southampton, for advice, respecting a tumor occupying the inner and upper portion of the orbit, and attended with a degree of exophthalmia, constant exacerbation at the period of the menses, and occasionally double vision. (See *Diplopia.*) We refrained from advising any immediate attempt at extirpation, the swelling being so firm and immoveable, that the disease was suspected to be partly of a bony nature. However, on seeing this case about a fortnight afterwards, I was surprised to find the tumor not more than half its former size, and all the firm and (what was conceived to be) bony induration below the superciliary ridge of the os frontis gone, as well as the exophthalmia, and derangement of vision. Some sharp bony irregularities, however, could now be most plainly felt, projecting in front of the diminished swelling.

In a late publication, a memorable case of exophthalmia is related by Mr. Travers: the globe of the eye appears to have been gradually forced upwards and outwards, and to have had its motions considerably impeded, in consequence of the orbit being partly occupied by two swellings, which were of the nature of the aneurism by anastomosis.—(See *Aneurism.*) The swellings could not have been removed, without at the same time extirpating the eye. Mr. Travers was therefore induced to try, whether applying a ligature to the carotid artery would have the effect of checking and curing the disease; an expectation, which was warranted by analogous instances, in which the growth of swellings, and their dispersion, are brought about by lessening the quantity of blood determined to them. The experiment completely succeeded; the swellings in the vicinity of the eye subsided; the patient was freed from several grievous complaints, to which she had been previously subject; and, amongst other benefits, a cure of the exophthalmia was one result, which most interests us in the present place. The case is also highly important on other accounts, and, more particularly, as confirming the fact, that the carotid artery may be tied, without any dangerous effects on the brain, and, as proving, that, in cases of aneurism, the surgeon should not be afraid of proceeding to such an operation. (See *Med. Chir. Trans. Vol.* 2. *Art.* 1.) The judgment and decision, with which Mr. Travers acted in this case, appear to me highly meritorious.

The carotid artery was also tied by Mr. Dalrymple, surgeon at Norwich, in a case very similar to the preceding, and with equal success. (See *Med. Chir. Trans. Vol.* 6, *p.* 111, *&c.*)

Mr. Guthrie has seen an exophthalmia on each side, the result of an aneurism of each ophthalmic artery, and other disease in the orbits. (*Operative Surgery of the Eye*, *p.* 158.)

When the causes of exophthalmia have been removed, the eye must be put into its natural situation. If the organ has been long displaced, the surgeon often finds the fulfilment of this indication attended with difficulty. Indeed, he is frequently obliged to employ methodical bandages for the purpose of promoting the gradual return of the eye into the orbit. Yet, even in such cases, the eyesight is often regained: but, if this should not happen spontaneously, stimulants and tonics are to be tried. (See *Amaurosis.*)

Fab Hildan centur. 6, *obs.* 1. *Vander Wiel, centur.* 2, *obs.* 9. *Paw. obs. anat.* 23. *Tulpius, lib.* 1, *cap.* 28. *Hope, in Phil. Trans. for* 1744. *Louis sur plusieurs Maladies du Globe de l'Œil, &c. in Mém de l'Acad de Chirurgie, T.* 13, *in* 12*mo. Brocklesby, in Medical Obs. and Enquiries, Vol.* 4, *p.* 371. *White's Cases in Surgery, p.* 131—135, *&c. Warner's Cases in Surgery, p.* 108, *Edit.* 3. *Lassus, Pathologie Chir. T.* 2, *p.* 144, *Edit.* 2. *Richerand, Nosogr. Chir. T.* 2, *p.* 117, *Edit.* 2. *Med. Chir. Trans. Vol.* 2, *art.* 1, *Vol.* 4, *p,* 316, *and Vol.* 6, *p.* 111, *&c. Richter's Anfangsgr. der Wundarzn. B.* 3, *p.* 406, *&c. Gött.* 1795. *Langenbeck, Neue Bibl. B.* 2. *B. Travers, Synopsis of the Diseases of the Eye, p.* 225, *&c. Lond.* 1820. *Dr. Monteath in Weller's Manual, Vol.* 1, *p.* 195. *Petitbeau, in Journ. de Méd. par Corvisart, T.* 14. *G. J. Guthrie, Operative Surgery of the Eye, p.* 145, *&c.* 8*vo. Lond.* 1823.

EXOSTOSIS. (from εξ, out, and οϛεον, a bone.) An exostosis is a tumor formed by an exuberant growth of bony matter on the surface of a bone, or, as Boyer says, it is formed by the more or less considerable enlargement of a part, or the whole, of a bone. (*Traité des Mal. Chir. T.* 3, *p.* 541.)

If bones resemble the soft parts of the body in their structure, they must resemble them in their diseases, and of course be liable to various kinds of tumors. Nay, an extraordinary increase of the size and density of all the bones of an individual has been observed, which affection ought probably also to be classed with the disease, to which surgeons usually apply the term exostosis.

The generality of writers, even the most modern, have admitted many diseases among exostoses, which ought to be considered in a very distinct light; I need only instance the spina ventosa.

One division of exostoses is into *true* and *false*; the former being of a truly osseous consistence, the others being more or less hollow, spongy expansions of the bones, sometimes containing a quantity of fleshy, fungous matter within the shell of the disease. Periostoses, or mere thickenings of the periosteum, are also classed amongst the *false* exostoses. (*Dict. des Sciences Med. T.* 14, *p.* 218.) According to Sir Astley Cooper, exostoses have two different seats: by *periosteal* exostosis, he means an osseous deposition seated between the external surface of the bone, and the internal surface of the periosteum, and firmly adherent to both; by *medullary* exostosis, he signifies a similar formation originating in the medullary membrane, and cancellated structure of a bone. The same experienced surgeon makes two other general divisions of exostoses into the *cartilaginous* and *fungous*, the first being "preceded by the formation of cartilage, which forms the nidus for the ossific deposit," while the second is a tumor softer than cartilage, yet firmer than fungus, in other parts of the body, containing spicula of bone, being of a malignant nature, and depending "upon a peculiar state of constitution and action of vessels." It is a disease similar to "fungus hæmatodes, but somewhat modified by the structure of the part in which it originates." (*Surgical Essays, Part* 1, *p.* 155.) This last form of exostosis is probably the disease treated of in another part of this dictionary, under the title of *Osteosarcoma.*

Exostoses differ very much in respect to size. Those of the cranium are generally small and circumscribed. Exceptions occur, however, for we learn, that Sir Everard Home removed a very large tumor, which had a bony base, and was situated on the head. (*A. Cooper, Surgical Essays, Part* 1, *p.* 156.) The largest *true* exostoses met with are such as are formed upon the long bones. In the history of surgery may be found numerous cases of enormous exostoses; but it is worthy of notice, that these were nearly all of them of the species termed *false*, and many of them were situated in the jaw, the clavicle, or the extremities of the long bones. Observations of this kind are abundant in l'Histoire de l'Acad. des Sciences; les Mém. de l'Acad. de Chir.; the Sepulchretum Anatomicum; the writings of

Morgagni, &c. (*Dict. des Sciences Med. T.* 14, *p.* 219.)

The bones, most frequently affected with exostosis, are those of the cranium, the lower jaw, sternum, humerus, radius, ulna, bones of the carpus, and particularly the femur, and tibia. There is, however, no bone of the body, which may not become the seat of this disease. It is not uncommon to find all the bones of the cranium affected with exostosis, and the ossa parietalia sometimes an inch thick.

According to Sir Astley Cooper, the exostosis, which forms between the outer table of the skull and the pericranium, is of an extremely hard consistence, and generally attended with little pain, while the *fungous* exostosis, springing from the diploe of the skull, is less firm, and more vascular. It is described as being of a malignant nature, making its way through the inner table, and occasioning disease of the dura mater, and fatal effects on the brain. (*Surgical Essays, Part* 1, *p.* 156.)

Sometimes, as Boyer remarks, the tumor is confined to a small part of the affected bone, composing a mass superadded to its surface, and of various shapes. Sometimes it rises insensibly, having no very distinct limits, and resembling a more or less regular portion of a sphere. In some instances, its figure is styloid, and it projects in a greater or less degree. On other occasions, its base is rendered distinct by a pedicle, or contraction, which varies in breadth and length in different cases. In particular instances, the exostosis, though limited to the surface of a bone, occupies the whole extent of it. Thus, the whole external surface of one of the bones of the skull has been found occupied by an exostosis, while the cerebral surface of the same bone was in the natural state. The whole circumference of the femur sometimes acquires an enormous size, at the same time that the medullary surface of the same bone continues entirely unchanged. These are the *periosteal* exostoses of Sir Astley Cooper. In other examples, on the contrary, the two surfaces and the whole thickness of the bone are deformed by an augmentation of bulk; and when this happens in a cylindrical bone, the medullary cavity is more or less reduced, or even totally obliterated. There are a few extremely uncommon cases, in which the substance of a bone acquires great solidity, and a hardness compared to that of ivory, without any material increase of bulk. An exostosis rarely occupies the whole extent and thickness of a bone; but when this happens in a cylindrical bone, the articular surfaces generally remain in their natural state.

The structure and consistence of exostoses present great differences. Sometimes, especially when the tumor is not very large, and it is situated on the surface of a cylindrical bone, one may trace with the eye the diverging of the osseous fibres, in the interspace of which we might say, that there is deposited a new bony substance, the organization of which is less distinct. Sometimes the tumor is entirely cellular, and formed of a few broad laminæ, intercepting extensive spaces, which are filled with matter different from the medulla, and of various quality. This case is denominated the *laminated exostosis.* Sometimes the enlarged portion of bone makes a sort of hollow sphere, with thick hard walls, and the cavity of which is filled with fungous granulations more or less extensive and indolent. According to Boyer, this variety of the disease differs essentially from osteosarcoma, notwithstanding external appearances. The case here alluded to, I conclude to be the same as that which Sir Astley Cooper has named the *cartilaginous exostosis of the medullary membrane.* "In this case, the shell of the bone becomes extremely expanded, or rather the original shell is absorbed, and a new one deposited; and within this ossified cavity, thus produced, a very large mass of cartilage is formed, elastic, firm, and fibrous." It is not malignant, but often ends in a very extensive disease. (*Surgical Essays, Part* 1, *p.* 173.)

In other instances, the tumor is perfectly solid, exceeding in consistence that of the hardest bones, and equalling that of ivory. Here, the surface is sometimes smooth, and like that of the bone in its natural state; sometimes irregular, full of little projections, and in some degree stalactitical. It is very uncommon to find a large portion of an exostosis converted into a pultaceous substance; but it is not at all unfrequent to see this substance composing part of the tumor. Lastly, it very often happens, that the same exostosis presents an assemblage of the ivory substance, and of the cellular laminated substance, the cavities of which are partly filled with a pultaceous matter, and partly with a sort of gelatinous substance.

When an exostosis is not very large, it hardly affects the surrounding soft parts; but when it has made considerable progress, the muscles become stretched and emaciated, the cellular substance is thickened, and, its layers being adherent together, a kind of confusion is produced amongst all the adjacent parts. Exostoses not of considerable size may, however, seriously interrupt the functions of certain organs. The action of the flexor muscles of the leg has been known to be obstructed by an exostosis in the vicinity of the knee. A similar tumor arising near the symphysis pubis need not be very large to impede considerably the functions of the urethra, as experience has proved. An exostosis in the orbit has been known to displace the eye and destroy vision. Lastly, exostoses, when situated near certain important organs, and of large size, may affect with different degrees of gravity, the functions of these parts, as the brain, the lungs, &c. (See *Boyer, Traité des Mal. Chir. T.* 3, *p.* 541—544.)

Sir Astley Cooper has related a case, in which the eyes were pushed out of their sockets by two exostoses, which grew from the antra, and one of which destroyed the patient by making its way to the brain through the orbitar process of the os frontis. (*Surgical Essays, Part* 1, *p.* 157.) In one instance, reported by the same author, an exostosis from the sixth or seventh cervical vertebra abolished the pulse at the wrist, by pressing upon the subclavian artery. (*P.* 159.) In another, a *cartilaginous* exostosis of the medullary membrane of the lower jaw extended so far back that it pressed the epiglottis down upon the rima glottidis, and caused such difficulty of respiration, and so much irritation, that the patient was destroyed. (*P.* 175.)

Venereal exostoses, or nodes, are observed to arise chiefly on compact bones, and such of these as are superficially covered with soft parts, as for instance, the bones of the cranium, and the front surface of the tibia.

The causes of exostosis do not seem to be at all understood. Most writers impute the disease to internal causes, such as scrofula and lues venerea. That the latter affection is the cause of nodes, which are certainly a species of exostosis, no one will deny; but, that scrofula is ever concerned in producing any of the other kinds of exostosis must not be admitted, at least, before some evidence is adduced in support of the doctrine. Boyer, however, and all the surgeons of the continent adopt the opinion, that scrofula is sometimes a cause of the disease.

Hydatids are occasionally found within exostoses, in which circumstance the former are supposed to be the cause of the enlargement of the bone. A remarkable specimen of such a disease in the tibia is mentioned by Sir Astley Cooper. (*Surgical Essays, Part* 1, *p.* 163.) He refers also to a humerus, in the museum of St. Thomas's Hospital, where the shell of the bone is considerably expanded, the periosteum over it thickened, and in the seat of the cancellated structure, several hydatids, supposed to have been the cause of the enlargement of the exterior surface of the bone, as well as of the increase of its cavity. (*Vol. cit. p.* 161.) A most interesting case of a bony tumor on the forehead, containing hydatids, has likewise been published by Mr. R. Keate. (*Med. Chir. Trans. Vol.* 10, *p.* 278.)

The ease, with which bony tumors form in some persons, is a curious and remarkable fact, and renders it probable, that constitutional causes here have great influence. Thus, such a blow, as in the generality of persons, would hardly excite notice, will, in others, bring on swellings of the bone, which is struck. Sir Astley Cooper adverts to a young friend of his, in whom an exostosis, which was undoubtedly caused by a blow, is growing on the metacarpal bone of the little finger. (*loc. cit.*) Mr. Abernethy mentions, in his lectures, his having seen a boy, from Cornwall, who was so excessively afflicted with an apparent predisposition to exostoses, or an exuberant deposition of bony matter, that a very trifling blow would occasion a bony swelling on any bone of his body. His ligamentum nuchæ was ossified, and prevented the motion of his neck; the margins of his axillæ were also ossified, so that he was, as it were, completely pinioned. Besides all this, the subject in question had numerous other exostoses on various parts of his body. Mr. Abernethy gave, in this case, muriatic and acetic acids, with a view of dissolving the lime, which this gentleman thought might be too abundant in the system; but, even if this theory had been correct, and the acids capable of the chemical action intended, after passing into the circulation, how could they be expected to dissolve only the redundant depositions of phosphat of lime, and at the same time leave the skeleton itself undissolved?

When an exostosis depends upon lues venerea, it is almost always preceded by an acute pain, which in the beginning extends to nearly the whole of the affected bone, but afterwards becomes fixed to the point, where the exostosis forms, and it is most severe in the night time. When an exostosis is caused by scrofula, says Boyer, the pain is duller, or rather it is quite inconsiderable. It is the same with the exostosis, which succeeds a blow, or contusion, without any manifest general cause. In the latter example, the pain, immediately excited by the accident, subsides in a few days, and the swelling occurs so slowly, that no notice is taken of it till it has attained some magnitude. (*Traité des Mal. Chir. T.* 3, *p.* 545.)

An exostosis constantly feels hard; but its size is various, and it may be indolent, or painful. By these signs, and its firm adhesion to the bones, it may be always distinguished from other tumors. Some exostoses cannot be ascertained before death. Such was the case in which the parietal bone was found, after death, to be three times thicker than natural. Such also was the example related in the memoirs of the Academy at Dijon, in which a person died from an exostosis on the internal side of the os pubis, which tumor prevented the discharge of the urine, or the introduction of a catheter, by its pressure on the neck of the bladder.

Exostoses may be either *acute*, or *chronic*, in their progress. In the first case, which, according to Boyer, happens most commonly in the *cellular* exostosis, described by authors under the name of *laminated*, the appearance and formation of the tumor are quick; the swelling rapidly acquires a considerable size; and, it is always preceded by, and accompanied with, continual violent pain, which the external and internal use of opium has little effect upon, and the intensity of which is not increased by pressure. The pain is sometimes so severe that it occasions a good deal of symptomatic fever. Boyer, who seems not to be aware of the origin of what he terms the *cellular*, and what Sir Astley Cooper has named *fungous exostosis*, from the medullary membrane, finds difficulty in accounting for the rapid growth and great sensibility of the tumor, considering the natural density of the bones, and the little energy of their vital properties.

In the hardest kinds of exostosis, says Boyer, the tumor is preceded by no pain, or, if any, it is very slight; the tumor grows slowly; and, although it sometimes attains a considerable size, its increase is attended with no particular sensibility, and no disturbance of the animal economy. (*Boyer, op. cit. T.* 3, *p.* 546.)

Our ignorance of the pathology of exostoses, particularly their causes, accounts for the imperfection of our treatment of them. With the exception of the venereal exostosis, or node, there is no species of this affection, for which, it can be said, that we have any one medicine of efficacy.

Boyer, and other writers on the diseases of the bones, seem to regard some exostoses as a perfectly inorganic mass of lime, and, consequently, they entertain no idea, that the absorbent vessels can possibly take away the particles of the tumor, just as the secerning arteries have laid them down. Such writers, however, are well aware, that nodes are capable of being diminished, and this can only be effected by the action of the absorbent system.

Boyer does acknowledge, indeed, that he has seen a venereal exostosis of the humerus, as well as a few other bony swellings, subside; but he represents the event as extremely rare; and he advances it as a principle, that the resolution of exostoses hardly ever happens, and that the greater part of the examples, recorded in proof of the occurrence, were nothing more than periostoses. (*P.* 547.)

When an exostosis is hard, chronic, and free from pain and alteration of the structure of the bone, it is a much more common thing for it to cease to enlarge and remain stationary during life, without producing inconvenience, provided it be so situated as not to impede the functions of any vital organ.

But, in the *cellular* exostosis of Boyer, which I take to be the same disease as the *fungous* exostosis of the medullary membrane of Sir Astley Cooper, the acute and rapid progress of the disease indicates a deeper and more serious alteration of the texture of the bone. A part of the tumor usually consists of a pultaceous, or gelatinous matter, and the rest, still endued with its natural organization, though altered by the disease, soon presents one or several cavities, in which there is suppuration. At the same time, the external soft parts, being excessively and rapidly distended, inflame, ulcerate, and leave exposed a more or less extensive portion of the tumor, the disease of which has in many cases been very wrongly supposed to be caries. It is not, observes Boyer, that the part of the swelling denuded by ulceration is not sometimes affected with caries; but, then it exists as a complication of the original disease, and as a particularity, by no means the result of the ulceration of the soft parts, and of the exposure of the diseased bone to the contact of the air. When the soft parts are thus ulcerated, the opening contracts to a certain point, and becomes fistulous. The suppuration is always of bad quality, and in a quantity proportioned to the size of the cavity of the abscess and the strength of the patient. The fever, which commences at an early period of the disorder, assumes a slow type, and its continuance, together with the copiousness of the ichorous discharge, the irritation, &c. may bring on the patient's dissolution.

The following are the symptoms of what Sir Astley Cooper denominates the *fungous exostosis of the medullary membrane*. The disease begins with a general enlargement of the affected part of the limb, extending a considerable way around the seat of the exostosis itself. This form of the complaint mostly occurs in young persons, though Sir Astley Cooper has seen it in an individual fifty years old. "Its increase proceeds very gradually; and even when it has acquired considerable magnitude, although it produces some diminution of motion in the limb, it does not occasion pain, or prevent the patient from using it. When any pain does arise, it is of an obtuse kind, only being acute in the event of a nerve being stretched by the tumor. Thus an exostosis of the thighbone sometimes causes great agony, by pressing on the sciatic nerve. Paleness, debility, and irregularity of the bowels, are observed to attend the early stage of the disease; and afterwards the complexion becomes sallow. In the mean time, the diseased part of the limb attains an enormous size; but the skin retains its natural colour. At many points, the swelling feels hard; at others, it is so elastic as to cause the presence of fluid to be suspected; but, if an opening be made, only blood is discharged. The surface of the tumor next becomes tuberculated, and the prominences tender, and their surface is often slightly inflamed. The rest is now broken, the appetite impaired, and the bowels extremely irregular. At length, the tubercles ulcerate; the skin secretes pus; but, when the swelling itself is exposed, it discharges a bloody coloured serum. A fungus then forms, which sometimes bleeds profusely, and, after it has risen very high, sloughing occurs, and considerable portions of the swelling are thrown off. But, although the swelling may be lessened by this process, Sir A. Cooper has never known the disease cured by it; and, in the end, the patient is destroyed by the effects of the repeated bleeding, immense discharge, and constitutional irritation." In this disease as in common fungus hæmatodes, tumors of a similar nature are often formed in other parts of the body, and, after the amputation of the affected bone, frequently make their appearance in organs of the greatest importance to life. The swelling is described as originating from the medullary membrane, and as removing the muscles to the distance of three inches, or more, from the bone, so that they represent a thin layer spread over the tumor. The blood vessels and large nerves are also similarly displaced. The tuberculated appearance of the skin, which is itself sound, is caused by projecting small masses on the surface of the tumor. Under the muscles is the periosteum, pushed to a considerable distance from the bone. A part of the swelling itself is yellow, like fat; another portion resembles brain; and a third is composed of coagulated blood with interstices filled with serum. In some parts, the white substance is found nearly as firm as cartilage; but, in general, it presents a more spongy appearance; and is interspersed with spiculæ of bone. The shell of the bone itself is in part absorbed; in some places, it is only thinner than usual; while in others it is immensely expanded, so as to form a case, like wire-work, over the tumor. The fungous granulations, proceeding from the medullary membrane itself, are exceedingly vascular, and often shoot from the cavity of the bone beyond the level of the integuments. (*A. Cooper. Surgical Essays, Part* 1, *p* 165—168.)

According to Boyer, spherical exostoses, with an internal cavity, and hypersarcosis, are only attended with violent pain in the beginning, and when they have attained a considerable size, they become almost indolent. But, the successive formation of the fungosities, contained in their cavity, has the effect of distending its parietes, and rendering them thin, so that such exostoses are exposed to fractures and ulceration. This last effect may, indeed, be a consequence of the progress of the disease, and give rise to a series of consecutive symptoms, which may be compared with those which have been described in the preceding case. The spherical exostosis, however, is less dangerous, perhaps, because the disease extends less deeply. Such tumors admit of being directly attacked, and operations for the destruction of the bony shell, and of the fungous growth, which it includes, may be successfully practised; an attempt, which would certainly be useless and dangerous in the foregoing instance.

One termination of exostosis, not spoken of by writers, but which has been observed, especially in the hard and stalactitical exostosis, is that by necrosis. Tumors of this description, after acquiring a large size, have been attacked with mortification, separated from the bone, which served them as a base, and surrounded with a reproduction in every respect similar to that, with which nature surrounds sequestra formed under any other circumstances. This termination is undoubtedly the most favourable of all, because nature proceeds in it slowly, without any violent disturbance; but, unfortunately, it is the least common. Art can imitate it; but her means are very inferior to those of nature. (*Boyer*, *Traité des Mal. Chir. T.* 3, *p.* 547—550.)

The hardest exostosis, which has grown slowly, and without causing severe pain, is the least dangerous of all, especially when the constitution is sound, and the patient not of a bad habit. After the disease has attained a certain size, it may become stationary, and continue in this state, without inconvenience, during life. This is most frequently observed in the *ivory* exostosis. Without having precisely this extreme hardness, however, some exostoses, which are tolerably solid, and in which the natural organization of bone is still distinguishable, are capable of undergoing a slight reduction after the removal of their cause by nature, or art. Boyer states, that this sometimes happens in a few scrofulous exostoses, and particularly in such as are venereal, and not of very large size.

The *cellular* exostosis of Boyer, the *fungous* exostosis of Sir A. Cooper, and the cases, which are named *osteosarcomata*, are the most serious of all, especially when the texture of the bone is considerably altered, and the disease is in a state of ulceration. The rapid formation of the disease, the violent shock which it imparts to the constitution, and the hectical disturbance which it excites, generally bring the patient into imminent danger, and commonly leave no other resource but that of amputating the limb.

The treatment of exostoses is to be considered in a medical and surgical point of view. When any general cause of the disease is known, or suspected, such cause is to be removed by those means, which experience has proved to be most efficacious. Thus Boyer recommends mercurial and antiscrofulous remedies, &c. according to the nature of the case.

Whatever may be the species of exostosis, or the nature of its cause, relief, says Boyer, may be derived from the outward use of opium, whenever the disease is attended with severe pain. He speaks favourably of the application of a linseed-meal poultice, made with a decoction of the leaves of night-shade and henbane, to which a strong solution of opium has been added. But he thinks, that an antiphlogistic plan, with bleeding, is hardly ever admissible, because it weakens the patient too much in so tedious a disease, and can only be a palliative, incapable of curing, or preventing the ravages of the disorder.

When there is no pain, or it has been appeased, during or after any general method of treatment, which may have been indicated, the surgeon may try resolvent applications, particularly soap and mercurial plasters, volatile liniment, bathing in water, containing a small quantity of soda, or potassa, hydro-sulphurated washes, &c. Boyer acknowledges, however, that the progress of exostoses can scarcely ever be checked by any general methodical treatment. The muriatic and acetic acids have been administered, but without effect; nor am I acquainted with any remedies, which possess efficacy, excepting mercury, which we know will rarely answer, except in cases of nodes. In the commencement of any deep-seated disease in a bone, however, Sir A. Cooper thinks, that the best medicine, for internal exhibition, is the oxymuriate of quicksilver in small doses, together with the compound decoction of sarsaparilla. (*Surgical Essays, Part* 1, *p.* 169.) Boyer is firmly of opinion, that with the exception of recent small exostoses, the nature of which is even doubtful, the resolution of such tumors is almost impossible. A slight diminution of the swelling, and its becoming perfectly indolent, are the most favourable changes which can be hoped for, whether they occur spontaneously, or are the fruit of surgical assistance. (*Traité des Mal. Chir. T.* 3, *p.* 554—557.)

Whether any exostoses might be lessened by keeping open a blister over them, for a considerable time, is a point, perhaps, worthy of further investigation. It is certain, that such applications tend to diminish venereal nodes, after they have been lessened as much as they can be by mercury; and we also know, that blisters, kept open, promote the absorption of the dead bone in cases of necrosis. In the local treatment, Sir Astley Cooper approves of the use both of leeches and blisters, a discharge from the latter being kept up with equal parts of the mercurial and savin ointments. (*Surgical Essays, Part* 1, *p.* 169.)

When exostoses merely occasion a deformity, and no pain, nor inconvenience, from the pressure which they produce on the neighbouring parts, it is certainly most advisable not to undertake any operation for their removal; for, as Boyer has truly observed, in by far the greater number of instances, the local affection is much less to be dreaded, than the means used for removing it.

Caustics and the cautery have occasionally been applied to exostoses; but they mostly do mischief. Boyer mentions an unfortunate woman, in whom some caustic was applied to an exostosis at the inside of the tibia: but which, instead of removing the tumor, caused a necrosis, of which she was not well two years afterwards. In a few instances, however, after the removal of fungous, or cartilaginous exostoses, of the interior of a bone with cutting instruments, the application of the cautery has prevented a reproduction of the diseased mass, as we find exemplified in a case recorded by Sir Astley Cooper, where such a disease of the jaw was thus extirpated. (*Surgical Essays, Part* 1, *p.* 158.) The bold and successful manner, also, in which the hydatid exostosis of the head was attacked with the saw, caustics and the actual cautery, by Mr. R. Keate, is particularly entitled to the attention of the surgical practitioner. (*Med. Chir. Trans.*

Vol. 10, *p.* 288, *&c.*) As far as my information extends, no attempt to stop the progress, and effect the cure of a fungous exostosis, by tying the main artery of the limb, has ever yet succeeded. Two cases, proving the inefficacy of this practice, are detailed by Sir A. Cooper." (*Vol. cit. p.* 170.)

As the *fungous exostosis of the medullary membrane* is evidently connected with a state of the constitution, analogous to what prevails in fungous hæmatodes, (see *this word*) the permanent success of amputation should never be too boldly promised; but, as no medicines have any material power over the disease, and the operation is the only chance of relief, it ought to be advised.

Cartilaginous exostoses of the medullary membrane may sometimes be extirpated by removing their outer bony covering, and then cutting away the cartilaginous matter closely from the bony surface to which it is attached. Sometimes, as I have noticed, these measures are followed by the use of the actual cautery.

Periosteal exostoses are also either *cartilaginous*, or *fungous*, which latter are attended with less general swelling of the limb, and are more prominent than fungous exostoses of the medullary membrane. Ulceration, bleeding, sloughing, and great discharge ensue, and, unless some operation be performed, the patient loses his life. (*A. Cooper, Surgical Essays, Part* 1, *p.* 180.)

The *cartilaginous exostosis, between the periosteum and bone*, arises from inflammation of the periosteum, and subjacent part of the bone, and a deposition of firm cartilage, adherent to both these surfaces, takes place. In this substance bony matter is secreted, which is first thrown out from the original bone. As the cartilage increases in bulk, the quantity of phosphate of lime augments, and fresh cartilage is constantly deposited upon the outer surface of the tumor. On dissection;—1st, the periosteum is found thicker than natural; 2dly, immediately below the periosteum, cartilage; and 3dly, ossific matter, deposited within the latter, from the shell of the bone, nearly to the inner surface of the periosteum. When the growth of such a swelling ceases, and the disease is of long standing, the exterior surface consists of a shell of osseous matter, similar to that of the original bone, and communicating with its cancelli, in consequence of the primitive shell having been absorbed. (*A. Cooper, Surgical Essays, Part* 1, *p.* 186.) The *periosteal cartilaginous* exostoses constitute the indolent, very hard forms of the disease. In their early stage, they may sometimes be checked by small doses of mercury, the decoction of sarsaparilla, and the emplastrum ammoniaci cum hydrargyro. (*Vol. cit. p.* 196.) When large, or troublesome, they may be sawn away, as Sir A. Cooper states, without danger, if the disease be well discriminated from the fungous swelling.

When exostoses are productive of much pain and injure the health, and their situation admits of their being safely removed, with the aid of suitable saws, or even with that of a gouge and mallet; the operation may be undertaken. Many tumors of this kind, however, have bases so very extensive, and deep, that, when situated on the limbs, amputation becomes preferable to any attempt made to saw or cut away the exostoses, and preserve the members on which they are situated.

In removing an exostosis, its base must be as freely exposed by the knife, as circumstances will allow, and to this part a small fine saw may be applied. In cutting away some exostoses, the flexible saw, described by Dr. Jeffray, of Glasgow, (see *Amputation*, *p.* 102,) will be found useful. Mr. Hey's saws and the semicircular trephine, are now so well known to the profession, that I scarcely need recommend them to be remembered in the present cases. Mr. Machell, a surgeon in London, has invented a saw, well calculated for cutting a bone at a great depth, without injuring the muscles. It is a small, fine, perpendicular wheel-like saw, turned by means of a handle connected with machinery. It is highly commended by Sir A. Cooper, who has given a drawing of it in his Surgical Essays, Part 1. An orbicular saw, invented and used by Professor Graefe, of Berlin, likewise merits particular notice on account of its ingenuity. (See *C. G. E. Schwalb de Serra Orbiculari*; 4to. *Berol.* 1819.) I would likewise recommend to the notice of surgeons the ingenious rotation saw, contrived by Professor Thal of Copenhagen, and of which a description and engraving may be found in the *Edinb. Med. & Surgical Jour. No.* 74. A strong pair of bone-nippers, and especially Mr. Liston's forceps, the edges of which are in the line with the handles, will also be useful.

E. Victorin de Ossibus tuberosis Upsal. 1717. *Haller, Disp. Chir.* 4, 561. *P. H. Mœhring de Exostosi Steatomatode Claviculæ, ejusdem felici Sectione. Gedani.* 1732. *J. Caspart de Exostosi Cranii rariore. Argent.* 1730. *J. R. Fayolle, de Exostosi. Monsp.* 1774. *Abernethy, in Trans. for the Improvement of Med. and Chir. Knowledge, Vol.* 2, *p.* 309. *Bonn, Descriptio Thesauri Ossium Hoviani. Dumont, Journ. de Med. T.* 13; *Hist. de l'Acad. des Sciences*, 1737, *p.* 28; *Houstet, in Mem. de l'Acad. de Chir. T.* 3.; *Matani de Osseis Tumoribus, p.* 20; *Petit, Traité des Mal. des Os, T.* 2. *Morgagni de Sedibus, &c. Ep.* 50. *art.* 56. *Kulmus de Exostosi Claviculæ. Haller. Collect. Diss. Chir.* 4. *R. Keate in Med. Chir. Trans. Vol.* 10; *Sir A. Cooper, Surgical Essays, Part* 1. 8vo. *Lond.* 1818. *J. F. Lobstein, Compte de son Musée Anatomique, p.* 24, *&c.* 8vo. *Strasb.* 1820.

EXTRAVASATION. (from *extra*, out of, and *vas*, a vessel.) A term, applied by surgeons to the passage of fluids out of their proper vessels, or receptacles. Thus, when blood is effused on the surface, or in the ventricles of the brain, it is said, that there is an *extravasation*.

When blood is poured from the vessels into the cavity of the peritoneum, in wounds of the abdomen, or when the contents of any of the intestines are effused in the same way, surgeons call this accident an *extravasation*. The urine is also said to be *extravasated*, when, in consequence of a wound, or of sloughing, or ulceration, it makes its way into the cellular substance, or among the abdominal viscera. When the bile spreads among the convolutions of the bowels, in wounds of the gall bladder, this is a species of extravasation.

In wounds of the thorax, an extravasation of blood also frequently happens in the cavity of the pleura. Large quantities of blood are often extravasated in consequence of vessels being ruptured by violent blows: in the scrotum, on the shoulder, and under the scalp, this effect is observed with particular frequency.

In the articles, *Head, Injuries of,* and *Wounds,* I have treated of extravasations of blood in the cranium, chest, and abdomen.

EYE, CALCULUS, IN THE INTERIOR OF. Scarpa dissected an eye, which was almost entirely transformed into a stony substance. It was taken from the body of an old woman, and was not above half as large as the sound one. The cornea appeared dusky, and, behind it, the iris, of a singular shape, concave, and without any pupil in its centre. The rest of the eyeball, from the limits of the cornea backward, was unusually hard to the touch. The particulars of the dissection of this case will be read with interest in Scarpa's Treatise on the Diseases of the Eye.

Haller met with a similar case. (See *Obs. Pathol. Oper. Min. Obs.* 15.) Fabricius Hildanus, Lancisi, Morgagni, Morand, Zinn, and Pellier, make distinct mention of calculi in the interior of the eye. Ossifications of the capsule of the lens, of that of the vitreous humor, and of, what was supposed to be, the hyaloid membrane, are noticed by Mr. Wardrop. (*Morbid Anatomy of the Human Eye, Vol* 2, *P.* 128, *8vo. Lond.* 1818.)

EYE, CANCER, AND EXTIRPATION OF. One of the well-known characters of carcinoma in general is to attack persons advanced in age, rather than children and young subjects. Hence, an observation, made by the experienced Desault, that cancer of the eye is most frequent in childhood, could not but appear a position inconsistent with the usual nature of the disease in general. Yet, how was this statement to be contradicted, while it was confirmed by the testimony of Bichat himself, who says, that more than one third of the patients, on whom Desault operated in the Hôtel Dieu for cancer of the eye, were under twelve years of age? Here truth and accuracy, as in many other questions relative to disease, would never have been attained without the aid of morbid anatomy, whereby distempers, which bear a superficial resemblance to each other, while they are in reality of a totally different nature, are prevented from being confounded together. Now when Scarpa even goes further than Bichat, and asserts, that *in twenty-four individuals, affected with what is called carcinoma of the eye, twenty of those, at least, are children under twelve years of age,* this declaration, considered with the acknowledged propensity of cancer, on all other occasions, to attack old, rather than young subjects, might have remained a mysterious anomaly in the history of disease, had not the valuable investigations of Mr. Wardrop proved beyond all doubt, that the afflicting disease, which rendered it necessary for so many young subjects to undergo a severe operation, was *not true cancer,* but what is now denominated by modern surgeons, *fungus hæmatodes.* (*Obs. on Fungus Hæmatodes. 8vo. Edinb.* 1809.) As Scarpa observes, this author has afforded a solution of the question, by showing, from careful observation, founded on pathological anatomy, that the morbid change of structure in the eyeball of a child, commonly called carcinoma, is not in reality produced by cancer, but by another species of malignant fungus, to which the epithet, hæmatodes, is applied; a disease, indeed, equally and, with regard to the eye, more formidable and fatal, than cancer, but distinguished from it by peculiar characters, which, not being confined to age, sex, or part of the body, attack the eyeball both of the infant and adult. (*Scarpa, Trans. by Briggs, P.* 502, *Ed.* 2.)

According to Scarpa, and, indeed, the sentiments of several other surgeons of the present day, cancer is always preceded by scirrhus, or a morbid induration of the part affected. As the disorganization increases in this hard scirrhous substance, an ichorous fluid is formed in cells within it, and afterwards extends towards the external surface of the tumor, causing ulceration of the investing parts. The compact and apparently fibrous mass is then converted into a malignant fungous ulcer, of a livid, or cineritious colour, with edges everted, and irregularly excavated, and with a discharge of acrid, offensive sanies. The schirrus, composing the base of the malignant fungus, instead of increasing in size, now rather diminishes, but retains all its original hardness, and, after rising a certain way above the ulcerated surface, is destroyed at various points by the same ulcerative process, from which it originated. And, if any part of the livid fungous sore seem disposed to heal, it is a deceitful appearance, as, in a little time, the smooth points are again attacked by ulceration. To relate in this place all the differences between cancer and fungus hæmatodes of the eye, would be superfluous, as the subject is considered in a future article; (See *Fungus Hæmatodes;*) but, I may briefly advert to a few remarkable points of diversity; 1st, The primary origin of fungus hæmatodes is generally in the retina, especially, that point at which the optic nerve enters the cavity of the eye. 2dly, True cancer of the eyeball, when it begins on any part of the organ itself, instead of commencing as fungus hæmatodes at the deepest part of the eye, originates on its surface in the conjunctiva; and, as far as present evidence extends, if we except the lachrymal gland, this membrane is the only texture, connected with the eye, ever primarily affected with carcinoma. (*Scarpa on Diseases of the Eye, p.* 526, *Edit.* 2.; *and Travers, Synopsis of the Diseases of the Eye, p.* 99.) 3dly, Cancer of the eye, as Scarpa truly observes, is less destructive than fungus hæmatodes, and that for two important reasons. In the first place, because carcinoma begins on the exterior parts of the eye, so that whatever relates to the origin and formation of the disease is open to observation; and secondly, because the cancerous fungus of the eye, on its first appearance, is not actually malignant, but becomes so in process of time, or from improper treatment, previously to which period good surgery may be employed with effect. In this light, Scarpa views many excrescences on the conjunctiva and anterior hemisphere of the eye, which appear in consequence of a staphyloma of the cornea, long exposed to the air and ulceration; those which arise from relaxation and chronic inflammation of the conjunctiva; from ulceration of the cornea, neglected or improperly treated; from violent ophthalmy, not of a contagious nature, treated in the acute stage with astringent and irritating applications; from suppuration of the eye, rupture of the cornea, and wasting of the eyeball; or from blows, or burns on the part. Nothing, says Scarpa, is more probable, than that all these ulcerated fungi were, on their first appearance, not of malignant character, or certainly not *cancerous*, and that many of them were not actually so at the time of a successful operation being done.

Now, in the opinion of the same valuable author, there is no criterion as yet known of the precise time, when a sarcoma of the eye changes from the state of a common ulcerated fungus to that of carcinoma; for, the exquisite sensibility, darting pains, rapidity of growth, colour, and ichorous discharge, are not an adequate proof of cancer. The symptom, however, on which he is inclined to place the greatest dependence, as a mark of the change in question, is the almost cartilaginous hardness of the malignant ulcerated fungus, which induration, he asserts, is not met with in the benign fungus, and never fails to precede the formation of cancer. (See *Scarpa on the Eye, Transl. by Briggs, Edit.* 2, *p.* 511—513.)

4thly. The last difference of fungus hæmatodes from cancer of the eye, here to be noticed, is the pulpy softness of the whole of the diseased mass, in the first of these diseases; a character, completely opposite to the firm almost cartilaginous consistence of the carcinomatous fungus.

Before describing the operation of removing an eye, affected with malignant disease, the following corollaries, drawn by Scarpa, should be recollected. 1. The complete extirpation of the eye, for the cure of fungus hæmatodes, although performed on the first appearance of the disease under the form of a yellowish spot, deeply seated in the eye, is useless, and rather accelerates the death of the patient.

But, although this statement, made by Scarpa, may be mostly true, I am happy to say, that modern experience begins to raise a hope, that exceptions to the foregoing melancholy inference are possible. Thus, Mr. Wishart removed from a boy, nine years old, an eye that had been affected with fungus hæmatodes about four months, and no relapse had taken place eighteen months after the operation. (See *Edinb. Med. and Surg. Journ. No.* 74. *p.* 51.)

2. The exterior fungous excrescence of the eye, commonly called carcinoma, beginning on the conjunctiva, and anterior hemisphere, *while it is soft, flexible, and pulpy*, although accompanied with symptoms, similar to those of carcinoma, is not actually this disease, nor does it become malignant, and strictly cancerous, until it is *rigid, hard, coriaceous, warty, and, in every respect, scirrhous.*

3. The inveterate fungous excrescence, hard to the touch in all its parts, covered with ulcerated warts, which has involved the whole of the eyeball, optic nerve, and surrounding parts, and rendered the bones of the orbit carious, and contaminated the lymphatic glands behind the angle of the jaw, and, in the neck, is incurable.

4. On the contrary, the partial, or total extirpation of the eye will succeed, when attempted before the external fungous excrescence has changed from the state of softness to that of a scirrhous, warty, and carcinomatous hardness. (*Vol. cit. p.* 526.)

The operation of removing the eye was first performed in the sixteenth century by Bartisch, a German, who employed a coarsely constructed instrument, shaped like a spoon, with cutting edges, and by means of which the eye was separated from the surrounding parts, and taken out of the orbit. This instrument was too broad to admit of ready introduction to the deep contracted part of the orbit, so that, when it was used, either a part of the disease was likely to be left behind, or the thin bones of the orbit to be fractured in the attempt to pass it more deeply into that cavity. Fabricius Hildanus learned these inconveniences from experience, and, in order to avoid them, devised a sort of probe-pointed bistoury. Bidloo made use of scissars, and a pointed bistoury.

La Vauguyon is the first French surgeon who spoke of this operation; and all his countrymen may be said to have regarded the operation as useless, cruel, and dangerous, until St. Ives performed it with success. Heister preferred operating with the bistoury alone. Several English surgeons used a sort of curved knife, an engraving of which is given in B. Bell's system; but, for dissecting out the tumor, this instrument was regarded by Louis as less convenient than a straight bistoury.

Thus far the plans of operating, advised by authors, were not guided by any fixed rules. Louis endeavoured to lay down such rules, and for a long while his method was mostly adopted in France. It consists in dividing the attachments of the eye to the eye-lids; then those of the small oblique muscle; next, those of the great oblique muscle; then those of the levator palpebræ superioris, varying, according to their insertions, the manner of holding the knife. The eyeball is afterwards detached, and the four straight muscles, and optic nerve, divided with a pair of scissars.

This way of operating, founded upon anatomical principles, seems at first glimpse to offer a method, in which, as Louis remarks, each stroke of the instrument is guided by the knowledge of the parts. But, it is to be noticed, that these parts, being altered by disease, most commonly do not present the same structure and relations, which they do in the natural state; and that the flattened, lacerated, destroyed muscles, on their being confused with the eye itself, cannot serve, as in lithotomy, for the foundation of any precept relative to the operation. Desault considered the scissars unnecessary, because the inclination of the outer side of the orbit will always allow a bistoury to be carried to the bottom of this cavity, so as to divide from above downwards, the optic nerve, and muscular attachments.

Hence, after having practised, and taught the method of Louis, he returned to Heister's advice, who directs only a bistoury to be employed. To have an exact idea of the mode of operating, which is always easy and simple with this one instrument, we must suppose the carcinoma to be in three different states. 1. When the tumor hardly projects out of the orbit, so that the eyelids are free. 2. When it is much larger, projects considerably forward, and pushes in this direction the healthy eyelids, which are in contact with it, together with a portion of the conjunctiva, which invests them, and is now detached from them. 3. When, in a much more advanced period, the eyelids participate in the cancerous state. In the first case, the eyelids must be separated from the eye, by cutting through the conjunctiva where it turns to be reflected over the globe of the eye. In the second instance, the eyelids and conjunctiva, which are in contact with the diseased eye, must be dissected from it. In the third, these parts must be cut away, together with the eye. (*Œuvres Chir. de Desault, T. 2.*)

After the above observations, and the additional information on the subject contained in the 1st vol. of the 4th Edition of the First Lines of the Practice of Surgery, I shall conclude this article with a few brief directions.

When the eyeball is exceedingly enlarged, it is necessary to divide the eyelids at the external angle, in order to facilitate the operation. The surgeon can in general operate most conveniently when he employs a common dissecting knife, and when his patient is lying down with his face exposed to a good light. In cutting out a diseased eye, it is necessary to draw the part forwards, regularly as its surrounding attachments are divided, in order that its connexions, which are still more deeply situated, may be reached with the knife. This object cannot be very well accomplished with the fingers, or forceps, and, therefore, most surgical writers recommend us, either to introduce a ligature through the front of the tumor, (see *Travers, Synopsis, p.* 308,) or to employ a hook, for the purpose of drawing the part in any direction, during the operation, which the necessary proceedings may require. When the eyelids are diseased, they must be removed; but, if prudence sanctions their being preserved, this is an immense advantage. The eye must not be drawn out too forcibly, before the optic nerve is divided, and care must be taken not to penetrate any of the foramina, or thin parts of the orbit, with the point of the knife, for fear of injuring the brain. Great care should also be taken to leave no diseased parts behind, in the orbit. The hemorrhage may be stopped by filling the orbit with scraped lint, and applying a compress and bandage. It is constantly advisable to remove the lachrymal gland, as this part seems to be particularly apt to be the source of such inveterate fungous diseases, as too often follow the operation.

Mr. Travers, with a straight double-edged knife, freely divides the conjunctiva and oblique muscles, so as to separate the eyeball and lachrymal gland from the base of the orbit. Drawing the eye then gently forwards with the ligature, he introduces a double-edged knife, "curved breadthwise" at the temporal commissure of the lids, for the purpose of dividing the muscles, vessels, and nerves, by which the globe remains attached. The hemorrhage he represses with a small bit of fine sponge put into the orbit, and a light compress, applied over the eyelids, and supported with a bandage. The sponge, he says, should not be suffered to remain longer, than the following day, when a soft poultice in a muslin bag may be substituted for the compress. He approves of giving an opiate at bed-time, and joins the late Mr. Ware in condemning the practice of cramming the orbit with lint, or charpie, and leaving it to be discharged by suppuration. (*Synopsis of the Diseases of the Eye, p.* 308.)

For a few days after the operation, antiphlogistic treatment is proper. The patient should be kept in bed, until all risk from inflammation is past, and suppuration has been freely established. In one case, operated upon by Mr. Guthrie, the symptoms of inflammation were so violent, that it was necessary to take away 250 ounces of blood in the course of the three first days. (*Operative Surgery of the Eye, p.* 183.) Sometimes, fungous granulations continually form in the orbit, notwithstanding they are repeatedly destroyed; and sometimes, the disease extends even to the brain, and produces fatal consequences. When malignant fungous excrescences grow from the cornea alone, it is clearly unnecessary to extirpate the whole eyeball.

For information, relating to the subjects of this article, consult particularly *Mémoire sur plusieurs Maladies du Globe de l'Œil; ou l'on examine particulièrement les cas qui exigent l'extirpation de cet organe, et la Methode d'y proceder; par M. Louis, in Mém. de l'Acad. de Chir. T.* 13, *p.* 262. *Edit. in* 12*mo. C. F. Kalischmeid, Programma de oculo ulcere canceroso laborante feliciter extirpato, &c. Jenæ.* 1748. *J. G. G. Voit, Oculi Humani Anatomia et Pathologia ejusdemque in statu morboso Extirpatio, 8vo. Norimb.* 1810. *Bertrandi, Traité des Opérations de Chirurgie, p.* 519, *Ed.* 1784, *Paris. Sabatier, de la Médecine Opératoire, T.* 3. *p.* 54. *Ed.* 1. *Richter, Anfangsgr. der Wundarzn. B.* 3. *p.* 415, *Gött.* 1795. *Mémoire sur l'Extirpation de l'Œil Carcinomateux in Œuvres Chir. de Desault par Bichat, T.* 2, *p.* 102. *Richerand, Nosographie Chir. T.* 2. *p.* 103, *&c. Edit.* 2. *Ware, in Trans. of the Medical Society of London, Vol.* 1, *Part* 1, *p.* 140, *&c. Lassus, Pathologie Chir. T.* 1, *p.* 450, *Edit.* 1809. *Wardrop on Fungus Hæmatodes, p.* 93, *&c. Scarpa on the Principal Diseases of the Eye, chap.* 21, *Edit.* 2, *transl. by Briggs, 8vo. Lond.* 1818. *B. Travers, A. Synopsis of the Diseases of the Eye, Sec.* 4, *8vo. Lond.* 1820. *J. H. Wishart, in Edinb. Med. and Surg. Journ. No.* 74. *G. J. Guthrie, Operative Surgery of the Eye, p.* 178, *&c. 8vo. Lond.* 1823.

EYE, DISEASES OF. See *Amaurosis; Cataract; Cornea; Encanthis; Exophthalmia; Fungus Hæmatodes; Gutta Serena; Hemeralopia; Iris; Hydropthalmia; Hypopium; Leucoma; Nyctalopia; Ophthalmy; Pterygium; Pupil, Closure of; Staphyloma, &c. &c.*

EYELIDS, DISEASES OF. See *Ectropium; Lagophthalmus; Hordeolum; Ptosis; Trichiasis; and Tumors Encysted.* In the examination of the interior of the upper eyelid, a modern very convenient plan is now pursued, which is to evert the part over a probe, which is to be placed just across the upper edge of the cartilage of the tarsus, which is then to be suddenly inclined outwards, when the whole inner surface of the lid will be exposed, the part continuing in this everted state until replaced by the surgeon.

F.

FEVERS, SURGICAL. Under this head may be comprehended two species of fever, viz. the *inflammatory*, and the *hectic*, which are particularly interesting to surgeons, because frequently attendant on surgical disorders.

In treating of inflammation, I have mentioned, that a febrile disturbance of the constitution is attendant on every considerable inflammation. In the present article, some account will be offered of the particulars of this disorder.

The fever about to be described is known and distinguished by several names; some calling it *inflammatory;* some *symptomatic;* and others *sympathetic.* It is supposed by some writers to be sometimes idiopathic; that is to say, it originates at the same time with the local inflammation, and from the same causes: (*J. Burns.*) a case which I have never seen. In other instances, and, indeed, we may say, in all ordinary surgical cases, it is symptomatic; or, in other words, it is produced, not directly by the causes, which originally produced the inflammation, but in consequence of the sympathy of the whole constitution with the disturbed state of a part.

Idiopathic inflammatory fever is said to be always preceded by chilliness. The symptomatic, or sympathetic inflammatory fever, sometimes takes place so quickly, in consequence of the violence of the exciting cause, or of the local inflammation, that no preceding coldness is observable. If, however, the local inflammation be more slowly induced, and, consequently, operate more gradually on the system, then the coldness is evidently perceived. The symptomatic fever, induced by scalding, or burning a part, is quickly produced, and we have very little time to attend to the earliest period of its formation. On the other hand, the symptomatic fever, induced by wounds, is excited more slowly, and the period of its formation is longer. This fever is not produced, when the inflammation only affects parts in a slight degree; but, it makes its appearance, if the local inflammation be considerable, or if it affect very sensible parts. (*Burns.*)

The degree, in which this fever is excited, does not altogether depend upon the absolute quantity, or violence of the inflammation; but, in a great measure upon the degree of the local inflammatory action, compared with the natural power and action of the part affected. Parts, in which the action is naturally low, are extremely painful when inflamed, and the system sympathizes greatly with them. Hence, the constitution is very much affected, when tendons, bones, or ligaments, are the parts inflamed. Severe inflammation of a large joint, every one knows, is apt to excite the most alarming, and even fatal derangement of the system. When very sensible parts are inflamed, as for instance, the eye, the symptomatic fever is generally more considerable, than it would be, were it to arise from an equal quantity and degree of inflammation in a less sensible organ.

In common parts, as muscles, cellular membrane, skin, &c. the symptoms will be acute; the pulse strong and full, and the more so, if the inflammation be near the heart; but, perhaps, not so quick, as when the part is far from it: the stomach will sympathize less, and the blood will be pushed farther into the small vessels.

If the inflammation be in tendinous, ligamentous, or bony parts, the symptoms will be less acute, the stomach will sympathize more, the pulse will not be so full, but, perhaps, quicker; there will be more irritability, and the blood, not being propelled so well into small vessels, will forsake the skin.

It seems to be a material circumstance, whether the inflammation is in the upper or lower extremity; that is, far from, or near the heart, for the symptoms are more violent, the constitution more affected, and the power of resolution less, when the part inflamed is far from the source of the circulation, than when near it, even when the parts are similar, both in texture and use.

If the heart, or lungs, are inflamed, either immediately, or affected, secondarily, by sympathy, the disease has more violent effects upon the constitution, than the same quantity of inflammation would have, if the part affected were not a vital one, or one with which the vital parts did not sympathize. If the part be such as the vital ones readily sympathize with, then the sympathetic action of the latter will affect the constitution, as in an inflammation of the testicle. In such cases, the pulse is much quicker and smaller, and the blood is more sizy, than if the inflammation were in a common part, such as muscle, cellular membrane, and skin.

When the stomach is inflamed, the patient feels an oppression and dejection through all the stages of the inflammation; the pulse is generally low and quick, and the pain obtuse, strong, and oppressive; such as the patient can hardly bear. If the intestines are much affected, the same symptoms take place, especially if the inflammation be in the upper part of the canal; but, if only the colon be affected, the patient is more roused, and the pulse is fuller, than when the stomach alone is inflamed. When the uterus is inflamed, the pulse is extremely quick and low. When the inflammation is either in the intestines, testicle, or uterus, the stomach generally sympathizes. In inflammation of the brain, the pulse varies more, than in the same affection of any other part; and, perhaps, we must, in this instance, form a judgment of the complaint, more from other symptoms, than the pulse.

When inflammation is situated in a part, not very essential to life, and occasions the general affection of the system, called inflammatory fever, the pulse is fuller and stronger, than common, and the blood is pushed further into the extreme arteries, than when the inflammation is in a vital part. The patient, after many occasional rigors, is at first rather roused. The pulse is as above described, when the constitution is strong and not irritable; but, if this be extremely irritable and weak, as in many women, who lead sedentary lives, the pulse may be quick, hard, and small, at the commencement of the inflammation, just as if vital parts were concerned. The blood may also be sizy; but it will be loose and flat on the surface. (*Hunter.*)

We may set down the ordinary symptoms of the inflammatory fever, occurring in consequence of local inflammation in common parts, and in a healthy habit, as follows: The pulse is frequent, full, and strong; all the secretions are diminished; the patient is vigilant and restless; the perspiration is obstructed, and the skin is hot and dry; the urine is high-coloured, and in small quantity; the mouth is parched, and the tongue furred; an oppressive thirst is experienced; with disturbance of the nervous system; loss of appetite and sleep; and, in some cases, delirium.

TREATMENT OF INFLAMMATORY FEVER.

Upon this part of the subject very little is to be said; for as, in almost every instance, the febrile disturbance of the system is produced, and entirely kept up by the local inflammation, it must be evident, that the means, employed for diminishing the exciting cause, are also the best for abating the constitutional effects. Hence, it very seldom happens, that any particular measures are adopted expressly for the fever itself; as this affection is sure to subside in proportion as the local inflammation is lessened, or resolved. But, when the febrile disturbance is considerable, and the inflammation itself is also considerable, the agitated state of the system may have in its turn a share in keeping up, and even increasing, the local affection, and should be quieted as much as possible. However, in these very instances, in all probability, we should be led to a more rigorous adoption of the antiphlogistic plan of treatment, by an abstract consideration of the state of the local inflammation itself, without any reference to that of the constitution. Indeed, the increased action of the heart and arteries, and the suppression of the secretions, require the employment of antiphlogistic means, and antimonials, the very same things, which are indicated for the resolution of the local inflammation itself. Bleeding, purging, cold drinks, low diet; the exhibition of the antimonium tartarizatum, James's powder, or the common antimonial powder; and bathing the feet and body in warm water, are measures, which have the greatest efficacy in tranquillizing the constitutional disturbance implied by the term inflammatory fever. But, I think it right to repeat, that it is hardly ever necessary to have recourse to such an evacuation as general bleeding, merely on account of the fever; as this is only an effect, which invariably subsides in proportion as the local cause is diminished.

As Dr. Thomson has remarked, " the inflammatory fever, succeeding to external injuries, or to chirurgical operations, undergoes a kind of natural crisis, by the appearance of suppuration. In these instances, therefore, unless when the patient is strong and in full health, when the disease is seated in an organ of much importance to life, or is in danger of spreading, as is the case in all inflammations of the membranes lining the three great cavities of the body, the lancet ought to be used with caution. For we may, by too free a detraction of blood, produce a sudden sinking of the powers of life, and convert the existing constitutional symptoms into fever of a different type, or character. But, in all cases of inflammation, in which any doubt arises, with regard to the farther general detraction of blood, it may, I believe, be laid down as a general rule, that it is safer to employ local, than general blood-letting." (*Lectures on Inflammation, p.* 170.)

HECTIC FEVER.

The *sympathetic*, or *symptomatic* fever, already described, is an *immediate* affection of the constitution, in consequence of some local disorder; hectic fever is a *remote* effect. When hectic fever is a consequence of local disease, it has commonly been preceded by inflammation and suppuration; but, there is an inability to produce granulation and cicatrization: and the cure, of course, cannot be accomplished. The constitution may now be said to be oppressed with a local disease, or irritation, from which it cannot deliver itself.

A distinction should be made, between hectic fever, arising entirely from a local complaint in a good constitution, which is only disturbed by too great an irritation, and hectic fever, arising principally from the badness of the constitution; which does not dispose the parts to heal. In the first species, it is only necessary to remove the part, (if removable) and then all will do well; but, in the second, nothing is gained by a removal of the part, unless the wound, made in the operation, is much less, and more easily put into a local method of cure; by reason of which, the constitution sinks less, under this state and the operation together, than under the former disease. Here the nicest discrimination is requisite. (*Hunter.*)

Owing to a variety of circumstances, hectic fever comes on at very different periods after the inflammation, and commencement of suppuration. Some constitutions, having less powers of resistance, than others, must more easily fall into this state.

Hectic fever takes its rise from a variety of causes, which have been divided into two species, with regard to diseased parts; viz. parts called vital, and others not of this nature. Many of the causes of hectic fever, arising from diseases of the vital parts, would not produce this constitutional affection, if they were in any other part of the body; such, for instance, is the formation of tumors, either in, or so as to press upon, a vital part, or one, whose functions are immediately connected with life. Scirrhi in the stomach, and mesenteric glands; diseased lungs, liver, &c. very soon produce hectic fever.

When hectic fever arises from a disease of a part, that is not vital, it commences sooner, or later, according as it is in the power of the part to heal, or continue the disease. If the part be far from the source of the circulation, the fever will come on sooner, with the same quantity of disease. When the disease is in parts which are not vital, and excites hectic fever, it is generally in situations, where so much mischief happens as to affect the constitution, and where the powers of healing are little. This is the case with diseases of many of the joints. We must also include parts, which have a tendency to such specific diseases, as are not readily cured in any situation.

Although hectic fever commonly arises from some incurable local disease of a vital part, or of an extensive disease of a common part, yet it is possible for it to be an original disease in the constitution, without any local cause whatever, that can be specified.

Hectic is a slow mode of dissolution: the general symptoms are those óf a low, or slow fever, attended with weakness. But, there is rather weak action, than real weakness; for upon the removal of the hectic cause, the action of strength is immediately produced, and every natural function is re-established, however much it may have been previously impaired.

The particular symptoms are debility; a small, quick, and sharp pulse; the blood forsakes the skin; loss of appetite; frequently, a rejection of all aliment from the stomach; wasting, a great readiness to be thrown into sweats; spontaneous perspirations, when the patient is in bed; pale-coloured, and very copious urine; and often a constitutional purging.

Hectic fever has been imputed to the absorption of pus into the circulation; but, no doubt, much exaggeration, has prevailed in the doctrine, which ascribes to this cause many of the bad symptoms, frequently attacking persons, who have sores. When suppuration takes place in particular parts, especially vital ones, hectic fever almost constantly arises. It also attends many inflammations, before suppuration has actually happened, as in cases of white swelling of the large joints. The same quantity and species of inflammation and suppuration in any of the fleshy parts, especially such as are near the source of the circulation, have in general no such effect. Hence, in the first instances, the fever is only an effect on the system, produced by a local complaint, that has a peculiar property.

The constitution sympathizes more readily with diseases of vital organs, than with those of any other parts; their diseases are also in general more difficult of cure, than the same affections of parts, which are not vital. All diseases of bones, ligaments, and tendons, affect the constitution more readily, than those of muscles, skin, cellular membrane, &c.

When the disease is in vital parts, and is such as not to kill, by its first constitutional effects, the system then becomes teased with a complaint, which is disturbing the *necessary actions of health.* In the large joints, a disease continues to harass the constitution, by attacking parts which have no power, or rather, no disposition to produce salutary inflammation and suppuration. Thus, the system is also irritated by the existence of an incurable disease. Such is the theory of the cause of hectic fever.

If the absorption of matter always produced the symptoms above described, how could any patient, who has a large sore, possibly escape hectic; for, there is no reason to suppose, that one sore can absorb more readily, than another. If absorbed matter occasioned such violent effects as have been commonly ascribed to it, why does not venereal matter do the same? We often know, that absorption is going on, by the progress of buboes. A large one, just on the point of bursting, has been known to be absorbed, in consequence of a few days' sea-sickness. The person continued at sea for four and twenty days afterwards; yet, no hectic symptoms followed, but only the specific constitutional effects, which were of a very different description.

When the cavities of veins are inflamed, matter is sometimes formed within these vessels, and cannot fail to get into the circulation; yet, hectic symptoms do not arise. Also, very large collections of matter, produced without visible inflammation, as many abscesses of the scrophulous kind, are wholly absorbed in a very short time, but no bad symptoms are the consequence.

We may conclude, therefore, that the absorption of pus has no share in occasioning hectic fever. Many arguments might be adduced to expose the absurdity of the doctrine; but, here it will be sufficient to refer the reader to what Mr. Hunter has said further on the subject, in his work on inflammation.

It is much more probable, that hectic fever arises from the effect, which the irritation of a vital organ, or other parts, such as joints, has on the constitution, when either incurable in themselves, or are so for a time to the constitution.

TREATMENT OF HECTIC FEVER.

There is no method of curing the consequences above related. All relief must depend on the cure of the cause (viz. the local complaint) or on its removal.

Tonic medicines have been recommended, on account of the evident existence of great debility. Antiseptics have also been given, in consequence of the idea that, when pus is absorbed, it makes the blood disposed to putrefy. For these reasons bark and wine have been exhibited. In most cases, bark will only assist in supporting the constitution. Until the cause is removed, however, there seems no prospect of curing a disorder of the constitution. It is true, tonic medicines may make the system less susceptible of the disease, and also contribute to diminish the cause itself, by disposing the local complaints to heal. When, however, hectic fever arises from a specific disease, such as the venereal, though bark may enable the constitution to bear the local affection better, than it otherwise could do, yet, as Mr. Hunter remarked, it can have little effect upon the syphylitic mischief.

No medicine, not even bark itself, has any direct power of communicating strength to the human constitution. All that can be done, in the treatment of hectic fever, when it is thought inexpedient, or impracticable, to remove the morbid part, is to combat particular symptoms, and to promote digestion. It is by bringing about the latter object, that bark in these cases is useful. The infusion of cinchona, and the sulphat of quinine, being more likely to agree with the stomach, than the decoction, or powder, should generally be preferred. Nourishing food, easy of digestion, should be frequently taken, in small quantities at a time. Nothing is more prejudicial to a weak constitution, than overloading the stomach. Wine may also be given, but not too freely, and, not at all, if it should create heartburn, as it sometimes does in hectic patients. Madeira is less apt than port, to have this disagreeable effect. In these cases, it is likewise often found useful to administer gentle cordial aromatic draughts. But, of all medicines, opium is perhaps the most valuable to those, who are afflicted with hectic fever; it alleviates pain, procures sleep, and checks the diarrhœa, which so frequently contributes to hasten the patient's dissolution.

When the local complaint, connected with this fever, is totally incurable, it must, if possible, be removed by a manual operation. Thus, when a diseased joint keeps up hectic fever, and seems to present no hope of cure, amputation must be performed. But, when the local disease is attended with a chance of cure, provided the state of the constitution were improved, the surgeon is to endeavour to support the patient's strength. Great discretion, however, must be exercised, in deciding how long it is safe to oppose the influence of an obstinate local disease over the system, by the power of medicine; for, although some patients, in an abject state of weakness, have been restored to health by a removal of the morbid part, many have been suffered to sink so low, that no future treatment could save them from the grave. Clemency in the practice of surgery does not consist so much in delaying strong and vigorous measures, as in boldly deciding to put them in execution, as soon as they are indicated.

When hectic fever arises from local diseases in parts, which the constitution can bear the removal of, the morbid part should be taken away, if it cannot be cured, consistently with the advice already given. When the disease arises from some incurable disease in an extremity, and amputation is performed, all the above-mentioned symptoms generally cease, almost immediately after the removal of the limb. Thus, as Mr. Hunter has correctly observed, a hectic pulse, at one hundred and twenty, has been known to sink to ninety in a few hours after the removal of the hectic cause. Persons have been known to sleep soundly the first night afterwards, who had not slept tolerably for several preceding weeks. Cold sweats have stopped immediately, as well as those called colliquative. A purging has immediately ceased, and the urine begun to drop its sediment.

FICATIO, or FICUS. (a fig.) A tubercle about the anus, or pudenda, resembling a fig.

FINGERS, ABSCESSES OF. See *Whitlow*.

Fingers, *Amputation of.* See *Amputation*.

Fingers, *Necrosis of.* In these cases, the surgeon is to endeavour to extract the exfoliating portions of bone, immediately they become loose. For this purpose he is justified in making such incisions, as will enable him to fulfil the object in view. Until the process of exfoliation is sufficiently advanced, he can do little more, than apply simple dressings, and keep the part in a clean quiet state.

When the separation of the dead pieces of bone will certainly destroy the utility of the finger, and convert the part into an inconvenient, stiff appendage to the hand; or, when the patient's health is severely impaired by the irritation of the disease, the termination of which cannot be expected, within a moderate space of time; amputation is proper. It is a truth, however, that many fingers are amputated, which might be preserved, and surgeons ought to consider well, before presuming to remove parts, which, when curable, may become of the greatest consequence in regard to the perfection of the hand. The bread of many persons, it is well known, depends on the unmutilated state of certain fingers. These remarks are offered, because I have seen several surgeons, fond of seizing every opportunity of cutting their fellow-creatures, remove fingers which might have been usefully saved, either by allotting a little more time for the exfoliation, or by making incisions, and cutting out the dead piece of bone.

Fingers, *Dislocations of.* See *Dislocation*.

Fingers, *Fractures of.* See *Fracture*.

Fingers supernumerary. The instances of children born with a smaller number of fingers, than natural, are more rare than cases in which the number is greater, than usual. Of the latter malformation, examples were noticed in times of great antiquity. Thus, in the 1st book of Chronicles is the following notice of such an occurrence: "There was war at Gath, where was a man of great stature, whose fingers and toes were four and twenty, six on each hand, and six on each foot." (*Ch.* xx. *ver.* 6.) Ann Boleyn, so celebrated for her beauty and her misfortunes, had six fingers on her right hand. Pliny, the naturalist, speaks of two sisters, who had six fingers upon each of their hands. In the Memoirs of the Royal Academy of Sciences for 1743, is the account of a child, which was shown at one of the meetings, and had six toes on each foot, and the same number of fingers on each hand. In each foot, there were six metatarsal bones, and in the left hand an equal number of metacarpal bones; but, in the right hand, there were only five, the outer one of which had two articular surfaces, one for the little, and the other for the supernumerary finger. In the Copenhagen Transactions, T. Bartholine has inserted the description of a very curious skeleton: on the right hand, there were seven fingers; on the left six; and, besides these circumstances, the thumb was double. On the right foot, there were eight toes; on the left, nine; the right metatarsus consisting of six bones; the left of seven. Saviard speaks of a still more curious case: he saw a new-born infant at the Hôtel Dieu at Paris, which had ten fingers on each hand, and ten toes on each foot: the phalanges seemed, as if they were all in a broken imperfect state. (*Obs. de Chir.*) The example of the greatest number of fingers and toes is recorded by Voight; including the thumb, there were thirteen fingers on each hand, and twelve toes on each foot. (*Mag. für das neueste der Naturkunde*, 3 *B. p.* 174.) Individuals are occasionally born with two thumbs on the same hand. (*Panarolus. Pentec*, 3, *Obs.* 4—8.)

Since allowing the redundant number of fingers to remain would keep up deformity, and create future inconvenience, the surgeon is called upon to amputate them. The redundant fingers are sometimes with, sometimes without a nail; seldom more numerous than one upon each hand; generally situated just on the outside of the little fingers; and, as far as my observation extends, incapable of motion, in consequence of not being furnished, like the rest of the fingers, with muscles. The phalanges are also mostly imperfectly formed, or deficient. The best plan is to cut off supernumerary fingers with a scalpel, at the place, where they are united to the other part of the hand. The operation should be performed, while the patient is in the infant state, that is to say, before the superfluous parts have acquired much size, and while the object can be accomplished with the least pain. The incisions ought to be made, so as to form a wound with edges, which will admit of being brought together with strips of adhesive plaster. As soon as the dressings are applied, the hemorrhage will almost always cease, without a ligature.

FISSURE. (from *findo*, to cleave asunder.) A very fine crack in a bone is so called.

FISTULA, in surgery, strictly means a sore, which has a narrow orifice, runs very deeply, is callous, and has no disposition to heal. The name is evidently taken from the similitude, which the long cavity of such an ulcer has to that of a pipe or reed. A fistula commonly leads to the situation of some disease keeping up suppuration; and from which place the matter cannot readily escape. No technical term has been more misapplied, than this; and no mis-interpretation of a word has had worse influence in practice, than that of the present one. Many simple, healthy abscesses, with small openings, have too often been called *fistulous;* and, being considered as in a callous state, the treatment pursued has in reality at last rendered them so, and been the only reason of their not having healed.

FISTULA IN ANO. See *Anus.*

FISTULA LACHRYMALIS. In correct language, this term can be applied only to one case, viz. that in which there is an ulcerated opening in the lachrymal sac, unattended with any tendency to heal, and from which opening a quantity of puriform fluid is from time to time discharged, especially when the lachrymal sac is compressed. Such has been the confusion, however, prevailing respecting the nature of the diseases of the lachrymal passages, and so great has been the force of ancient custom, that down to the present time, the generality of British, as well as foreign surgeons, imply by the expression, *fistula lachrymalis*, several forms of disease, totally different from each other, and to only one of which the name is at all applicable. In order not to assist in perpetuating this absurd and erroneous plan, from which nothing but mistakes and ignorance can result, I shall follow the example, pointed out by Beer, Schmidt, and our countryman, Mr. M'Kenzie, and consider the various forms of disease, to which the lachrymal passages are subject, not under the head of *fistula lachrymalis*, but under the more sensible title, *Lachrymal Organs, Diseases of the.*

FISTULÆ IN PERINÆO. As Sir Astley Cooper has justly observed, incisions in the urethra generally heal with great facility; a fact, amply proved by the common result of the lateral operation; but, when apertures are formed in the urethra, either from diseased states of the constitution and the part together, or of the latter alone, and when they are accompanied with any considerable destruction of the sides of the urethra, and of the corpus spongiosum, they are mostly very difficult of cure. (*Surg. Ess. Pt. 2, p.* 211.)

When the methods recommended for the removal of strictures (See *Urethra, Strictures of)* have not been attempted, or not succeeded, nature endeavours to relieve herself by making a new passage for the urine, which, although it often prevents immediate death, yet, if not remedied, is productive of much inconvenience and misery to the patient through life. The mode, by which nature endeavours to procure relief, is by ulceration on the inside of that part of the urethra which is enlarged, and situated between the stricture and the bladder. Thus the urine becomes applied to a new surface; irritating the part, and occasioning the formation of an abscess, into which the urine has access; and when the matter is discharged, be it by nature, or by art, the urine passes through the aperture, and generally continues to do so, whilst the stricture remains. (*A. Cooper, Surgical Essays, Part* 2, *p.* 212.)

The ulceration commonly begins near, or close to the stricture, although the stricture may be at a considerable distance from the bladder. The stricture is often included in the ulceration, by which means it is removed; but, unluckily, this does not constantly happen. The ulceration is always on the side of the urethra, next to the external surface.

The internal membrane and substance of the urethra having ulcerated, the urine readily gets into the loose cellular membrane of the scrotum and penis, and diffuses itself all over those parts; and as this fluid is very irritating to them, they inflame and swell. The presence of the urine prevents the adhesive inflammation from taking place; it becomes the cause of suppuration wherever it is diffused, and the irritation is often so great that it produces mortification, first in all the cellular membrane, and afterwards in several parts of the skin; all of which, if the patient live, slough away, making a free communication, between the urethra and external surface, and producing what are termed *fistulæ in perinæo*, though it is plain enough to every surgeon, who knows the correct meaning of the word *fistula*, that a recent opening, produced in the perineum by ulceration or sloughing, ought not to be called a fistula, immediately it is formed, and at least, not until it has acquired some of the characters, specified in our explanation of the term *fistula.*

According to Mr. Hunter, when ulceration takes place further back, than the portion of the urethra, between the glans penis and membranous part of the canal, the abscess is generally more circumscribed.

The urine sometimes insinuates itself into the corpus spongiosum urethræ, and is immediately diffused through the whole, even to the glans penis, so as to produce a mortification of all those parts. A fatal instance of this kind is reported by Mr. C. Bell. (*Surgical Obs. Vol.* 1, *p.* 92.)

Although the ulceration of the urethra may be in the perinæum, yet the urine generally passes easily forwards into the scrotum, which contains the loosest cellular substance in the body; and there is always a hardness, extending along the perinæum to the swelled scrotum, in the track of the pus. (*Hunter.*)

Sir Astley Cooper is of opinion, that, as soon as the abscesses, which are the forerunners of the fistulæ, can be plainly felt to contain a fluid, it is the best practice to open them with a lancet. The extensive destruction of parts by ulceration, will thus be prevented; the place not unfrequently then heals up expeditiously without any fistulous orifice being left, and a tendency to those dangerous extravasations of urine is also prevented, which, if the abscesses are not opened early, often prove destructive to life. (*Vol. cit. p.* 212.)

Ulceration can only be prevented by destroying the stricture; but when the urine is diffused in the cellular membrane, the removal of the stricture will generally be too late to prevent all the mischief, although it will be necessary for the complete cure. Therefore, an attempt should be made to pass a bougie, for perhaps the stricture may have been destroyed by the ulceration, so as to allow this instrument to be introduced. When this is the case, bougies must be almost constantly used, in order to procure as free a passage as possible. In these cases, Sir A. Cooper expresses a preference to metallic bougies, the size of which is to be gradually increased, until their diameter exceeds the natural diameter of the passage. In some instances, however, he says, that it will be necessary to introduce a pewter catheter, of large size, and to allow it to remain in the bladder, so as at once to act upon the stricture, and hinder the urine from passing through the preternatural opening. In this manner, a permanent cure may often be effected. Although this experienced surgeon agrees with most surgeons of the present day, respecting the general inexpediency of employing caustic for the removal of a stricture, under the preceding circumstances, yet he admits, that instances do present themselves, in which, from long neglect, the urethra, and the parts surrounding the stricture, are so altered in structure, that no instrument can be passed through the obstruction, without danger, and where the slower action of caustic is safer, than the use of a metallic bougie. (*Surgical Essays*, *Part* 2, *p*. 213.) The experience of modern surgeons tends to prove, however, that there are some cases which form exceptions to the plan of employing bougies, or catheters, though a fistulous opening may have occurred in the passage. These cases are the examples, in which the apertures in the urethra are the consequence of ulceration and abscess, unaccompanied by stricture, and taking place in a bad constitution, and perhaps only preceded by a slight discharge from the urethra. Here bougies would increase the tendency to ulceration, and aggravate the local and constitutional irritation. (*A. Cooper*, *p*. 216.)

While we are attempting to cure the stricture, antiphlogistic measures, particularly bleeding, are to be adopted. The parts should be exposed to the steam of hot water; the warm bath made use of; opium and turpentine medicines given by the mouth, and in glysters; with a view of diminishing any spasmodic affection. But, as Mr. Hunter observes, all these proceedings are often insufficient; and, therefore, an immediate effort must be made, both to unload the bladder, and to prevent the further effusion of urine, by making an opening in the urethra, somewhere beyond the stricture, but, the nearer to it, the better.

Introduce a director, or some such instrument, into the urethra, as far as the stricture, and make the end of it as prominent as possible, so as to be felt; which, indeed, is often impossible. If it can be felt, it must be cut upon, and the incision carried on a little farther, towards the bladder, or anus, so as to open the urethra beyond the stricture. This will both allow the urine to escape, and destroy the stricture. If the instrument cannot be felt, at first, by the finger, we must cut down towards it; and, on afterwards feeling it, proceed as above.

When the stricture is opposite the scrotum, as the opening cannot be made in this situation, it must be made in the perinæum, in which case, there can be no direction given by an instrument, as it will not pass sufficiently far, and the only guide is our anatomical knowledge. The opening being made, proceed as directed in the cure of a false passage. (See *Urethra, False Passage of.*) In whichsoever way the operation is done, a bougie, or a catheter, which is better, must afterwards be introduced, and the wound healed over it.

When the inflammation, from the extravasation of urine, is attended with suppuration and mortification, the parts must be freely scarified, in order to give vent both to the urine and pus. When there is sloughing, the incisions should be made in the mortified parts.

Sometimes, when the urethra is ulcerated, and the cellular membrane of the penis and prepuce is so much distended, as to produce a phymosis, it is impossible to find the orifice of the urethra.

Frequently the new passages for the urine do not heal, on account of the stricture not being removed: and even when this has been cured, they often will not heal, but become truly fistulous, and produce fresh inflammation and suppurations, which often burst by distinct openings. Such new abscesses and openings often form, in consequence of the former ones having become too small, before the obstruction in the urethra is removed.

Such diseases sometimes bring on intermittent disorders, which do not yield to bark; but cease as soon as the fistulæ, and disease of the urethra, have been cured.

In order to cure fistulæ in perinæo, unattended with the above described urgent symptoms, the urethra must be rendered as free as possible, and, this alone is often enough; for, the urine finding a ready passage forwards, is not forced into the internal mouth of the fistulæ, which therefore heal up. The cure of the strictures, however, is not always sufficient, and the following operation becomes indispensable.

The sinuses are to be laid open in the same manner as other sinuses, which have no disposition to heal. In doing this, as little as possible of the sound part of the urethra must be opened. Hence, the surgeon must direct himself to the inner orifice of the fistulæ, by means of a staff, introduced (if possible) into the bladder, and a probe passed into one of the fistulous passages. The probe should be first bent, that it may more readily follow the turns of the fistula. When it can be made to meet the staff, so much the better; for then the operator can just cut only what is necessary.

When the fistula is so straight, as to admit of a director being introduced, this instrument is the best. When neither the probe, nor the director, can be made to pass as far as the staff, we must open the sinuses as far as the first instrument goes, and then search for the continuation of the passage, for the purpose of laying it open. The difficulties of this dissection, however, in the thickened, diseased state of the parts in the scrotum and perinæum, are such as can only be duly appreciated by a man, who has either made the attempt himself, or seen it made by others. I have myself seen one of the first anatomists in London fail in two instances to trace the continuation of the urethra, and baffled in the endeavour, therefore, to pass an instrument from the orifice of that passage into the bladder. The difficulty and confusion, arising from the hardened, enlarged state of the parts, which are to be cut, have been well depicted by Mr. C. Bell. (*Surgical Obs. Vol.* 1, *p.* 129.)

Having divided the fistulæ as far as their termination in the urethra, a catheter should be introduced, and worn, at first, almost constantly. This is better than a bougie, which must be frequently withdrawn to allow the patient to make water, and it often could not be introduced again without being entangled in the wounds.

In many cases, the employment of the catheter should not be continued after a certain period. At first, it often assists the cure; but, in the end, it may obstruct the healing, by acting at the bottom of the wound, as an extraneous body.

Hence, when the sores become stationary, let the catheter be withdrawn, and introduced only occasionally. And even after the sores are well, it will be prudent to use the bougie, in order to determine whether the passage is free from disease.

When fistulæ in perinæo have been laid open, the wounds are to be at first dressed down to the bottom as much as possible, which will prevent the re-union of the parts first dressed, and make the granulations shoot from the bottom, so as to consolidate the whole by one bond of union. (*Hunter on the Venereal Disease, Ed.* 2.) Additional observations upon this subject, and, in particular, the opinions of Desault, will be found in the article *Urinary Abscesses and Fistulæ.* Sir A. Cooper's practice in cases, where a considerable portion of the urethra has been destroyed, will be hereafter noticed. (See *Urethra*.)

FISTULA, SALIVARY. (See *Parotid Duct.*)

FLUCTUATION. (from *flucto, to float.*) The perceptible motion communicated to any collection of purulent matter, or other kind of fluid, by applying the fingers to the surface of the tumor, and pressing with them alternately, in such a manner, that the fingers of one hand are to be employed in pressing, or rather in briskly tapping upon the part, while those of the other hand remain lightly placed on another side of the swelling. When the ends of one set of fingers are thus delicately applied, and the surgeon taps, or makes repeated pressure with the fingers of the other hand, the impulse, given to the fluid, is immediately perceptible to him, and the sensation, thus received, is one of the principal symptoms, by which practitioners are enabled to discover the presence of fluid in a great variety of cases. Great skill in ascertaining by the touch the presence of fluid in parts, or being endued with the *tactus eruditus*, as it is termed, distinguishes the man of experience as remarkably, perhaps, as any quality that can be specified.

When the collection of fluid is very deeply situated, the fluctuation is frequently exceedingly obscure, and sometimes not at all distinguishable. In this circumstance, the presence of the fluid is to be ascertained by the consideration of other symptoms. For example, in cases of hydrops pectoris and empyema, surgeons do not expect to feel the undulation of the fluid in the thorax with their fingers; they consider the patient's difficulty of breathing, the uneasiness attending his lying upon one particular side, the œdema of the parietes of the chest, the dropsical affection of other parts, the more raised and arched position of the ribs on the affected side, the preceding rigors, fever, and several other circumstances, from which a judgment is formed, both with regard to the presence and the peculiar nature of the fluid.

FOMENTATION. By a fomentation, surgeons commonly mean the application of flannel or towels, wet with warm water, or some medicinal decoction. In the practice of surgery, fomentations are chiefly of use in relieving pain, and inflammation, and in promoting suppuration, when this is desirable. Some particular decoctions, however, are used for fomentations, with a view of affecting by means of their medicinal qualities, scrofulous, cancerous, and other sores, of a specific nature. I shall merely subjoin a few of the most useful fomentations in common use.

FOMENTUM AMMONIÆ MURIATÆ. ℞. Fomenti Communis ℔ij. Ammon. Mur. ℥j. Spirit. Camph. ℥ij.

Just before using the hot decoction, add to it the ammonia muriata, and spirit. Said to be of service to some indolent ulcers; and, perhaps, it might be of use in promoting the absorption of some tumors, and suppuration in others.

FOMENTUM CHAMÆMELI. ℞. Lini contusi ℥j. Chamæmeli ℥ij. Aq. Distillat. ℔vj. Paulisper coque, et cola. A fomentation in very common use.

FOMENTUM CONII. ℞. Fol. Conii. recent. ℔j. vel. Fol. Conii. exsiccat. ℥iij. Aq. Comm. ℔iij. Coque usque reman. ℔ii. et cola. Sometimes applied to scrofulous, cancerous, and phagedenic ulcers.

FOMENTUM GALLÆ. ℞. Gallæ Contusæ, ℥ss. Aq. Ferventis ℔ij. Macera per horam, et cola. Used for the prolapsus ani, and sometimes employed, as a cold application, in cases of hemorrhoids.

FOMENTUM PAPAVERIS ALBI. ℞. Papav. Alb. Exsiccati, ℥iv. Aq. Pur. ℔vj. Bruise the poppies, put them in the water, and boil the liquor, till only a quart remains, which is to be strained. This fomentation is an excellent one, for very painful inflammations of the eyes, and for numerous ulcers, and other diseases, attended with intolerable pain.

FORCEPS, an instrument much employed in surgery for a variety of purposes, and having accordingly various constructions. The general design, however, of surgical forceps is to take hold of substances, which cannot be conveniently grasped with the fingers; and, of course, the instrument is always formed on the principle of a pair of pincers, having two blades, either with, or without handles, according to circumstances. The smallest forceps is that which is employed in the operation of extracting the cataract, and which is useful for removing any particles of opaque matter from the pupil, after the chief part of the crystalline lens has been taken away.

Another forceps, of larger size, is that used for taking up the mouths of the arteries, when these vessels require a ligature, in cases of hemorrhage. This instrument is also frequently employed for taking dressings off sores, removing pieces of dead bone, foreign bodies from wounds, and, particularly, for raising the fibres, which are about to be cut, in all operations, where careful dissection is required. This forceps resembles that, which is contained in every case of dissecting instruments, and is often called the *artery*, or *dissecting* forceps, from its more important uses.

Neither of the foregoing forceps is made with handles; each opens by its own elasticity; and the ends of the blades only come into contact, when pressed together by the surgeon.

The following kinds of forceps are constructed with handles, by means of which they are both opened and shut:

1. The common forceps, contained in every pocket-case of surgical instruments, and used for removing dressings from sores, extracting dead pieces of bone, foreign bodies, &c.
2. Larger forceps, employed for extracting polypi.
3. Forceps of different sizes and constructions, used in the operation of lithotomy, for taking the stone out of the bladder, or for breaking the calculus, when it is too large to be extracted in an entire state.
4. Cutting forceps, as the common bone-nippers, and the sharp-forceps, made with the edges in the same line with the handles, used by Mr. Liston for the division of bones.

FRACTURE. (from *frango*, to break.) Is a solution of continuity of one, or more bones, produced in general by external force; but occasionally, by the powerful action of muscles, as is often exemplified in the broken patella.

The subject of fractures is so interesting a branch of surgery, and the accidents themselves so frequent and important, that the little which English surgeons have done for the improvement of this part of their profession cannot but cause equal surprise and regret. Mr. Pott, it is true, made many excellent observations on the treatment of fractures in general, and his remarks on compound fractures in particular are in some respects the best which are extant; but what surgeon will now presume to defend the weak arguments, upon which he has founded the doctrine of paying unqualified attention to the relaxation of the muscles, as if this were an object, which should constantly supersede every other consideration, and invariably regulate the posture of the limb? I have no hesitation in declaring my own belief, that the doctrine and practice recommended by Mr. Pott, in regard to fractured thighs, have done considerable harm, and the more so, as coming from a man, who was deservedly looked upon as one of the best and most experienced judges of surgical practice. Many a surgeon in this country implicitly believed every thing, which was asserted by so able a master, and the very observations, which some years ago were here considered to be the glory of their author, and the pride of English surgery, are now exposed by the surgeons of neighbouring countries, as specimens of our wrong precepts and bad practice. M. Roux, in fact has had but too much room for animadversion upon this subject. Down to the period of his visit to this country, if we except some of Mr. Pott's observations on the use of the 18 tailed bandage, the necessity of quietude, the principles on which splints ought to be constructed, and the inestimable remarks on compound fractures by the same distinguished English surgeon, it cannot be said, that we had made a single improvement of consequence in the treatment of any particular fracture, while the generality of our surgical writers had given the most faulty and imperfect account of the diagnosis, and every thing else relating to these accidents. What is worse, a view of our practice conveyed no better opinion of this part of our surgery. Observe the care and neatness, with which a French surgeon applies the bandages, and splints, and consider how well every indication is accomplished by his apparatus, and you will find great cause both for admiration and imitation. On the other hand, see the slovenly way in which an English surgeon generally puts on the splints and roller, and the unscientific method, in which he usually treats a fractured thigh, or clavicle, and you cannot fail to be ashamed of the comparison. This was a matchless opportunity for M. Roux to draw a parallel in favour of French surgery, and of course he has not neglected it, many pages of his work being devoted to an explanation of the many improvements Desault made; the little, or rather the nothing, which we had done; and the errors, to which we unfortunately still adhere. (See *Voyage fait à Londres en* 1814, *ou Parallèle de la Chirurgie Angloise avec la Chirurgie Françoise, p.* 173, *&c.*) It is to be hoped, however, that the period has now arrived, when we shall give to the study of fractures the time, the attention, and the importance, which it claims; and when even the young hospital pupil will not be convinced, that his lecturer, by one or two cursory discourses, can have done justice to the subject. The observations, lately published by Sir Astley Cooper on fractures of the joints, are indeed highly creditable to this part of English surgery, and afford satisfactory evidence of the increased attention, which is now paid to the principles, which ought to regulate each individual case of fracture.

In this article, my plan is to follow the arrangement adopted by Boyer, in his "Traité des Maladies Chirurgicales, T. 3." I shall first speak of fractures in general, and allot separate sections to the consideration of; 1. Their differences; 2. Their causes; 3. Their symptoms; 4. Their prognosis; 5. Their treatment; 6. The formation of callus.

The subject will then conclude with a full account of the symptoms, causes, and treatment of the fractures of particular bones.

1. *Differences of Fractures.*

The differences of fractures depend upon what bone is broken; what portion of it is fractured; the direction of the fracture; the respective position of the fragments; and, lastly, upon circumstances accompanying the injury, and making it simple, compound, or variously complicated.

1. *In respect to the bone affected.* Sometimes it is one of the broad bones, as the scapula, the sternum, or the os ilium. Sometimes it is a

short bone, like the os calcis; but, far more commonly, it is one of the long bones. The situation and functions of the broad bones render their fractures unfrequent. The bones of the skull are the only exception to this remark; for, they are often broken; but, here the assistance of the surgeon is required less for the solution of continuity itself, than for the affection of the brain, and the extravasation of blood, with which the case is apt to be combined. Fractures of the short bones are still more unusual, because these bones, being nearly equal in their three dimensions, are capable of greater resistance, and are not much within the reach of external violence. Besides, most of them are but little exposed to the operation of outward force, by their situation, or functions. Hence, except when limbs are crushed, fractures of short bones are generally caused by muscular action, which frequently breaks the patella, olecranon, and os calcis. The long bones, which serve as pillars, or arches of support, or levers, are, from the very nature of their functions, particularly liable to fractures.

2. *In respect to the part of the bone broken.* Bones may be fractured at different points of their length. Most commonly, their middle portion is broken, and, in this circumstance, they usually break like a stick, which has been bent beyond its extensibility by a force applied at each end of it. Sometimes the fracture occurs more or less near the extremities of the bone, which is always an unfavourable event. Lastly, the bone is sometimes broken in several places, and the injury may be produced by two different causes, which operate successively, or simultaneously, upon the broken parts of the bone; or it may be occasioned by one single cause, which acts at the same moment upon several points of it. These distinctions of fractures, deduced from their particular situation, (says Boyer) are not mere scholastic refinements; they have a truly important influence over the prognosis and treatment.

3. *In respect to the direction, in which the bone is broken.* A bone may be fractured in various ways, and the fracture receives different names, according to its direction in regard to the axis of the bone. Thus, fractures are distinguished into *transverse* and *oblique.* The obliquity renders the surface of the injury larger, and materially increases the difficulty of maintaining the ends of the bone in contact, after they have been set. Oblique fractures are subject to considerable variety, which depends upon the degree of their obliquity, and whether they are partly oblique and partly transverse. When a bone is broken in different places at once, and divided into several fragments, or splinters, the fracture is termed *comminuted.*

Duverney admitted another class of fractures, viz. *longitudinal.* (See *Traité des Maladies des Os, T.* 1, *p.* 167.) But such cases were regarded by J. L. Petit as only imaginary, because he conceived, that any blow, capable of breaking a bone longitudinally, would much more readily cause a transverse fracture. For the same reason, Louis absolutely rejected the possibility of longitudinal fractures, and this sentiment has prevailed down to the present day.

The following case, however, is related by Leveillé, in order to prove the possibility of longitudinal fractures. He amputated the thigh of an Austrian soldier, who was put under his care in the year 1800, in consequence of being struck by a ball in the lower third of the leg at the battle of Marengo. The soldier had walked several miles, after receiving the injury, before he arrived at Pavia. The wound appeared simple, and likely to heal as soon as the injured portion of the tibia had exfoliated. The event turned out otherwise, and the thigh was amputated.

Levéillé has preserved the tibia, upon which the impression of the ball may be distinguished, and, from this point, run several longitudinal and oblique lines, which extend from the lower third towards the upper head of the tibia, and pass through the whole thickness of the parietes of the medullary canal. They were acknowledged to be really longitudinal fractures, by Dubois, Chaufrier, Duméril, Deschamps, and Roux, who were appointed by the Ecole de Médecine to inquire into the fact. (*Levéillé, Nouvelle Doctrine Chir. T.* 2, *p.* 158.)

In several cases of fractured thigh-bones from gunshot violence, which were under the care of Dr. Cole and myself in Holland, the bone was split longitudinally to the extent of seven or eight inches. The fact, however, that bullets and other balls do produce longitudinal fractures, is now universally admitted; and were there any doubt upon the subject, a specimen sent to England by my friend Dr. Cole would soon remove it. Boyer, who, a few years ago, denied the possibility of longitudinal fractures, in his late work remarks:—"*On trouve néanmoins, à la suite des plaies d'armes à feu, les os fendus suivant leur longueur, jusques dans leurs articulations,*"—but he is correct, when he adds, that such instances afford no proof of the possibility of a simple longitudinal fracture. (See *Traité des Maladies Chir. T.* 3, *p.* 10.)

4. *In regard to the respective position of the fragments.* These differences are highly important to be understood, because, as Boyer remarks, the treatment of fractures consists almost entirely in remedying, or preventing, the displacement of the fragments. It is not to be supposed, however, that such displacement is an absolutely essential symptom of all fractures, for it seldom exists in members composed of two bones, when only one of them is broken. Neither does it constantly happen in every fracture of the neck of a bone, as is exemplified in certain fractures of the neck of the thigh-bone, the fragments of which sometimes change their relative situation only when the patient tries to walk, or the limb is imprudently moved about. Fractures of the leg are also observed, in which there is neither a displacement of the fragments, nor an alteration in the shape of the limb, especially when the tibia alone is fractured near its upper part, where it is very thick. When the ulna alone is broken at its upper part, there is hardly ever any displacement. The corresponding surfaces of the fragments having a large extent cannot be separated, or can only be so with difficulty. Fractures of the fibula are also frequently unattended with displacement. But, it is a symptom, which almost constantly occurs when both bones of the leg, or forearm, are fractured,

together; as also in fractures of limbs, which contain only one bone, on account of the little extent of the surfaces of the fracture, and the great number of muscles, which tend to displace them.

The displacement may happen in respect to the diameter, length, direction, or circumference, of the bone.

In respect to the diameter. Transverse fractures are the only cases, in which this kind of displacement is observed. The two fragments may either be in contact at a part of their surfaces, or they may not be in contact at all. In the latter circumstance, the limb is shortened by the ends of the fracture slipping over each other.

In respect to length. This mode of displacement, in which the ends of the broken bone ride more or less over each other, constantly occurs in oblique fractures, and sometimes in transverse ones, when the displacement, in the direction of the diameter of the bone, has been such that the surfaces of the fracture are no longer in contact. It will be hereafter explained, that whenever the limb is shortened in fractures of the extremities, it is the lower fragment which is displaced.

We may refer to the species of displacement here spoken of, that which takes place in fractures of the patella, olecranon, and os calcis; but with this difference, that the fragments, instead of riding over each other, separate from each other in the direction of the length of the bone, and continue separated by an interspace more or less considerable.

In respect to the direction of the bone. In this kind of displacement, the two fragments form an angle more or less prominent, and the bone appears arched. It is principally observed in comminuted fractures. It may also happen in simple fractures; for instance, in the leg, when the limb in a straight posture does not lie upon a surface exactly horizontal, and the heel is lower, than the rest of the leg. The angular projection is then anterior. On the contrary, it would be posterior, if the heel were too much raised.

In respect to the circumference of the bone. This displacement occurs when the lower fragment performs a rotatory movement, while the upper one continues motionless. Thus, in fractures of the neck of the femur, if the foot is badly supported by the apparatus, its weight, together with that of the limb, and the action of the muscles, inclines it outward, and turns the lower fragment in the same direction.

Besides the simple displacements, above described, there are others of a more complicated nature, which happen in several directions at once. For example, such is the displacement, which is observed in a fracture of the thigh-bone, when the lower fragment is drawn upward and inward, while the foot is turned outward.

Let us next consider the causes producing the displacement of fractures.

The bones being only passive instruments of locomotion, possess not, in their own organization, any cause of the change of situation which takes place; but yield to the impulse of external bodies, the weight of the member, and the action of the muscles.

The displacement may be produced by an external force, either at the moment when the fracture happens, and by the very action of the fracturing cause itself; or it may be caused by the weight of the body when the fracture precedes the fall; or, lastly, it may be brought on by some other external force, acting on the fragments, sooner or later, after the occurrence of the injury.

The outward violence, which is productive of a fracture, operates sometimes directly on the situation of the breach of continuity; sometimes on parts more or less distant from this place. In both cases, the action of the force is not confined to the production of the fracture, but is partly spent in causing a displacement of the fragments.

Fractures are generally occasioned by falls. Sometimes, however, the fall does not happen till after the leg, or thigh, is actually broken. The weight of the body then produces the displacement, by pushing the upper fragment against the soft parts, which are more or less lacerated. This is what happened to Ambrose Paré, who, being kicked by a horse, endeavoured to get out of the way, but instantly fell down, and the two bones of his left leg, which had been fractured, being impelled by the weight of the body, not only passed through the skin, but even through his stocking and boot. Boyer has seen a case nearly similar in a young man about twenty years of age, who, in a standing posture, was struck on the middle of the thigh with the pole of a carriage, which fractured the femur. The patient fell down, and in the fall the upper fragment was not only driven through the muscles and integuments, but also through his breeches.

The weight of the limb itself may produce displacement according to the direction, or circumference of the bone, as already detailed. The disturbance of the limb, also, in lifting the patient, and carrying him to his bed, may sometimes alter the relative situation of the fragments, and cause them to be displaced.

But, of all the causes of the displacement of fractures, the action of the muscles is the common and most powerful one. Amongst the muscles, surrounding a fractured bone, some are attached to it throughout its whole length, and are equally connected with both the fragments. Some arise from the bone above, and are inserted either into that, which is articulated with the lower fragment, or into the lower fragment itself. Lastly, there are others, which come from a point more or less distant, and terminate in the upper fragment. The muscles round the thigh-bone furnish examples of these three arrangements. The triceps is attached to the bone its whole length. The biceps, semi-membranosus, and semi-tendinosus, come from the pelvis, and are inserted into the leg, a part, with which the lower fragment is articulated, and all the motions of which it follows. The great head of the triceps is inserted into this fragment itself. Lastly, the iliacus, psoas, pectineus, &c. come from the loins and pelvis, and are attached to the femur, not far from its upper end.

The muscles, attached to both fragments, contribute very little to their displacement. They may, however, draw them to the side, on which they are situated, and thus change the direction of the limb. The triceps, especially its middle portion, acts in this manner in fractures of the femur, and renders the thigh convex anteriorly. The coraco-brachialis tends to produce the same effect, when the humerus is broken below its middle.

The displacement is principally owing to such muscles as are affixed to the lower fragment, or part with which this fragment is articulated. Suppose the humerus to be broken between its upper end and the insertion of the great pectoral. This muscle, aided by the latissimus dorsi and teres major, will draw the lower fragment inward, and displace it by drawing it to the inner side of the upper fragment, which remains motionless. In fractures of the neck of the thigh-bone, the upper fragment, included within the capsular ligament, affords attachment to no muscle. All those, which are affixed to the lower fragment, pull it upward and backward, in which direction the displacement is inevitable. In all fractures, the lower fragment follows every movement made by the part of the limb with which it is articulated, and, consequently, the muscles which are attached to the bones of this last part of the limb, become a powerful cause of displacement. Thus, in a fracture of the thigh-bone, the biceps, semitendinosus, and semi-membranosus, draw the leg, and with it the lower fragment, upward, inward, and backward, so as to make the lower end of the fracture ascend at the inside of, and rather behind, the upper one, the extremity of which then projects forward and outward. In a fracture of the leg, the gastrocnemius, soleus, and peronei muscles, acting upon the foot, pull the lower fragments of the tibia and fibula, and draw them to the outer and posterior side of the upper fragments. For, here, as well as every where else, the strongest muscles, in producing the displacement, draw towards their own side the end of the fracture, on which they operate. And as the posterior muscles of the leg are far more numerous and powerful than those on the front of the limb; while those on its outside are not antagonized by any others; the displacement must happen in the direction backward and outward. Whenever therefore a bone is fractured at a given point, a knowledge of the muscles will enable one to determine *à priori* in what direction the displacement will occur, if no means be taken to impede it, and it proceed altogether from this particular cause.

Lastly, the muscles, which are attached only to the upper fragment, may sometimes displace it. In a fracture of the thigh, situated immediately below the little trochanter, the psoas and iliacus muscles together carry forward the extremity of the upper fragment, which elevates the integuments, and forms a more or less considerable projection near the fold of the groin. But, it is to be observed, that, in general, the displacement of the upper fragment is not common, and that it is the lower one, which is drawn out of its proper position.

The manner, in which the displacement of fractures is effected by the action of muscles, explains one circumstance, which frequently attends these cases, especially fractures of the thigh, clavicle, and leg. This is a rising, a projection, of the upper fragment, or that which is nearest the trunk. One might believe, at first sight, that such projection is formed by the upper fragment, which, quitting its natural situation, rises over the lower one. But, on the least reflection, it becomes manifest, that the upper end of the fracture projects only because the lower one is displaced, and drawn towards that side on which the strongest muscles are situated. Thus, in practice, in order to make the *rising end of the bone*, (as it was termed) disappear, it is only necessary to reduce the lower fragment into its natural place. If instead of doing this, pressure be made on the projecting part, the design fails; and if the plan be still more forcibly pursued and continued, inflammation, and sloughing, of the integuments and other soft parts, and the conversion of the case into a compound fracture, are likely to be the unfortunate consequences.

5. *In respect to circumstances, with which fractures are accompanied.* The most important division of fractures is into *simple* and *compound*.

By a *simple fracture*, surgeons mean a breach in the continuity of one, or more bones, without any external wound, communicating internally with the fracture, and caused by the protrusion of the ends of the broken bone, or bones. By a *compound fracture*, they signify the same sort of injury of a bone, or bones, attended with a laceration of the integuments, which laceration is produced by the protrusion of one, or both ends of the fracture.

The dangerous nature of compound fractures will be fully explained in the sequel of this article: the subject indeed has been already touched upon in speaking of *Amputation*.

Fractures are said to be *complicated*, when they are attended with diseases, or accidents, which render the indications in the treatment more numerous, and require the employment of different remedies, or the practice of sundry operations, for the accomplishment of the cure.

Thus, fractures may be complicated with severe degrees of contusion, wounds of the soft parts, the injury of large blood-vessels, a dislocation, or disease, such as the scurvy, rickets, lues venerea, pregnancy, &c. which are said to retard the formation of callus, and render the cure more backward.

The complication of fracture with dislocation happens but seldom, and it cannot occur, unless the luxation has taken place first, or has been produced at the same time with the fracture, and by the same cause. When once the fracture has happened, the fragments are not sufficiently within the grasp of external force, and are too moveable to admit of the bone being dislocated.

A patient with fracture may be attacked by an acute disease, which may render the treatment more troublesome, and the cure slower.

2. *Causes of Fractures.*

The causes of fractures are divided into *predisposing* and *remote*.

In the first class are comprehended, the situation and functions of the bones, the age of the patients, and their diseases. Superficial bones are more easily fractured, than those which are covered by a considerable quantity of soft parts. The functions of some bones render them more liable to be fractured, than others; thus the radius, which supports the hand, is more liable to be fractured, than the ulna. The clavicle, which serves to keep the shoulder in its proper position, and support on its arched extremity all the motions of the upper extremity, is particularly subject to be broken. The gradual increase of the quantity of the phosphate of lime, in the structure of the bones, makes them brittle, in proportion as we advance in years, and, in old age, the proportion of the inorganized to the organized part is so great, that the bones are fractured by the slightest causes. In childhood, the fibrous and organized part bears a greater proportion to the earth, and the bones being, consequently, more elastic and flexible, are not so easily broken, as in old age.

Lues venerea, arthritis, cancer, rachitis, scurvy, and scrofula, says Levéillé, predispose to fractures. B. Bell mentions two venereal patients, of whom the hardest and largest bones were completely broken by the ordinary action of the muscles of the limb. Fabricius Hildanus quotes from Sarazin, a physician of Lyons, the case of a gouty patient, sixty years of age, who, in putting on his glove, broke his arm above the elbow. Desault used often to speak of a nun of Salpêtrière, whose arm was broken, as a person was handing her out of a carriage. Louis, who was vexed, that no union took place, was not a little surprised to find her thigh-bone experience the same fate, one day as she was changing her posture in bed. It was then learned, that she had a cancer in her right breast. Levéillé assures us, that he has observed similar cases in the Hôtel Dieu, and Sir Astley Cooper has met with others. (See *Cancer.*)

According to Levéillé, the history of two girls is related by Buchner, one of whom died ricketty at the age of sixteen, having broken the femur a short time before her death; and the other, after taking the breast very well for two years, and thriving for a time, became affected with rachitis, and met with the same accident as she was merely running along the street. (*Nouvelle Doctrine Chir. T. 2, p.* 163.)

Many extraordinary instances of fractures from the morbid softness and fragility of the bones are upon record. Suffice it here, to refer to the Philosophical Transactions; Mém. de l'Acad. Royale des Sciences; Act. Hafniens.; Ephem. Nat. Cur. Dec. 1, Ann. 3, Obs. 112; Gooch's Chirurgical Works, Vol. 2; Saviard, Observations Chir. p. 274, &c. (See also *Fragilitas* and *Mollities Ossium.*)

On the subject of fractures, produced by the scurvy, Levéillé recommends us to peruse Marcellus Donatus; Saviard's Observations; Heyne de Morbis Ossium; Poupart's Works inserted in the Mém. de l'Acad. de Sciences, 1699; and the Treatise published at Verona, in 1761, by Jean de Bona. To these works, I would add Lord Anson's Voyage, in which the effect of the scurvy in producing the absorption of the callus of old fractures, and a disjunction of the fragments, is very curiously exemplified.

Paré, Platner, Callisen, and several other writers, set down cold, as a predisposing cause of fractures. This doctrine has originated from these injuries being more frequent in the winter time, but is quite erroneous, since, in cold counties, the greater number of falls, which happen in winter, from the slippery state of the roads, is a circumstance, that fully explains why fractures are then more common, than in summer.

The remote cause of fractures is external force variously applied, in falls, blows, &c. In particular instances, the bones are broken by the violent action of the muscles attached to them; this is almost always the case with the fractured patella. The olecranon and os calcis have likewise been broken by a violent contraction of the muscles inserted into them. With respect to the heel, Petit records two instances, one of which, was communicated to him by Poncelet, and the other seen by himself in Madame La Presidente de Boissire, who met with the accident in walking a gentle pace in the court of the Hôtel de Soubise. When the injury happens in leaping, or falls from a high situation, Levéillé thinks it more probable, that a portion of the os calcis is torn off by the powerful action of the muscles of the calf, than that it is broken by any blow immediately on the part. He states, that Desault used frequently to cite two examples of this kind, one of which is recorded in his Œuvres Chirurgicales.

Whether the long bones can be fractured by the mere action of the muscles, is yet an unsettled point. In the Philosophical Transactions, a fracture of the humerus is ascribed to this cause, and Botentuit saw the same accident produced by striking a shuttlecock with a battledore. According to Debeaumarchef, as a man was descending a ladder at a quick rate, his heel got entangled in an opening, and he made a violent exertion to avoid falling. The consequence was a fracture of the lower third of the leg. Curet informs us, that a cabin-boy, aged seventeen, made a considerable effort to keep himself from being thrown down by the rolling of the ship, as he was making water. The femur was fractured by the powerful action of the muscles of the thigh. The lad had no fall, and, with some difficulty, supported himself on the other limb, till he received assistance.

We are told, says Levéillé, by Poupée Desportes, that a negro, about twelve or thirteen years old, was seized with such violent spasmodic contractions of the muscles of the lower extremities, that the feet were turned backward, and the neck of each thigh-bone was fractured, the ends of the broken bones also protruding through the skin upon the outside of the thigh. A cure was effected after an exfoliation. We read also, in the Melanges des Curieux de la Nature, that, during a fit of epilepsy, a child, ten years old, had its left humerus and tibia broken, and, that upon opening the body, other solutions of continuity were observed. Chamseru assisted in dressing a child, eleven or twelve years old, that had broken the humerus in throwing a stone a considerable distance. (*Levéillé, Nouvelle Doctrine Chir. T.* 2, *p.* 164, 166.)

Richerand, however, positively denies, that a long bone, when healthy, can ever be broken by the mere contraction of the muscles. (*Nosogr. Chir. T.* 3, *p.* 12, *Edit.* 4.)

For my own part, making all due allowance for the inaccuracy of some of the reports made by writers, I think the possibility of the long bones being broken by the violent action of the muscles is sufficiently proved. I have never seen but one example; but it was a very unequivocal one: I once attended, for the late Mr. Ramsden, an exceedingly strong man, at Pentonville, who broke his os brachii in making a powerful blow, although he missed his aim and struck nothing at all. The whole limb was afterwards affected with vast swelling and inflammation. This man, I remember, was also visited by Mr. Welbank, of Chancery-lane. According to Nicod, the greater number of fractures of long bones, by mere muscular action, are preceded by pains in the broken limbs, and, in one of the cases, published by this author, not only was this circumstance remarked, but an abscess and exfoliation of a portion of the fractured humerus ensued. In another instance, reported by this gentleman, the clavicle, in a state of preternatural fragility from disease, was fractured in an effort to carry the arm far behind the back. After the reunion of the fracture, an abscess took place, and a piece of the bone exfoliated. (*Annuaire Med. Chir. des Hopitaux de Paris, p.* 494—8, *&c. 4to. Paris,* 1819.)

3. *Symptoms of Fractures.*

Some of the symptoms of fractures are equivocal: the pain, and inability to move the limb, commonly enumerated, may arise from a mere bruise, a dislocation, or other cause. The crepitus; the separation and inequalities of the ends of the fracture, when the bone is superficial; the change in the form of the limb; and the shortening of it; are circumstances, communicating the most certain information; and the crepitus, in particular, is the principal symptom to be depended upon, though occasionally attendant on dislocations, and arising, as Sir Astley Cooper has explained, from a change in the quality of the synovia. (*On Dislocations, &c. p.* 6.) The signs of fractures, however, are so exceedingly various, according to the bones, which are the subject of injury, that, it cannot be said, that there is any one, which is invariably present and characteristically confined to them. The writers of systems of surgery usually notice loss of motion in the injured limb, deformity, swelling, tension, pain, &c. as forming the general diagnosis of fractures. However, it is easily comprehensible by any one, acquainted with anatomy, that numerous fractures cannot prevent the motion of the part, nor occasion outward deformity; and every surgeon must know, that, though, at first, there may be pain in the situation of a fracture, no swelling and tension take place till after a certain period.

When, therefore, a limb is broken, and the event is not manifest from the distortion of the part, it is proper to trace, with the fingers, the outlines of the suspected bone: if it be the tibia, let the surgeon examine with his fingers, whether any inequality can be discovered along the anterior surface, and along the sharp front edge of that bone. If it be the clavicle, let him trace the superficial course of the bone, in the same attentive manner. Wherever any unusual pain occurs, or any unnatural irregularity appears, let him try, if a grating, or crepitus, cannot be felt, on endeavouring to make one end of the suspected fracture rub against the other. When the humerus, or the os femoris, is the subject of inquiry, a crepitus is felt almost as soon as the limb is touched, and, in the case of the broken thigh, there is a considerable shortening of the extremity, except in a few cases of fractures, completely transverse. But, when there are two bones, as in the leg and the forearm, and only one is broken, the other continues to prevent the limb from being shortened, and thrown out of its natural shape, so that a crepitus can only be felt by a very careful examination with the fingers. The difficulty of the diagnosis is increased, when the surgeon is consulted late, and great swelling has come on. "Where is the surgeon," says Boyer, "that has not sometimes hesitated to deliver an opinion in certain cases of this description?" (*Traité des Malad. Chir. T.* 3, *p.* 27.)

When the injured limb is shortened, the surgeon, before pronouncing that such change proceeds from the riding of the fragments over each other, must be sure, that the bones are not dislocated, and that the limb is not naturally shorter, than the other, or in consequence of a previous fracture, that has been badly set.

In comparing the length of the lower extremities, one should place the pelvis in a horizontal position, and put the two anterior superior spines of the ossa ilium in the same line; for, if these processes are not on a level, the limb, towards which the pelvis inclines, will seem longer, than the opposite member.

The practitioner, who is well acquainted with the anatomy of the limbs, and particularly with the mutual relations of the eminences of the bones to each other, will readily perceive the alterations produced by a fracture. Whenever, in consequence of a fall, or blow, a limb becomes concave at a part, where it ought to be convex; or straight, et vice versa; the change of shape and direction must proceed from a fracture with displacement. The inner edge of the great toe, when the leg rests on a horizontal surface, should correspond with the inner edge of the knee-pan. If this natural relation be altered; if the inner edge of the great toe correspond with the outer edge of the knee-pan, there can be no doubt of the existence of a fracture of both bones of the leg. (*Boyer, Vol. cit. T.* 3, *p.* 25.)

I am aware, that considerable harm, and great unnecessary pain, have been occasioned in the practice of surgery, by too much solicitude to feel the grating of fractured bones, and, whenever the case is sufficiently evident to the eyes, the practitioner who gives way to this habit, at the expense of torture to the unfortunate patient, ought in my opinion to be severely censured. A fracture is an injury, necessarily attended with a great deal of pain, and followed by more, or less swelling, and inflammation; and to increase these evils, by roughly, or unnecessarily handling the part, is ignorantly cruel, and, (if I may use the expression) unsurgical.

In some kinds of fractures, the broken bone is so surrounded with thick fleshy parts, that it is difficult to feel a crepitus, or ascertain the existence of the injury. Some fractures of the neck of the thigh-bone, unattended with much retraction of the limb, are cases illustrative of this observation. Whether Laennec's stethoscope will become practically useful, as a means of elucidating the diagnosis, further time and experience must determine: Lisfranc is said to have used it with success. (See *Edinb. Med. and Surg. Journ. No,* 78, *p,* 237.)

4. *Prognosis of Fractures.*

The prognosis of fractures varies, according to the kind of bone injured, what part of it is broken, the direction of the breach of continuity, and what other mischief complicates the case. Fractures of bones which have many strong muscles inserted into them, are more difficult of cure, than those of other bones, which have not so many powers attached to them, capable of disturbing the fragments.

A fracture of the middle part of a long bone, is less dangerous, than a similar injury near a joint. Fractures near joints may occasion a false anchylosis. Thus, in a fracture of the thigh-bone, near the condyles, the inflammation and swelling extend to the knee-joint, which is affected with a degree of stiffness that continues for a long while, and sometimes cannot be entirely cured during life. Besides, the inflammation of the joint is attended with more severe symptoms, in consequence of the contusion having been more violent. In a fracture near an articulation, it is to be observed, also, that the splints have little command over the short fragment, so that it is often difficult to prevent displacement; and, with respect to a transverse fracture of the neck of the thigh-bone *within the capsular ligament,* no unequivocal specimen of the reunion of such a case *by means of bony matter,* is to be met with in any museum in this country, so that the opinion of Sir Astley Cooper, in relation to the incurability of the accident, continues as yet unrefuted.

When a bone is fractured in several places, the case is more serious, and the difficulty of cure much augmented. But, the accident is still worse, when a limb is fractured in two different places at once; as, for instance, in the thigh and leg. Here it is almost impossible to reduce the fracture of the thigh and maintain the reduction well, so as to preserve the natural length of the limb. (*Boyer, Traité des Mal. Chir. T.* 3, *p.* 29.)

Oblique fractures are more troublesome, and difficult of cure, than transverse ones, because an oblique surface does not resist the retraction of the lower portion of the broken bone, and consequently it is very difficult to keep the ends of the fracture duly applied to each other.

Fractures, complicated with violent contusion of the soft parts, or with a wound, rendering them *compound,* are much more dangerous, than others free from such accidents. The bad symptoms, which render compound fractures so dangerous, are of many kinds: hemorrhage; violent and extensive inflammation of the limb, with extreme pain, delirium, and fever; large abscesses; gangrene; &c. Fractures of the leg are generally more serious, than similar injuries of the upper extremity. The wound of a large artery may add considerably to the danger of a fracture.

In a debilitated old man, a fracture is less likely to end well, than in a healthy child, or strong young subject. In extreme old age, the cure of a fracture is always more difficult, and sometimes impossible. (*Boyer, T.* 3, *p.* 32.) The scurvy certainly retards the formation of callus, and, as I have already noticed, even produces its absorption again; but, it is not true, that pregnancy always prevents the union of fractures. Some years ago, I attended for Mr. Ramsden, a woman in a court, leading out of St. Paul's Churchyard, who broke both bones of her leg, when she was several months gone with child. Her pregnancy, however, did not appear to be at all unfavourable to the cure, as she got quite well in the usual time. "It is not generally settled," says a modern writer, "whether pregnancy should be accounted a complication. I have, as well as some other practitioners, seen a pregnant woman get well of a simple fracture in the ordinary time." (*Levéille, Nouvelle Doctrine Chir. T.* 2, *p.* 159.) And in another place he says, "*Contre l'opinion de Fabrice de Hildan, l'experience m'a prouvé que, chez les femmes grosses, le cal était aussi prompt a se former, que chez toute autre personne.*" (*Op. cit. T.* 2, *p.* 172.) The experience of Boyer also tends to prove, that pregnancy is not unfavourable to the union of fractures. (See *Traité des Mal. Chir. T.* 3, *p.* 32.)

The cases, in which fractures remain disunited, will be considered in a future section of the present article.

5. *Treatment of Fractures in general.*

The general treatment of fractures embraces three principal indications. The first is to reduce the pieces of bone into their natural situation. The second is to secure and keep them in this state. And the third, is to prevent any unpleasant symptoms likely to arise, and relieve them when they have come on.

The first indication is only applicable to cases attended with displacement; for, when the fragments are not out of their relative position, the surgeon must strictly refrain from all avoidable disturbance of the limb. His interference should then be limited to putting up the fracture, resisting the accession of all unfavourable symptoms, and removing them, if possible, after they have taken place.

6. *Of the Reduction of Fractures.*

The means, employed for the reduction of fractures in general, are chiefly three, viz. *extension; counter-extension;* and *coaptation,* or *setting.* But, as Boyer remarks, these means should vary according to the species of displacement; and surgical writers have generalized too much in representing them all three as necessary for the reduction of every kind of fracture. In fact, there are several cases, in which extension and counter-extension are positively useless: of this nature are fractures of the patella and olecranon, where the displacement consists of a separation of the fragments. Here the reduction may be accomplished, by putting the limb in a position, in which the muscles attached to the upper part of the bone are relaxed, and then pushing the upper fragment into contact with the lower.

Extension signifies the act of pulling the broken part in a direction from the trunk, with a view of bringing the ends of the fracture into their natural situation. By counter-extension, surgeons imply the act of making extension in the opposite direction, in order to hinder the limb, or even the whole body, from being drawn along by the extending power, which would then be unavailing.

It was formerly recommended to apply the extending force to the lower fragment, and the counter-extension to the upper one. Such practice, indeed, was advised by Mr. Pott, and is still generally preferred in this country; but upon the continent, it has been abandoned. The objections made to it by Boyer are: first, that it is frequently difficult and sometimes impossible, to take hold of the two fragments; as, for example, when the neck of the thigh-bone is broken. Secondly, that by applying the extension and counter-extension to the broken bone itself, most of the muscles, which surround it, are compressed, and such compression produces in these organs a spasmodic contraction, which often renders the extension and counter-extension useless, and sometimes even hurtful. (*Traité des Mal. Chir. T.* 3, *p.* 34.) The French surgeons, therefore, apply the extending force to that part of the limb, which is articulated with the lower fragment, and the counter-extension to that, which is articulated with the upper. For instance, in a fracture of the leg, the extending means act upon the foot, and the counter-extending upon the thigh; and in a fracture of the thigh, the extension is applied to the leg, while the counter-extending power fixes the pelvis.

One circumstance must here occur to the mind of the surgical reader. In this country, it is properly inculcated, that one of the first principles to be attended to in the reduction of fractures, is to put the limb in such a position as will relax the most powerful muscles connected with the broken bone; because these muscles principally impede the reduction, and disturb the ends of the fracture. But, in the French mode of making the extension and counter-extension, how can this grand principle be observed? If the extending and counter-extending means are not to be applied to the broken bone itself; but, to others, which are articulated with it, the limb must of necessity be kept in a straight posture at the time of reducing the fracture; for, were the limb placed in a half-bent state, the extension and counter-extension, as practised by the continental surgeons, would not be in the same line. If therefore, it be advantageous to bend the limb at the time of reducing a fracture, the French mode of practising extension and counter-extension must be relinquished. I am not, however, one of those surgeons, who are entirely blinded with the idea of the possibility of relaxing the whole of the muscles, connected with the broken bone, by merely bending the limb. On the contrary, I am perfectly convinced with Desault, that, in general, what is gained by the relaxation of some muscles, is lost by the tension of others. But, where it is possible to relax by a certain posture the set of muscles most capable of preventing the reduction and disturbing the coaptation of a fracture, that posture I would select. Thus, in a fracture of the leg, the strong muscles of the calf undeniably possess this power, and the bent position, which relaxes them, appears to me therefore the most judicious and advantageous, not only during the reduction, but during the whole treatment of the case. A few years ago, I had under my care, in the military hospital at Cambray, a fracture of the tibia and fibula, which was at first treated in the straight posture. The gentlemen, who assisted me, reduced the fragments, and made them lie tolerably well. But, every time the bandage was opened, the bones were always found displaced again. Finding that this inconvenience went on for two or three weeks, we resolved to lay the limb on its outside, in the bent position. Not the least trouble was afterwards experienced in keeping the fragments reduced. Unless, therefore, the situation of a wound, abscess, or some particular reason indicate an advantage or convenience from the straight posture, I always reduce a fractured leg in the bent position, which will be hereafter described. Here, therefore, I consider the French mode of making the extension and counter-extension as generally inadmissible.

I was also formerly of opinion, that the bent position of the limb on its side, as advised by Mr. Pott, was the best for fractured thighs; but, this sentiment has subsequently appeared to me erroneous, and it gives me pleasure to have this opportunity of declaring my entire conversion to the principles and practice adopted in these cases by Desault, and other eminent continental surgeons. The considerations, which have led me to this change, will be related in speaking of fractured thighs. If then the straight posture be advantageous in cases of broken thighs, I think it will be universally allowed, that the parts of the limb, recommended by the French surgeons for the application of the extension and counter-extension, are the most proper.

The evils and difficulties, formerly encountered in setting fractured limbs, undoubtedly proceeded in a great measure from the violent extension and counter-extension practised by our ancestors. As they were ignorant of the utility of relaxing the muscles, which displaced the ends of the broken bone, they had no means, but the employment of actual force, to effect the reduction. Since, however, the excellent instructions, contained in Mr. Pott's remarks on fractures, have received all the attention due to them, practitioners have generally been careful, in the reduction of fractures, to incapacitate the muscles as much as possible by relaxing them, and thus the necessity for the employment of violent extension and counter-extension is effectually removed.

It is difficult to lay down rules, respecting the precise degree of force, which should be used in making extension; for, it must vary in different cases, according to the species of displacement, and the number and power of the muscles concerned in producing it. In transverse fractures, displaced only according to the diameter of the bone, a very moderate extension suffices, as it is merely practised with a view of lessening the friction of the surfaces of the fracture, which are always more or less rough. But, whatever be the direction of the fracture, when the fragments ride over each other, the extension and counter-extension must constantly be such as to remove the shortening of the limb, and overcome the force of those muscles, which, after all attention has been paid to their relaxation, still oppose the reduction. Extension, however, ought never to be practised in a violent and sudden way; but, in as gradual a manner as possible, the utmost care being taken not to shake, nor even move the limb any more, than can be avoided. When the practitioner extends a broken member all at once violently, he excites the muscles to strong spasmodic action, and there is some danger of lacerating them, because their fibres are not allowed the requisite time to yield to the force, which elongates them. The extension is to begin in the direction of the lower fragment, and be continued in that, which is natural to the body of the bone.

In every case of fracture with displacement, as soon as the necessary extension has been made, the surgeon is to endeavour to place the ends of the broken bone in their natural situation: this is termed *coaptation*, or *setting*. This operation is to be undertaken in different ways, according to the species of displacement, and the practitioner can almost always execute it by acting upon the lower fragment, without applying his fingers directly to the fracture itself, in order to regulate the contact of the extremities of the bone. When, however, it is judged necessary for this purpose to touch the broken part itself, it should be done with the utmost gentleness, so as to avoid pressing the soft parts against the points and splinters of bone.

Although the reduction of fractures may in general be accomplished with tolerable facility, it sometimes happens, that the first attempts fail. This is occasionally ascribable to the employment of too much force, and too little management, in making the extension; so that the muscles are irritated, and act so powerfully, that the design of the surgeon is completely frustrated. Here, the grand means of success is putting the limb into such a position, as will relax the most powerful muscles, which oppose the reduction. Sometimes, however, the irritable and convulsive state of the muscles is not the effect of any wrong mode of proceeding on the part of the surgeon; but arises from the alarm, pain, and injury, caused by the accident itself. Here relaxing the muscles as much as possible is also the most likely method of removing the difficulty. In short, now that the utility of paying attention to this principle is universally known in the profession, a fracture is hardly ever met with, which cannot be immediately reduced; particularly if a copious bleeding be premised when the patient is a strong muscular subject. This evacuation, indeed, will also prove for other reasons highly beneficial, where the limb is much contused and swollen, and the tendency to inflammation is great.

7. *Of the Means for keeping Fractures reduced.*

After the bones have been put into their natural situation, time alone would complete their cure, were there not in the muscles a continual propensity to displace the ends of the fracture again. In cases of fracture, the muscles are often affected with involuntary spasmodic action, by which the broken part would certainly be displaced, were no measures taken to maintain the extremities of the broken bone in contact. Besides, the patient in easing himself, coughing, sneezing, &c. must unavoidably subject the limb to a degree of motion by which the coaptation would be altogether destroyed. Hence the necessity of employing means for fixing the broken limb so effectually, that it may continue perfectly motionless during the whole time requisite for the union of the fracture. This second indication is sometimes troublesome and difficult, and, as Boyer observes, it is in this part of the treatment, that the surgeon has an opportunity of evincing his skill. The means employed for the fulfilment of this indication are: an advantageous position; quietude; bandages; splints; and various kinds of apparatus.

In the treatment of all fractures, the position of the part, and indeed of the whole body, is a thing of material importance. Whenever the case is a fracture of the lower extremities, the patient should lie strictly in bed, until the callus is completely formed. It is likewise an advantage not to have the bed much more than a yard wide, because the surgeon and assistants can then more conveniently get at any part of the limb. Feather beds are a great deal too soft and yielding: a horsehair mattress is far preferable. Boyer, indeed, is so impressed with the utility of letting the patient lie upon a surface, which will not sink, that he recommends two mattresses to be used, and a board to be laid under the upper one, from the hip to beyond the patient's foot. (*Traité des Mal. Chir. p.* 39, *Vol.* 3.)

The most favourable position for a fractured limb, is that, in which all the muscles, passing over the fracture, and extending either to the lower fragment, or to that part of the limb, which is articulated with it, are equally relaxed. The injured limb should also have firm support at every point, and its position ought to be regulated, so that not only this object be carefully fulfilled, but at the same time the chance of displacement from the action of the muscles, or the weight of the body, or part itself, may be diminished as much as possible.

The natural or rather the most easy position of the limb, is that which is usually chosen by a person who reposes himself, or who is sleeping; for then all motion is suspended, and every part assumes that posture which is most congenial to it. In this condition, the limbs are not extended, nor yet entirely bent; but only in a moderate state of flexion. Hence, Boyer remarks, that a half-bent position of the limbs, is that, which is most natural, and that in which all the muscles enjoy an equal degree of relaxation, and, consequently, that it is, generally speaking, the best for fractures. This posture, which was recommended by Hippocrates and Galen, has been highly extolled by Pott, who appears to have exaggerated its advantages. Considered in a general way, it is without contradiction preferable to every other position of the limb; but, its employment should be liable to exceptions, as will be noticed in treating of particular fractures. (See *Boyer, Traité des Mal. Chir. T.* 8, *p.* 40.)

In whatever position a broken limb is placed (says this writer) it should bear throughout its whole length, equally and perpendicularly upon the surface on which it lies, and not be only partially supported. When, for example, only the extremities of a fractured limb rest upon the bed, the weight of the limb itself will make it bend in the situation of the fracture. The limb will also be rendered crooked, if the broken part be supported, while the extremities of the limb (especially the inferior), sink lower by their own weight. The displacement of the fracture is not the only inconvenience arising from the limb being laid upon a surface, where it is not every where equally well supported. The parts which do bear on this surface, experience a painful degree of pressure, which, if long continued, is apt to produce inflammation, and even sloughing of the integuments. Thus, in fractures of the leg, gangrene of the heel has sometimes arisen entirely from this cause. Such inconveniences may be prevented by laying a fractured limb on a surface of corresponding form; that is to say, on a surface, which is depressed where the limb has projections, and rises where it presents depressions. The surface should not be so hard as to annoy the patient, but yet it ought to be sufficiently firm not to yield to the weight of the limb and apparatus. According to Boyer, the best pillows for the support of broken limbs, are stuffed with chaff of oats, a substance, which he describes as far preferable to feathers, because it more readily admits of being pushed from the place where the limb is prominent to another situation where the member presents a depression, or hollow; and it has the advantages of being less heating than feathers, and less apt to spoil.

In whatever position fractured limbs are placed, they ought to be kept perfectly quiet during the whole time requisite for the union. If the broken bone be moved, while the callus is forming, the surfaces of the fracture rub against each other, and the process is disturbed; and, indeed, sometimes by repeatedly moving the limb, the consolidation of fractures is entirely prevented, or, at least, rendered very slow and difficult

In order to maintain the limb in the right position, and in a state of quietude, and to preserve the fragments in proper contact with respect to each other, the surgeon is to caution the patient to avoid moving at all more than can be helped, and every cause likely to subject the limb to any kind of shock, or concussion, is to be removed. But, in particular, it will be necessary to apply a retentive apparatus, usually consisting of some application to the skin itself. bandages, splints, tapes, straps, and buckles, soft pads, &c. (See *Boyer*, *Traité des Mal. Chir. T.* 3, *p.* 42.)

Upon the subject of the dressings, bandages, &c. which ought to be applied to fractures, no surgeon has written better than Mr. Pott.

"The intention (says he) in applying any kind of external medicine to a broken limb is, or ought to be, to repress inflammation, to disperse extravasated blood, to keep the skin lax, moist, and perspirable, and at the same time to afford some, though a very small degree of restraint or confinement to the fracture, but not to bind or press; and it should also be calculated as much as possible to prevent itching, an herpetic eruption, or an erysipelatous efflorescence. At St. Bartholomew's hospital, we use a cerate made by a solution of litharge in vinegar, which with soap, oil, and wax, is afterwards formed into such consistence as just to admit being spread without warming.

"This lies very easy, repels inflammation, is not adherent, comes off clean, and very seldom, if ever, irritates, or causes either herpes or erysipelas. But let the form and composition of the application made to the limb be what it may, one thing is clear, viz. that it should be put on in such manner, as that it may be renewed and shifted as often as may be necessary, without moving the limb in any manner: it being certain, that when once a broken thigh or leg has been properly put to rights, and has been deposited properly on the pillow, it ought not ever to be lifted up or moved from it again without necessity, until the fracture is perfectly united; and it is true, that such necessity will not very often occur."

Such application having been made as the surgeon thinks right, the next thing to be done is to put on a proper bandage.—That formerly used was what is commonly called a roller. This was of different lengths according to the surgeon's choice, or as it was used in the form of one, two, or more pieces.

"By such kind of bandage three intentions are aimed at, and said to be accomplished, viz. to confine the fracture, to repress or prevent a flux of humours, and to regulate the callus, (see *Duverney;*) but whoever will reflect seriously on this matter, will soon be convinced, that although some sort of bandage is necessary in every simple fracture, as well for preserving some degree of steadiness to the limb, as for the retention of the applications, yet none, nor either of these three ends can be answered merely, or even principally, by bandage of any kind whatever: and therefore, if this should be found to be true, that is, if it should appear, that whatever kind of deligation be made use of, it cannot be a principal, but only an accessary kind of assistance, and that in a small degree, and very little to be depended upon, it will follow that such kind of bandage as is most difficult to be applied with justness and exactitude, such as is soonest relaxed and out of order, such as stands most frequently in need of renewal, and, in such renewal, is most likely to give pain and trouble, must be more improper and less eligible, than one which is more easily applied, less liable to be out of order, and which can be adjusted without moving the limb, &c.

"The best and most useful bandage for a simple fracture of the leg or thigh, is what is commonly known by the name of the eighteen-tailed bandage, or rather one made on the same principle, but with a little difference in the disposition of the pieces. The common method is to make it so, that the parts which are to surround the limb make a right angle with that which runs lengthways under it; instead of which, if they are tacked on so as to make an acute angle, they will fold over each other in an oblique direction, and thereby sit more neatly and more securely, as the parts will thereby have more connexion with and more dependence on each other. In compound fractures, as they are called, every body sees and acknowledges the utility of this kind of bandage preferably to the roller, and for very obvious and convincing reasons, but particularly because it does not become necessary to lift up and disturb the limb every time it is dressed, or every time the bandage loosens.

"The pain attending motion in a compound fracture, the circumstance of the wound, and the greater degree of instability of parts thereby produced, are certainly very good reasons for dressing such wound with a bandage, which does not render motion necessary; but I should be glad to know what can make it necessary, or right, or eligible, to move a limb in the case of simple fracture? what benefit can be proposed by it? what utility can be drawn from it? When a broken bone has been well set, and the limb well placed, what possible advantage can arise from moving it? surely none; but, on the contrary, pain and probable mischief. Is it not the one great intention, to procure unition? Can moving the limb every two or three days contribute to such intention? must it not, on the contrary, obstruct and retard it? Is not perfect quietude as necessary toward the union of the bone, in a simple as in a compound fracture? It is true, that in the one there is a wound which requires to be dressed, and the motion of the limb may in general be attended with rather more pain than in the other; but does motion in the simple fracture give ease, or procure more expeditious union?

" Every benefit then which can be supposed to be obtained from the use of the common bandage or roller, is equally attainable from the use of that which I have just mentioned, with one additional, and to the patient, most invaluable advantage, viz. that of never finding it necessary to have his leg or thigh once, during the cure, removed from the pillow on which it has been properly deposited." (*Pott's Remarks on Fractures, &c.*)

In France, a universal preference is given to Scultetus's bandage in every instance, where we employ the eighteen-tailed one, from which it chiefly differs in being composed of separate pieces admitting of removal, so that when a part of the bandage is soiled, it can be taken away, without disturbing the whole of the dressings. The clean pieces are first stitched to those which are about to be removed, and then they are drawn under the part. In cases of compound fracture, where the bandage is soiled with the discharge in a very short time, and must be often removed, certainly Scultetus's bandage is the best, particularly as it possesses all the recommendations peculiar to that of the eighteen-tailed kind. (*Boyer, Traité des Mal. Chir. T.* 3, *p.* 46.)

With respect to the general objects and uses of bandages in cases of fracture, I ought to notice one design of them, which is strongly inculcated in the modern French schools: namely, that of " benumbing the irritability of the muscles" by the compression resulting from their regular and even application to the whole of the member. In describing the treatment of particular fractures, I shall have occasion to advert to the examples, in which a moderate general compression of the muscles may be attended with utility.

" The parts of the general apparatus for a simple fracture, which come next in order, (observes Mr. Pott) are the splints;" which are unquestionably the most efficient of all the applications made to a broken limb, with a view of keeping the ends of the fracture steady and in a proper state of contact. Without them, the surgeon would in vain endeavour to maintain the reduction.

" Splints," says Pott, " are generally made of pasteboard, wood, or some resisting kind of stuff, and are ordered to be applied lengthways on the broken limb; in some cases three, in others four; for the more steady and quiet detention of the fracture.

" That splints, properly made and judiciously applied, are very serviceable, is beyond all doubt; but their utility depends much on their size, and the manner in which they are applied.

" The true and proper use of splints is to preserve steadiness in the whole limb, without compressing the fracture at all. By the former they become very assistant to the curative intention; by the latter they are very capable of causing pain and other inconveniences; at the same time that they cannot, in the nature of things, contribute to the steadiness of the limb.

" In order to be of any real use at all, splints should, in the case of a broken leg, reach above the knee, and below the ankle; should be only two in number, and should be so guarded with tow, rag, or cotton, that they should press only on the joints, and not at all on the fracture.

" By this they become really serviceable; but a short splint, which extends only a little above and a little below the fracture, and does not take in the two joints, is an absurdity, and, what is worse, it is a mischievous absurdity.

" By pressing on both joints, they keep not only them, but the foot steady; by pressing on the fracture only, they cannot retain it in its place, if the foot be in the smallest degree displaced; but they may, and frequently do, occasion mischief, by rudely pressing the parts covering the fracture against the edges and inequalities of it.

" In the case of a fractured os femoris, if the limb be laid in an extended posture, one splint should certainly reach from the hip to the outer ankle, and another (somewhat shorter) should extend from the groin to the inner ankle. In the case of a broken tibia and fibula, there never can be occasion for more than two splints, one of which should extend from above the knee to below the ankle on one side, and the other splint should do the same on the other side." (See *Remarks on Fractures and Dislocations, in Pott's Chirurgical Works, Vol.* 1, *p.* 298, *&c. Edit.* 1808.)

Assalini strongly disapproves of the employment of all tight bandages, and of covering the whole of a broken limb with splints. He was called to a gentleman of rank at Paris, who had broken the knee-pan transversely. He laid the limb upon a concave splint, the shape of which was adapted to the under surface of a part of the leg and thigh. No bandage was used, merely two leather straps, which crossed upon the knee, and included the fractured bone. A perfect bony union was thus easily effected. Assalini afterwards extended the use of a concave splint, applied under the limb, to fractures of the leg and thigh. In the first of these cases, however, only the thigh is received in the hollow splint, and from this two branches, or lateral splints, go along the leg. The apparatus has also a kind of sole for the support of the foot. As this simple contrivance is fastened with a very few straps, and no plasters, or bandages, are used, the surgeon has constantly a view of the whole front of the limb, and of the fractured part of it, which Assalini thinks a great advantage. In compound fractures, he puts no other dressings on the wound but linen compresses, which are kept continually wet with cold water. (*Manuale di Chirurgia, parte prima*, 1812.) For further observations on the subject, see *Splint*.

In oblique fractures of the thigh, and sometimes even in those of the leg, the difficulty of accomplishing by the ordinary means a cure free from deformity, and especially without a shortening of the limb, has led to the idea of employing continual extension. This expression implies the operation of a bandage, or machine, which continually draws the fragments of the broken bone in contrary directions, at the same time that it restrains them from gliding over each other, and maintains them in contact during the whole time necessary for their union. In England, this practice has long been relinquished. It appears to have been chased away by the dazzling theory of relaxing every muscle in such manner as to render it incapable of displacing an oblique fracture; a theory, with which the surgeons of this country were but too much blinded by the persuasive eloquence of the late Mr. Pott. Desault saw, at once, however, every inconsistency in the doctrine of the possibility of relaxing the muscles, so as to incapacitate entirely the whole set connected with a broken thigh; and he never ceased to inculcate in his school, that, in such a case, the assistance of a mechanical apparatus applied to the limb was the main thing, by which the shortening of the limb was to be prevented. When we consider the treatment of fractured thighs, we shall find, that the principle of continual, but moderate extension, has had in France advocates of great talent and eminence, though it is a method, to which many surgeons in this country appear to entertain strong, but highly exaggerated objections.

By means of continual extension, (observes Boyer) we not only succeed in uniting the fracture, while the limb preserves its natural length; but, we afford the part a steadiness, which is singularly favourable to the formation of the callus.

In order to derive from continual extension the utmost benefit, and render the method as little painful as possible, and supportable during the whole time of treatment, the machines and bandages, according to Boyer, should be constructed and applied conformably to the following rules.

We should avoid compressing the muscles, which pass over the situation of the fracture, and the elongation of which organs is necessary to restore to the limb the length, which it has lost by the gliding of the fragments over each other.

With this view, the extending power ought to be applied to that part of the limb, which is articulated with the lower head of the fractured bone; and the counter-extending force to that, which is articulated with the upper head. If these powers were applied to the broken bone itself, the muscles passing over the fracture would suffer such compression, as would excite spasm, and render the continual extension ineffectual and even hurtful.

The extending and counter-extending force ought to be divided upon as large surfaces as possible.

The reason of this rule is obvious. The pressure of external bodies on parts is less painful, in proportion as the surface pressed upon is extensive, and the operation supported at once by numerous points. On this principle, a narrow band creates stronger and more painful pressure, than a broad one; and hence, the rollers, and other pieces of the apparatus for making the extension and counter-extension, should be as wide as possible.

The powers, making continual extension, should act according to the direction of the axis of the broken bone.

The continual extension should be practised in as slow, gradual, and insensible a manner as possible.

The muscles easily yield to a force, which stretches them, when such force acts slowly, and is very gradually increased, according to the shortness of the limb, and the power of the muscles producing the displacement. But, if one were all on a sudden to begin with making violent extension, the rough forced elongation of the muscles would excite such a spasmodic action of them, as would frustrate every attempt to restore the natural length of the limb. And, if in order to fulfil this purpose, the extending force were increased in a ratio to the resistance of the muscles, there would be danger of lacerating these organs, because their fibres would not have time enough to yield.

Lastly; the parts, upon which the extending and counter-extending force acts, should be defended; and the compression, made by the tapes, or other pieces of the bandage and apparatus, ought to be equalised.

These indications may be fulfilled by covering the parts, on which the tapes and bandages press, with tow or wool-pads; and by filling up all the depressions of the limb with the same soft substances, so as to give it a circular form. The bandages will then not hurt the most projecting parts, on which they would make a strong and injurious degree of pressure, if the depressions were not artificially filled up.

By observing these rules, says Boyer, continual extension may always be borne, even by the most delicate and irritable patients: and the important advantage will be obtained of curing the fracture, with the proper length of the limb preserved. (*Traité des Mal. Chir. T.* 3, *p.* 56, 59.)

8. *Means for preventing and removing the unfavourable Symptoms liable to arise from Fractures.*

After having reduced the fracture; applied a suitable apparatus for maintaining the reduction; and put the part in an advantageous position; the practitioner is to attend to the third indication in the treatment, viz. the prevention and removal of any unfavourable symptoms.

With the exception of a few simple fractures of the upper extremity, it is proper in all cases to allow for the first few days only very low diet, broths, tea, &c. When the patient is young, and strong, and the swelling and inflammation are likely to be considerable, venesection should be practised. In other circumstances, it may in general be dispensed with, because it is well known, that for the quick formation of callus, by which the fracture is to be united, strength and a vigorous circulation are highly favourable. The patient may be permitted to drink as often, and as much as he likes, of any cooling acid beverage. A very low diet is only to be continued the first few days, unless great inflammation arise; for, experience proves, that the method, when too much prolonged, has bad effects, and tends, on the same principle as bleeding, to retard the union of the fracture.

Costiveness is to be averted by the use of clysters, and mild aperient medicines. It must be confessed, that, in fractures of the lower extremity, the disturbance of the limb caused by the patient's being obliged to move himself, after taking a purgative, is seriously objectionable; but, perhaps, in all, and certainly in some habits, a neglect to open the bowels soon after the accident, would have still more pernicious consequences. In order, however, to lessen the disturbance, a bed-pan should be carefully introduced under the patient. Here also, I feel it my duty to recommend to the notice of the profession a very complete fracture-bed invented by my friend, Mr. Earle. One great convenience of this bed, the cost of which is moderate, is to enable the patient to void his feces, without the slightest change of position, or disturbance; an object, effected by the simple contrivance of a little kind of trap, opening under the bed, out of which a small portion of the mattress admits of being withdrawn, and a tin receptacle is placed for the reception of what is voided from the bowels and bladder. Some other advantages of this apparatus will be hereafter briefly mentioned.

With respect to external applications, we should carefully avoid using all such plasters and ointments as irritate the skin, or create a disagreeable itching; for they sometimes bring on erysipelas. The emplastrum saponis in common use is the best for all simple fractures, and it is the best, rather because it does no harm, than because it does any essential good. It is, generally speaking, a good plan for the first few days to wet the bandages with cold water; for in this way, the tendency to inflammation and swelling may be considerably lessened. The surgeon, however, should recollect, that the bandage shrinks when wet, and may become so tight as to do harm, if not attended to. Solutions of the acetate of lead, and other salts, make bandages stiff and hard; and as they are perhaps not more efficacious than cold water alone, the latter is sometimes preferred in cases of fracture.

When a fracture is well set, the position of the part right, and the bandage and splints neither too tight, nor too slack, the less the broken bone is moved, and the less the apparatus and dressings are disturbed, the better. Sometimes, however, the practitioner is obliged to take off the splints, and undo the bandage, in order to ascertain, that the ends of the fracture lie in even contact. Were he to leave the splints on the part ten days, or a fortnight, without ever being sure of this important point, he might find, when too late for alteration, that the fracture was in a state of displacement, and the limb seriously deformed. Hence, a strong reason for employing the eighteen-tailed bandage, which admits of being opened, without disturbing the limb, or even without lifting it from the surface, upon which it has been deposited.

In fractures of the lower extremities, particularly of the legs, it sometimes happens, the first two or three nights after the reduction, that the limb is affected with convulsive spasms and cramps, which make the patient start in his sleep, and displace the ends of the bone, which must be again reduced.

When the callus has acquired some firmness, the patient should still keep the part or limb quiet, until the union is perfectly consolidated. And, in fractures of the lower extremity, even after the union has proceeded so far, that the splints admit of being left off, the patient ought not to venture to get out of bed, or bear upon the limb, till several more days have elapsed.

All fractures, however simple and well treated they may be, are constantly followed by weakness and stiffness of the limb. These unpleasant consequences are the greater, the more violently the limb has been contused, the nearer the fracture is to a joint, and the longer the part has remained motionless, and without exercise. The stiffness always affects the inferior joint of the broken bone, much more than the superior. For the relief of these effects of fractures, it is customary to employ friction, liniments, emollient relaxing applications, cold washes and bathing; but, sometimes, notwithstanding such remedies, the member does not quickly recover its strength, but continues stiff and weak for a year, or even a longer time. The most effectual plans for the prevention of this state should therefore be resorted to early. These consist in making the joints, nearest the fracture, execute slight motions, as soon as the union is sufficiently advanced, not to be in danger of interruption from this practice. A great deal of caution, however, is necessary in moving the part, and it is safer for the surgeon to superintend the business himself, than leave it to the patient, or others. One of the best proceedings also for the hindrance of much weakness and stiffness in the limb after a fracture, is to discontinue the splints and tight bandages, immediately the state of the callus will allow. The manner, in which their pressure retards the circulation, and prevents the action of the muscles, is one of the principal causes of the stiffness of the limb, and, consequently, the sooner they can be safely left off, the sooner will the patient regain the free use of the limb.

In France, the chief division of fractures is into *simple* and *complicated*, which last includes, amongst many varieties, the cases which we name *compound*. We shall here briefly notice a few of the complications, and the particular treatment which they require.

Fractures (says Boyer) are always attended with a certain degree of contusion, which is constantly more severe in cases where the violence has acted directly on the situation of the fracture. But, such contusion can only be regarded as a complication of the accident, when it exists in so violent a degree as to demand a different treatment from that which is employed in simple fractures.

In this circumstance, the splints and bandage should be applied rather slackly, and the latter ought to be wet with cold water, or some resolvent lotion. The patient is to be bled more or less freely, according to his age, the state of his constitution, and violence of the contusion. The next day, the splints and bandage should be opened; a thing highly necessary to be observed; for, where it has been neglected, the limb has been known to mortify, in consequence of the swelling having rendered the bandage too tight, so that the circulation was impeded. (*Boyer, Traité des Mal. Chir. T.* 3, *p.* 63—64.)

In cases where the contusion is very great, but unattended with a wound of the integuments, the tension and swelling may be so intense, that the cuticle is detached, forming vesicles filled with yellowish serum. These vesicles may deceive an inexperienced surgeon, and lead him to imagine that the limb is threatened, or actually affected with gangrene. They ought to be punctured, and covered with pledgets of simple ointment. Here some practitioners apply emollient poultices under the apparatus; but, there is some inconvenience in their use, and it may be questioned, whether cold lotions are not generally better.

In simple fractures, it does not often happen, that a large artery is wounded; but, when the injury does occur, and a diffused aneurism takes place, the surgeon is to expose the vessel by an incision, and apply a ligature above and below the opening. We are to be careful, however, before resorting to the operation, that the tumor is not a venous extravasation, which may almost always be dissipated by resolvent applications.

Fractures are sometimes complicated with a dislocation. Here, if possible, the luxation should invariably be reduced before the fracture is set. The possibility of reducing the dislocation (says Boyer) depends upon the species of articulation, the situation of the fracture, and other circumstances of the case. When it is a ginglymoid joint, when the ligaments are lacerated, and the swelling is not considerable, the luxation may be reduced easily enough; but, when it is an orbicular joint, surrounded by numerous muscles; and when the fracture is near the articulation, and situated below the dislocation; the reduction of the latter is impossible. The attempt, indeed, would be injurious, because the necessary extension could not act upon the upper fragment, and were it to operate upon the lower, it could only have the effect of painfully stretching the muscles, and perhaps lacerating them. The fracture, therefore, should be at first attended to, and after its firm union, an endeavour may be made to rectify the dislocation. Boyer conceives, that there will be more probability of success, when care is taken to move the limb gently, as soon as the state of the callus will permit it. He also recommends the employment of emollient relaxing applications. He confesses, however, that the attempt rarely succeeds after the perfect union of the fracture. There are, it is true, examples, in which old dislocations may be reduced; but, these are cases, which are not complicated with a fracture, an accident, which always renders the muscles and ligaments so stiff, that they cannot yield to the extension requisite for the reduction. " I do not know, (says Boyer) that a luxation, complicated with fracture, has ever been reduced, when the nature of the joint, and the circumstances of the case, prevented the treatment from beginning with the reduction of dislocation." (*Traité des Mal. Chir. T.* 3, *p.* 79.)

COMPOUND FRACTURES.

What Mr. Pott has said upon these cases is, with one or two exceptions, to which I shall advert, the essence of good surgery, not in the least deteriorated, as a few other parts of his precepts have been, by the more mature instructions of time and experience, or by that growing state of surgical science, which, fostered by genius and observation, is continually bringing to light new facts.

" In a compound fracture," says Mr. Pott, " the first object of consideration is, whether the preservation of the fractured limb can, with safety to the patient's life, be attempted; or, in other words, whether the probable chance of destruction, from the nature and circumstances of the accident, is not greater than it would be from the operation of amputation. Many things may occur to make this the case. The bone, or bones, being broken into many different pieces, and that for a considerable extent, as happens from broad wheels, or other heavy bodies of large surface, passing over, or falling on such limbs; the skin, muscles, tendons, &c. being so torn, lacerated, and destroyed, as to render gangrene and mortification the most probable and most immediate consequence; the extremities of the bones forming a joint being crushed, or as it were comminuted, and the ligaments, connecting such bones, being torn and spoiled, are, among others, sufficient reasons for proposing and for performing, immediate amputation. Reasons, which (notwithstanding any thing that may have been said to the contrary) long and reiterated experience has approved, and which are vindicable upon every principle of humanity, or chirurgic knowledge.

" When a surgeon says, that a limb, which has just suffered a particular kind of compound fracture, ought rather to be cut off, than that any attempt should be made for its preservation, he does not mean by so saying, that it is absolutely impossible for such limb to be preserved at all events: he is not to be supposed to mean so much in general, though sometimes even that will be obvious; all that he can truly and justly mean is, that from the experience of time it has been found, that the attempts to preserve limbs so circumstanced, have most frequently been frustrated by the death of the patients, in consequence of such injury; and that from the same experience it has been found, that the chance of death from amputation is by no means equal to that arising from such kind of fracture.

" Every man knows, that apparently desperate cases are sometimes cured; and that limbs so shattered and wounded, as to render amputation the only *probable* means for the preservation of life, are now and then saved. This is an uncontroverted fact, but a fact which proves very little against the common opinion; because every man of experience also knows, that such escapes are very rare, much too rare to admit of being made precedents, and that the majority of such attempts fail.

" This consideration relative to amputation is of the more importance, because it most frequently requires immediate determination; every minute of delay is, in many instances, to the patient's disadvantage; and every short space of time indeed, frequently makes all the difference between probable safety and fatality. If these cases in general would admit of deliberation for two or three days, and during that time such circumstances might be expected to arise, as ought necessarily to determine the surgeon in his conduct, without adding to the patient's hazard, the difference would be considerable; the former would not seem to be so precipitate in his determination, as he is frequently thought to be; and the latter, being more convinced of the necessity, would submit to it with less reluctance. But, unhappily for both parties, this is seldom the case; and the first opportunity having been neglected or not embraced, we are frequently denied another. Here, therefore, the whole exertion of a man's judgment is required, that he may neither rashly and unnecessarily deprive his patient of a limb, nor, through a false tenderness and timidity, suffer him to perish, by endeavouring to preserve such limb. Some degree of address is also necessary upon such occasions, in order to convince the patient, that what seems to be determined upon hastily and with precipitation, will not safely admit of longer deliberation.

"The limb being thought capable of preservation, the next consideration is the reduction of the fracture. The ease or difficulty attending this, depends not only on the general nature of the case, but on the particular disposition of the bone with regard to the wound.

"If the bone be not protruded forth, the trouble of reducing and of placing the fracture in a good position, will be much less than if the case be otherwise; and in the case of protrusion, or thrusting forth of the bone or bones, the difficulty is always in proportion to the comparative size of the wound, through which such bone has passed. In a compound fracture of the leg or thigh, it is always the upper part of the broken bone which is thrust forth. If the fracture be of the transverse kind, and the wound large, a moderate degree of extension will in general easily reduce it; but if the fracture be oblique, and terminates, as it often does, in a long sharp point, this point very often makes its way through a wound no longer than just to permit such extension. In this case, the very placing the leg in a straight position, in order to make extension, obliges the wound or orifice to gird the bone tight, and makes all that part of it, which is out of such wound, press hard on the skin of the leg underneath it. In these circumstances, all attempts for reduction in this manner will be found to be impracticable; the more the leg is stretched out, the tighter the bone will be begirt by the wound, and the more it will press on the skin underneath.

"Upon this occasion, it is not very unusual to have recourse to the saw, and by that means to remove a portion of the protruded bone.

"I will not say that this is always or absolutely unnecessary or wrong, but it most certainly is frequently so. In some few instances, and in the case of extreme sharp-pointedness of the extremity of the bone, it may be, and undoubtedly is right (See *Dunn's Obs. in Med. Chir. Trans. Vol*, 12): but, in many instances, it is totally unnecessary.

"The two most proper means of overcoming this difficulty are, change of posture of the limb, and enlargement of the wound. In many cases, the former of these, under proper conduct, will be found fully sufficient; and where it fails, the latter should always be made use of. Whoever will attend to the effect, which putting the leg or thigh (having a compound fracture and protruded bone) into a straight position always produces; that is, to the manner in which the wound in such position girds the bone, and to the increased difficulty of reduction thereby induced, and will then, by changing the posture of such limb from an extended one, to one moderately bent, observe the alteration thereby made, in both the just mentioned circumstances, will be satisfied of the truth of what I have said, and of the much greater degree of ease and practicability of reduction in the bent, than in the extended position; that is, in the relaxed, than in the stretched state of the muscles." Reduction being found impracticable, either by extension or change of posture, Mr. Pott recommends an enlargement of the wound.

"If the bone be broken into several pieces, and any of them be either totally separated, so as to lie loose in the wound, or if they be so loosened and detached, as to render their union highly improbable, all such pieces ought to be taken away; but they should be removed with all possible gentleness, without pain, violence, or laceration, without the risk of hemorrhage, and with as little poking into the wound as possible. If the extremities of the bone be broken into sharp points, which points wound and irritate the surrounding parts, they must be removed also. (See *Dunn, vol. cit.*) But, the whole of this part of the treatment of a compound fracture should be executed with great caution; and the practitioner should reremember, that if the parts surrounding the fracture be violated, that is, be torn, irritated, and so disturbed as to excite great pain, high inflammation, &c. it is exactly the same thing to the patient, and to the event of the case, whether such violence be the necessary consequence of the fracture, or of the unnecessary, and awkward manner of poking into, and disturbing the wound. The great objects of fear and apprehension in a compound fracture, (that is, in the first or early state of it,) are, pain, irritation, and inflammation; these are to be avoided, prevented, and appeased by all possible means, let every thing else be as it may be; and although certain things are always recited, as necessary to be done, such as removal of fragments of bone, of foreign bodies, &c. &c. &c. yet it is always to be understood, that such acts may be performed without prejudicial or great violence, and without adding at all to the risk or hazard necessarily incurred by the disease.

"Reduction of, or setting a compound fracture, is the same as in the simple; that is, the intention in both is the same, viz. by means of a proper degree of extension to obtain as apt a position of the ends of the fracture, with regard to each other, as the nature of the case will admit, and thereby to produce as perfect and as speedy union as possible.

"To repeat in this place what has already been said under the head of Extension would be tedious and unnecessary. If the arguments there used for making extension, with the limb so moderately bent as to relax the muscles, and take off their power of resistance, have any force at all, they must have much more when applied to the present case: if it be allowed to be found very painful to extend, or to put or to keep on the stretch, muscles which are not at all or but slightly wounded, and only liable in such extension to be pricked and irritated, it is self-evident that it must be much more so when the same parts are torn and wounded." After a few additional observations, in praise of the good effects of relaxing the muscles, Mr. Pott proceeds: —

"The wound dilated, (if necessary) loose pieces removed, (if there were any) and the fracture reduced in the best possible position, the next thing to be done is to apply a dressing."

When Mr. Pott wrote on this subject, the plan of bringing the edges of the wound together with adhesive plaster, in cases of compound fracture, had not been established; and the advantage of this mode of dressing in the first instance was not duly known. I do not mean the practice of drawing the edges of the wound forcibly together with strips of plaster, nor of encircling and compressing the part with the same; but only the method of applying two, or three short pieces of plaster, so as lightly and gently to retain the opposite sides of the wound in contact, and afford them an opportunity of uniting by the first intention. Now, although such attempt will frequently fail, on account of the wound being generally in a contused, irregular, and lacerated state, the chance of success should be taken, because the experiment at all events will occasion no harm, and if it answer, it will change the case at once from a fracture with an open wound, to one which has no external communication, or, as might almost be said, from a compound into a simple fracture. Some of the following directions, therefore, given by Mr. Pott, I consider in the present state of surgery as only applicable when the wound has suppurated.

"The dressing, necessary in a compound fracture, is of two kinds, viz. that for the wound, and that for the limb. By the former, we mean to maintain a proper opening for the easy and free discharge of gleet, sloughs, matter, extraneous bodies, or fragments of bone, and this in such manner, and by such means, as shall give the least possible pain or fatigue, shall neither irritate by its qualities, nor oppress by its quantity, nor by any means contribute to the detention or lodgment of what ought to be discharged. By the latter our aim should be the prevention or removal of inflammation, in order, if the habit be good, and all other circumstances fortunate, that the wound may be healed, by what surgeons call the first intention, that is, without suppuration or abscess; or, that not being practicable, that gangrene and mortification, or even very large suppuration may be prevented, and such a moderate and kindly degree of it established as may best serve the purpose of a cure. The first, therefore, or the dressing for the wound, can consist of nothing better, or indeed so good, as soft dry lint, laid on so lightly as just to absorb the sanies, but neither to distend the wound, or be the smallest impediment or obstruction to the discharge of matter. This lint should be kept clear of the edges, and the whole of it should be covered with a pledget spread with a soft easy digestive. The times of dressing must be determined by the nature of the case; if the discharge be small or moderate, once in twenty-four hours will be sufficient; but if it be large, more frequent dressing will be necessary, as well to prevent offence, as to remedy the inconveniences arising from a great discharge of an irritating sharp sanies.

"When from neglect, from length of time passed without assistance, from misconduct or drunkenness in the patient, from awkwardness and unhandiness in the assistants, or from any other cause, a tension has taken possession of the limb, and it is become tumid, swollen, and painful, Mr. Pott admits, that a warm cataplasm is the most proper application that can be made: immediate union is impossible, and every thing which can tend toward relaxing the tense, swollen, and irritable state of the parts concerned, must necessarily be right. But, when the parts are not in this state, the intention seems to be very different. To relax swollen parts, and to appease pain and irritation by such relaxation, is one thing; to prevent inflammatory defluxion and tumefaction, is certainly another; and they ought to be aimed at by very different means. In the former, a large suppuration is a necessary circumstance of relief, and the great means of cure; in the latter it is not, and a very moderate degree of it is all that is required. The warm cataplasm, therefore, although it be the best application that can be made use of in the one case, is certainly not so proper in the other, as applications of a more discutient kind, such as mixtures of spirit. vini, vinegar and water, with the muriate of ammonia, liquor ammoniæ, acetatæ, liquor plumbi acetatis, and medicines of this class, in whatever form the surgeon may choose. By these, in good habits, in fortunately circumstanced cases, and with the assistance of what should never be neglected, (I mean phlebotomy * and the general antiphlogistic regimen,) inflammation may sometimes be kept off, and a cure accomplished, without large collections or discharges of matter."—

"Compound fractures in general require to be dressed every day; and the wounded parts not admitting the smallest degree of motion without great pain, perfect quietude becomes as necessary as frequent dressing.

"The common bandage therefore (the roller) has always in this case been laid aside, and what is called the eighteen-tailed bandage substituted, very judiciously, in its place.

"Splints of proper length, which reach from joint to joint, comprehend them both, and are applied on each side of the leg only, are very useful both in the simple and in the compound fracture, as they may, thus applied, be made to keep the limb more constantly steady and quiet, than it can be kept without them."

Mr. Pott then enters into the consideration of the posture of the limb, which "is so principal a circumstance, that without its concurrence every other will be fruitless. The points to be aimed at are, the even position of the broken parts of the bone, and such disposition of the muscles surrounding them, as is most suitable to their wounded, lacerated state, as shall be least likely to irritate them, by keeping them on the stretch, or to produce high inflammation, and at best large suppuration."

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* At present bleeding is not frequently practised, except on young plethoric persons, and out of large cities.

According to Mr. Pott, these cases, of all others, require at first the most rigid observance of the antiphlogistic regimen; pain is to be appeased, and rest obtained, by anodynes; inflammation is to be prevented or removed, by bleeding, and aperient medicines.—And during the first state or stage, the treatment of the limb must be calculated, either for the prevention of inflammatory tumefaction, by discutients; or, such tumor and tension having already taken possession of the limb, warm fomentation, and relaxing and emollient medicines are required.

"If these, according to the particular exigence of the case, prove successful, the consequence is, either a quiet easy wound, which suppurates very moderately, and gives little or no trouble; or a wound, attended at first with considerable inflammation, and that producing large suppuration, with great discharge, and troublesome formation and lodgment of matter. If, on the other hand, our attempts do not succeed, the consequence is gangrene and mortification.

"These are the three general events or terminations of a compound fracture, and according to these must the surgeon's conduct be regulated.

"In the first instance, he has indeed nothing to do but to avoid doing mischief, either by his manner of dressing, or by disturbing the limb. Nature, let alone, will accomplish her own purpose; and art has little more to do than to preserve the due position of the limb, and to take care, that the dressing applied to the wound proves no impediment.

"In the second stage, that of formation and lodgment of matter, in consequence of large suppuration, all a surgeon's judgment will sometimes be required in the treatment both of the patient and his injured limb. Enlargement of the present wound, for the more convenient discharge of matter*; new or counter-openings for the same purpose, or for the extraction of fragments of broken or exfoliated bone, will very frequently be found necessary, and must be executed. In the doing this, care must be taken, that what is requisite be done, and no more; and that such requisite operations be performed with as little disturbance and pain as possible."

Previous to large suppuration, or considerable collections and lodgments of matter, evacuation by phlebotomy, an open belly, and antiphlogistic remedies, as well as the free use of anodynes, and such applications to the limb as may most serve the purpose of relaxation, are the remedies, which Mr. Pott advises for the relief of the swelling, induration, and high inflammation, attended with pain, irritation, and fever. "But the matter having been formed and let out, and the pain, fever, &c. which were symptomatic thereof, having disappeared, or ceased, the use and purpose of such medicines and such applications cease also, and they ought therefore to be discontinued. By evacuation, &c the patient's strength has necessarily (and indeed properly) been reduced; by cataplasm, &c. the parts have been so relaxed as to procure an abatement or cessation of inflammation, a subsidence of tumefaction, and the establishment of a free suppuration; but these ends once fairly and fully answered, another intention arises, which regards the safety and welldoing of the patient, nearly, if not fully as much as the former; which intention will be necessarily frustrated by pursuing the method hitherto followed. The patient now will require refection and support, as much as he before stood in need of reduction; and the limb, whose indurated and inflamed state hitherto required the emollient and relaxing poultice, will now be hurt by such kind of application, and stand in need of such as are endued with contrary qualities, or, at least, such as shall not continue to relax. Good, light, easily digested nutriment, and the Peruvian bark, will best answer the purpose of internals; the discontinuation of the cataplasms, and the application of medicines of the corroborating kind, are as necessary with regard to externals*."

"Every body who is acquainted with surgery knows (says Mr. Pott) that, in the case of bad compound fracture, attended with large suppuration, it sometimes happens, even under the best and most judicious treatment, that the discharge becomes too great for the patient to sustain; and that, after all the fatigue, pain, and discipline, which he has undergone, it becomes necessary to compound for life by the loss of the limb†. This, I say, does sometimes happen under the best and most rational treatment; but I am convinced that it also is now and then the consequence of pursuing the reducing, the antiphlogistic, and the relaxing plan too far. I would therefore take the liberty seriously to advise the young practitioner to attend diligently to his patient's pulse and general state, as well as to that of his fractured limb and wound; and when he finds all febrile complaint at an end, and all inflammatory tumor and hardness gone, and his patient is rather languid than feverish, that his pulse is rather weak and low than hard and full, that his appetite begins to fail, and that he is inclined to sweat, or purge, without assignable cause, and this in consequence of a large discharge of matter from a limb which has suffered great inflammation, but which is now become rather soft and flabby, than hard and tumid; that he will in such circumstances set about the support of his patient, and the strengthening of the diseased limb, *totis viribus;* in which I am from experience satisfied, he may often be successful, where it may not be generally expected that he would. At least, he will have the satisfaction of having made a rational attempt; and if he is obliged at last to have recourse to amputation, he will perform it, and his patient will submit to it, with less reluctance, than if no such trial had been made."

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* "It is a practice with some, from a timidity in using a knife, to make use of bolsters and plaster-compresses for the discharge of lodging matter. Where another, or a counter-opening can conveniently and safely be made, it is always preferable, the compress sometimes acting diametrically opposite to the intention with which it is applied, and contributing to the lodgment by confining the matter; besides which, it requires a greater degree of pressure to make it efficacious, than a limb in such circumstances generally can bear."

* "It is surprising how large and how disagreeable a discharge will be made for a considerable length of time, in some instances, from the detention and irritation of a splinter of bone. If therefore such discharge be made, and there be neither sinus nor lodgment to account for it, and all other circumstances are favourable, examination should always be made, in order to know whether such cause does not exist, and if it does, it must be gently and carefully removed."

† After the bones had united, Mr. Pott never found it necessary to amputate a limb for a compound fracture, on account of the too great discharge.

According to Mr. Pott, gangrene and mortification are sometimes the inevitable consequences of the mischief done to the limb at the time that the bone is broken; or they are the consequences of the laceration of parts, made by the mere protrusion of the said bone. They are also sometimes the effect of improper or negligent treatment; of great violence used in making extension; of irritation of the wounded parts, by poking after, or in removing fragments or splinters of bone; of painful dressings; of improper disposition of the limb, and of the neglect of phlebotomy, anodynes, evacuation, &c.

"When such accident, or such disease, is the mere consequence of the injury done to the limb, either at the time of, or by the fracture, it generally makes its appearance very early; in which case also, its progress is generally too rapid for art to check. For these reasons, when the mischief seems to be of such nature that gangrene and mortification are most likely to ensue, no time can be spared, and the impending mischief must either be submitted to or prevented by early amputation. I have already said, that a very few hours make all the difference between probable safety and destruction. If we wait till the disease has taken possession of the limb, even in the smallest degree, *the operation will serve no purpose, but that of accelerating the patient's death.* If we wait for an apparent alteration in the part, we shall have waited until all opportunity of being really serviceable is past. The disease takes possession of the cellular membrane surrounding the large blood-vessels and nerves, some time before it makes any appearance in the integuments; and will always be found to extend much higher in the former part, than its appearance in the latter seems to indicate. *I have more than once seen the experiment made of amputating, after a gangrene has been begun, but I never saw it succeed; it has always hastened the patient's destruction* *.

"As far therefore as my experience will enable me to judge, or as I may from thence be permitted to dictate, *I would advise that such attempt should never be made;* but, the first opportunity having been neglected, or not embraced, all the power of the chirurgic art is to be employed in assisting nature to separate the diseased part from the sound; an attempt which now and then, under particular circumstances, has proved successful, but which is so rarely so, as not to be much depended upon.

"If the parts are so bruised and torn, that the circulation through them is rendered impracticable, or if the gangrene is the immediate effect of such mischief, the consequence of omitting amputation, and of attempting to save the limb is, as I have already observed, most frequently very early destruction: but, if the gangrenous mischief be not merely and immediately the effect of the wounded state of the parts, but of high inflammation, badness of general habit, improper disposition of the limb, &c. it is sometimes in our power so to alleviate, correct, and alter these causes, as to obtain a truce with the disease, and a separation of the unsound parts from the sound. The means whereby to accomplish this end must, in the nature of things, be varied according to the producing causes or circumstances: the sanguine and bilious must be lowered and emptied; the weak and debilitated must be assisted by such medicines as will add force to the *vis vitæ;* and errors in the treatment of the wound or fracture must be corrected; but it is evident to common sense, that for these there is no possibility of prescribing any other than very general rules indeed. The nature and circumstances of each individual case must determine the practitioner's conduct.

"In general, inflammation will require phlebotomy and an open belly, together with the neutral antiphlogistic medicines; pain and irritation will stand in need of anodynes, and the Peruvian bark, joined in some cases, and at some times, with those of the cooling kind, at others with the cordial, will be found necessary and useful. So also tension and induration will point out the use of fomentation and warm relaxing cataplasms, and the most soft and lenient treatment and dressing."

Mr. Pott then offers many just observations against stimulating antiseptic applications to the wound and scarification of the limb, as practised while the gangrene is forming. The custom of using stimulating dressings to bad compound fractures first began in cases produced by gun-shot, and had its foundation in the opinion, that gun-shot wounds were poisonous, and that the mortification in them was the effect of fire; a doctrine and practice now completely exploded. "A gun-shot wound (says Pott) whether with or without fracture, is a wound accompanied with the highest degree of contusion, and with some degree of laceration; and every greatly contused and lacerated wound requires the same kind of treatment which a gun-shot wound does, as far as regards the soft parts. The intention in both ought to be to appease pain, irritation, and inflammation.

"Scarification, in the manner, and at the time in which it is generally ordered and performed, has never appeared to me to have served any one good purpose. When the parts are really mortified, incisions made of sufficient depth will give discharge to a quantity of acrid and offensive ichor; will let out the confined air, which is the effect of putrefaction; and thereby will contribute to unloading the whole limb; and they will also make way for the application of proper dressings. But while a gangrene is impending, that is, while the parts are in the highest state of inflammation, what the benefit can be which is supposed or expected to proceed from scratching the surface of the skin with a lancet, I never could imagine; nor, though I have often seen it practised, do I remember ever to have seen any real benefit from it. If the skin be still sound, and of quick sensation, the scratching it in this superficial manner is painful, and adds to the inflamed state of it; if it be not sound, but quite altered, such superficial incision can do no possible service; both the sanies and the imprisoned air are beneath the membrana adiposa; and merely scratching the skin in the superficial manner, in which it is generally done, will not reach to, or discharge either.

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* In the article *Gun-shot Wounds*, however, the reader will find, that there is a species of gangrene, arising from external violence, and totally unconnected with constitutional causes, where the surgeon should deviate from the common rule of deferring amputation, until the mortification has ceased to spread. A memoir "*Sur la Gangrène Traumatique*," which was published a few years ago by Baron Larrey, contains the most decisive facts in regard to the propriety of such practice. (See his *Mém. de Chir. Militaire, T.* 2.) And the experience of Mr. Lawrence tends also to confirm the truth of Larrey's Observations. (See *Med. Chir. Trans. Vol.* 6, *p.* 184, *&c.*)

"From what has been said, it will appear, that there are three points of time, or three stages, of a bad compound fracture, in which amputation of the limb may be necessary and right; and these three points of time are so limited, that a good deal of the hazard or safety of the operation depends on the observance or nonobservance of them.

"The first is immediately after the accident, before inflammation has taken possession of the parts. If this opportunity be neglected or not embraced, the consequence is either a gangrene or a large suppuration, with formation and lodgment of matter. If the former of these be the case, the operation ought never to be thought of, till there is a perfect and absolute separation of the mortified parts*. If the latter, no man can possibly propose the removal of a limb, until it be found, by sufficient trial, that there is no prospect of obtaining a cure without; and that, by not performing the operation, the patient's strength and life will be exhausted by the discharge. When this becomes the hazard, the sooner amputation is performed the better. In the first instance, the operation ought to take place before inflammatory mischief is incurred; in the second, we are to wait for a kind of crisis of such inflammation; in the third, the proportional strength and state of the patient, compared with the discharge and state of the fracture, must form our determination." (*Pott's Remarks on Fractures.*)

6. *Of the Formation of Callus, the Consolidation of Fractures, and of the Cases in which they remain without Union.*

In the treatment of fractures, the whole business of the surgeon consists in putting the displaced extremities of the bone into their natural situation again; in keeping them in this situation by means of a suitable apparatus; in endeavouring to avert unfavourable symptoms, and in adopting measures for their removal, when they have actually occurred. The consolidation of a broken bone is (strictly speaking) the work of nature, and is effected by a process, to which a state of perfect health is above all things propitious.

This consolidation of a broken bone, which is analogous to the union of wounds of the soft parts, is termed the *formation of the callus*, and the new uniting bony substance itself is named *callus.*

1. *Of the Time requisite for the Formation of the Callus, and of general circumstances, which favour, retard, or even completely prevent it.*

Surgical writers have been absurdly anxious to specify a determinate space of time, which should be allowed for the formation of the callus, as if this process always went on in different cases with the same uninterrupted regularity. Forty days were often fixed upon as necessary for the purpose. This prejudice is not only false, but dangerous, inasmuch as patients have been thereby induced to suppose themselves cured, before they were so in reality, and have consequently moved about too boldly, and thus run the risk of occasioning deformity, or a new fracture. As Boyer observes, it is impossible to determine precisely, and in a general way, the period requisite for the cure, because it differs according to a variety of circumstances. All we know is, that the callus is usually formed between the twentieth and seventieth day, sooner or later, according to the age and constitution of the patient, the thickness of the bone, the weight which it has to support, the state of the patient's health, &c.

1. *Age.* Fractures are consolidated (*cæteris paribus*) with more ease and quickness in young subjects, than in adults, or old persons. In general also the callus forms more speedily in proportion as the individual approaches to infancy. In two children, whose arms had been broken in difficult labours, De la Motte saw the humerus united in twelve days, by a very simple apparatus. In fact, at this period of life, every part has a tendency to grow and develop itself, and the vitality of the bones is more active, their vascularity greater, their gelatinous substance more abundant. On the contrary, in advanced age, the parts have lost all disposition to development, the vascularity of the bones is in a great measure obliterated, and (to use the expression of Boyer) their vitality is annihilated under the mass of phosphate of lime, which accumulates in them.

It has been asserted, that, in early infancy, the callus is generally produced in excess, and may cause deformity by its redundance. But, experience does not confirm the truth of this statement. The real cause of deformity always proceeds from the fracture either being badly set, or not kept properly reduced, or else from the part being moved about before the callus has acquired a due degree of firmness.

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* Compound fractures are cases of external violence. Now as the mortification proceeds from the injury, and may not be connected with any internal cause, it is an example of what Larrey calls the "*Gangrene Traumatique*;" and the question whether the surgeon ought to be governed by the old maxim of delaying amputation, until the spreading of the mortification has ceased, yet remains unsettled. Were the patient of a sound constitution, and not too far gone, I should not fear to imitate Larrey, and amputate, though the mortification were actually in a spreading state.

2. *Constitution.* A fracture is united much sooner, in a strong healthy person, than a weak unhealthy subject. Sometimes, the consolidation is prevented by some inexplicable unknown cause, nothing wrong being remarkable either in the constitution, or the part. Ruysch and Van Swieten met with several cases of this kind, in which the patients were apparently quite healthy and judiciously treated; and there are few surgeons of much experience, who are not acquainted with similar examples.

3. *Thickness of the Bone, and weight which it has to support.* The bones are thicker and larger, in proportion as they have a greater weight to bear, and as the muscles inserted into them, are more powerful. It is observed, *cæteris paribus*, that the larger the bones are, the longer is the time requisite for their union. Thus, a broken thigh-bone is longer in growing together again, than a fractured tibia; the tibia longer than the humerus, the bones of the fore-arm, clavicle, ribs, &c.

As the callus remains a good while softer, than the rest of the bone, it follows, that if the newly united bone has to bear all the weight of the body in walking, the patient should defer this exercise longer. Hence one reason, why fractures of the arm are sooner cured than those of the tibia, and why six or seven weeks at least are necessary in the treatment of a broken thigh-bone, which of itself has to support in progression all the weight of the trunk.

4. *State of Health.* Fractures unite with more quickness and facility, when the patient enjoys good health. The scurvy has a manifest and powerful effect in retarding the consolidation of fractures, and even in causing the absorption of the callus several years after its formation, so that a bone becomes flexible again at the point, where it was formerly broken. In Lord Anson's Voyage, this phenomenon is particularly recorded. (See *p.* 142, *Edit.* 15 *in 8vo.*) Langenbeck is acquainted with several cases, in which the callus at the end of eight weeks became again soft, and the bone flexible, in consequence of the patients being attacked with fevers, or erysipelas. (*Neue Bibl. B.* 1, *P.* 90.) Cancer, lues venerea, and rickets, are also stated by surgical writers to obstruct and sometimes binder altogether the formation of callus.

Fabricius Hildanus has cited two cases, which tend to prove, that the union of fractures is retarded by pregnancy. (*Cent.* 5. *Obs.* 87. *Cent.* 6. *Obs.* 68.) Alanson has also related a case in which the union, which had been delayed during pregnancy, took place after delivery. (*Med. Obs. and Inq. Vol.* 4. *No.* 37.); and Werner has published an account of a fracture of the radius in a pregnant woman, where the cure was apparently retarded for a long time by this circumstance, and though the union took place previously to delivery, the callus was not very firm till after that event. (*Richter, Bibl. B.* 11. *P.* 591.) From the facts, however, mentioned in a preceding page of this article, there can now be no doubt, that pregnancy frequently does not prevent the formation of callus in the ordinary time, though the observation of Mr. Wardrop is true, that many instances have been observed of bones being fractured during pregnancy, and never showing any disposition to unite till after delivery. (*Med. Chir. Trans. Vol.* 5, *p.* 359.)

Besides the remarks, made here and in a foregoing page on the causes preventing the union of fractures, a few additional observations on the same subject will be introduced in the sequel of this article, when we speak of the modes of attempting the cure of old disunited fractures.

2. *Of some local Circumstances necessary for the Consolidation of Fractures.*

As Boyer has well explained, three local circumstances are necessary to obtain a firm callus, without deformity. 1. The two fragments must be possessed of sufficient vascularity. 2. The surfaces of the fracture must correspond. 3. They must be kept in a completely motionless state.

The two fragments must be sufficiently vascular. If one of them should be too scantily supplied with blood, the fracture would be incapable of union. This (says Boyer) is what happens in certain fractures of the neck of the femur, where the head of this bone is entirely detached, and the ligamentous substance, which is reflected over its neck and serves as its periosteum, is totally lacerated, as well as the vessels, which ramify upon it. Hence, the upper fragment lodged in the cotyloid cavity no longer receives from the vessels, sent to it through the ligamentum teres, a sufficiency of blood for the process of the formation of callus. This is especially likely to be the case, when the patient is far advanced in years, and the vessels considerably lessened in diameter. An adequate circulation must therefore exist in both portions of bone; for without it the attempt at union will fail.

The surfaces of the fracture must correspond exactly. This circumstance is not absolutely necessary for the consolidation of the fracture; but without it, the formation of the callus is always slow and difficult. For instance, in a transverse fracture of the thigh-bone, the fragments, after being displaced according to the thickness of the bone, may undergo a second displacement according to its length, by passing beyond each other. The surfaces of the fracture are then not at all in contact, and the portions of bone only touch each other by their sides, which being covered by the periosteum, can unite but difficultly. Here, at the end of the second month, the union will frequently have made but little progress; nor can the cure be accomplished without deformity and shortening of the limb.

The fragments must be retained in a completely motionless state. This condition is so essential to the formation of callus, that if the ends of a fracture were daily moved, they could not unite. The two extremities of the bone would then heal separately, just like the sides of a wound which have not been put in contact. The ends of a fracture, however, which cicatrize separately, do not (according to Boyer) always become smooth, nor is there ordinarily any capsular ligament formed. (*Traité des Mal. Chir. T.* 3, *p.* 86.)

3. *Different Opinions on the Formation of Callus.*

As Boyer remarks, perhaps no subject has excited more discussion, than the formation of callus. The ancients ascribed it to the extravasation of a gelatinous fluid, which was called the osseous juice. and which becoming hard, served to unite the ends of the broken bone, just as glue serves to unite two pieces of wood. Hence, in order to favour the production of callus, they were in the habit of recommending their patients to eat abundantly of every sort of viscid farinaceous aliment, the glutinous parts of animals, and especially osteocolla, of which Fabricius Hildanus relates miracles.

But, if these accounts were true, callus must be inorganic; or else one would be compelled to admit, that the inspissation of an inorganic fluid was capable of producing an organized substance: which is an absurdity. Besides, observation demonstrates, that callus is an organized matter, like the substance of the bone itself, which it resembles, and that, when subjected to anatomical and chemical experiments, it exhibits all the appearances of the proper substance of bones.

According to Duhamel, callus is formed by the periosteum, which he regards as the organ of ossification. When a bone is fractured (says this naturalist), the periosteum of the two fragments first grows together, and then swells, and forms a circular rising round the fracture. The thickened membrane is converted into a gelatinous substance, which soon becomes a cartilaginous matter. In this vessels develop themselves, and different points of ossification commence, which multiply and unite. Thus, when every part of the periosteum near the fracture is hardened and ossified, this membrane is changed, as it were, into a sort of clasp, which extends over the two fragments, and holds them together.

It was objected to Duhamel's theory, that, if a bone be slit longitudinally in the situation of a former fracture, the fragments are observed to have their substances blended completely together, and not simply to lie in contact in the manner of two pieces of wood placed end to end, and kept in contact by means of a clasp. Duhamel, with a view of obviating this difficulty, supposed that the periosteum elongated itself from the circumference towards the centre of the bone, and that such continuation of this membrane underwent the same changes, as that portion which was contiguous to the fracture, and thus served to unite the ends of the fragments, between which it was interposed. He admits, also, in some cases, that the internal periosteum, or medullary membrane, may furnish productions extending between the ends of the fracture, like the continuation of the external periosteum, with which they become connected. Lastly; he supposed, that, in young subjects, whose bones had not acquired their full degree of hardness, the cartilaginous part was capable of extension, and that in cases of fracture, it contributed to the more perfect union of the fragments.

The system of Duhamel was opposed by Haller and Dethleef, who, after a long series of well-performed experiments, came to the conclusion, that the callus was formed by a gelatinous juice, which exudes from the extremity of the fractured bone, particularly from the medullary texture, and is effused all about the fracture; that such juice is organized, forms a cartilage, and at length ossifies.

But, as Boyer justly remarks, whatever difference there may seem to be betwixt this doctrine, and that of Duhamel, it is merely in the mode of explaining the facts. All these observers noticed the same phenomena; and all the experiments of Dethleef accorded perfectly well with those of Duhamel. Both found, during the first days, immediately after the fracture, a lymph extravasated between the fragments, and a small tumor in the situation of the fracture. Both also remarked, that this tumor became softer, and that it afterwards formed a gelatinous, then a cartilaginous, and lastly, a bony, substance, which composed the uniting medium. But, Duhamel contends, that the cartilage is produced by the periosteum, while Haller and Dethleef argue, that it is the production of the extravasated lymph.

Professor Boyer thinks, that Duhamel imputes too much to the periosteum; but, that Haller and Dethleef were also wrong, if they supposed, as Fougeroux alleges, that an unorganized lymph could produce an organized substance by inspissation. (See *Le Second Mémoire sur les Os, par M. Bordenave, recueilli et publié par M. Fougeroux, p.* 124.) It appears to Boyer much more natural to believe, that the gelatinous lymph already contains the rudiments of organization, which become visible as they are developed; just as it is usually believed, that the rudiments of all our organs are contained in the transparent mucilage, of which the embryo seems to consist.

The experiments of Duhamel and Dethleef were carefully repeated by Bordenave, who ascertained several new and interesting facts. The result was the same in regard to the phenomena observed; but the explanation of them was different.

Instead of attributing the formation of callus to the periosteum, like Duhamel; or to the extravasation of lymph, like Dethleef; Bordenave conceived, that broken bones unite again by a process analagous to that, which nature employs for the union of the divided soft parts. His inference is principally founded on two facts generally admitted; 1st, that there is in the bones a vascular texture, designed to maintain the circulation in them; 2dly, that such texture dilates when fractures are uniting, as appears from the swelling in the situation of the fracture, without which swelling there could be no union. Bordenave further remarks, with Haller and Dethleef; 1st, That callus, at the commencement of its formation, appears to consist of a glutinous fluid effused from the ruptured vessels. 2dly, That this substance afterwards assumes the form of cartilage, to which certain vessels are distributed, which deposit the bony matter, and thus begin the generation of callus. 3dly, That the particles of bone, being all joined together, the callus changes into a porous substance, which in time becomes solid and compact, like the substance of bones.

Doubtless (says Boyer) we shall always remain ignorant of the process, which nature employs for the union of the bones, as well as for that of the soft parts. Every theory, which can be invented on this point, will only be conjectures more or less probable. However, if this author were to adopt any system exclusively, he expresses that he should prefer that of Bordenave.

The mechanism of nature, in the formation of callus, must be analagous to that which she adopts in the union of wounds. The principal difference seems to be, that in the union of a fracture, the vessels after a time deposit the phosphate of lime. The vessels of the periosteum, medullary membrane, and probably also those of the soft parts in the immediate vicinity of the fracture, first effuse coagulating lymph. This gradually becomes vascular, and in proportion as the vessels acquire the power of secreting earthy matter, it is by degrees converted into new bone, termed *callus*, which from being at first soft and flexible, at length becomes firm and unyielding, and fit for constituting the future bond of union between the two extremities of the fracture.

The observations, made by Baron Larrey, lead him to reject, as entirely erroneous, the doctrine, which refers the production of callus to the periosteum, and he adopts the opinion, that the union and reparation of bones are the work of their own vessels. He adverts to examples, in which, after the use of the trephine in young subjects, the perforation becomes more or less closed by new bone, thrown out from the circumference towards the centre. Here, says he, the ossification assuredly can neither be referred to the pericranium, nor the dura mater. The first of these membranes has been extensively destroyed, and, if the second were concerned, a vertical substance, shutting up the opening, would be apparent. In further support of his opinions, Baron Larrey cites the well-known celerity, with which fractures of the lower jaw unite, on account of the great vascularity of that bone, and he believes, with Sir Astley Cooper, that if the ends of a fracture do not touch in consequence of loss of substance, the intervening space remains unfilled up by new bone; a position, which seems rather repugnant to what has been said, concerning the mode of reparation after the use of the trephine.

Larrey has often seen the superficial layers of the tibia exfoliate, after a necrosis produced by a cause, which had destroyed the whole of the periosteum on the front surface of that bone, as is sometimes the case in hospital gangrene. He has seen these layers replaced by red vascular granulations, disposed in parallel lines, which granulations soon ossified, that is to say, phosphate of lime was substituted for the vermilion colour of the vessels, and gave the new-formed substance the appearance and consistence of bone. Lastly, this substance was covered with a new cellular membrane, derived from the adjacent textures; but, in the place of the cicatrix, a depression always remained, proportioned to the loss of substance. If the formation of callus depended on the periosteum, Larrey argues, that the broken patella could never unite by bone, as it is often found to do, when the fragments are kept closely in contact. Here he contends, that the union is the result of the work and inosculation of the vessels belonging to the substance of the fragments themselves. Lastly, he adverts to preparations, in which the vessels of callus have been actually injected by the celebrated Soemerring. (See *Journ. Complém. du Dict. des Sciences Méd. T.* 8, *p.* 107, *&c.* 8*vo. Paris*, 1820.)

Mr. Liston, of Edinburgh, coincides very much with Baron Larrey: "To the surrounding soft parts (says he) has been attributed a great share of the work in the union of broken bones; and when bones have been fractured in circumstances not admitting of this assistance, the process of separation, it is said, cannot be accomplished. In dissecting a fractured limb, which has been removed during the process of union by callus, it will be found, that *the new bone is uniformly attached to the sound part of the old*, the vessels of the part employed in this process being much increased in size. *The newly deposited bone, which in its turn carries on the process, being perforated by numerous and large foramina, for the entrance of corresponding ramifications of arteries. The new formation will be perceived shooting from the opposed ends till these are united;* and the masses, in which they are deposited, will be direct, and but slightly prominent, or, on the other hand, irregular and unshapely, according as the separated ends are favourably or unfavourably placed. I can conceive it possible (says Mr. Liston) and in fact, have frequently found new bone connected with the soft parts; but, this was the produce of a splinter which had still retained its vitality, and *whose vessels* had formed a contribution to the general action. Great powers, not only in the production, but also in the removal of bone, have been long allowed to the periosteum. No one, I will venture to say, has as yet detected this membrane in either of these acts. *New bone has not been found adhering to the periosteum, either in fractures or necrosis;* far less, has a complete substitute, composed of the ossified periosteum, been ever discovered incasing a sequestrum. In every instance, the new formation is deposited in nodules, adhering firmly to the old bone, and, as remarked above, freely perforated by nutritious arteries. The vessels of the bone, no doubt, are ramified on the external and internal periosteum; but, it is only after their entrance into the perforations, that they become disposed to pour out ossific matter." (*Edinb. Med. and Surg. Journ. No.* 78, *p.* 47.)

From experiments, instituted by Breschet and Villermé, it would appear, that the union of broken bones is not exclusively owing to the effusion of a particular fluid, which concretes and gradually changes into an osseous substance; nor to the ossification of the swollen and elongated periosteum; nor, in the majority of instances, to granulations produced from the surfaces of the fracture; but, it is frequently dependent upon all these circumstances together, or at least several of them; and, in every case, it is the result of a series of changes, observable in the soft parts immediately adjoining the fracture, in the periosteum, in the medullary structure, in the cavities and very texture of the bones themselves, and in the substance intervening betwixt the two fragments. In simple fractures, the following are stated to be the principal circumstances remarked during the process.

1. Extravasation and coagulation of a small quantity of blood between the ends of the fracture, which blood escapes from torn, or ruptured vessels.

2. A fluid, at first of a viscid quality, effused and secreted, as it were, between the periosteum and the bone, and likewise exuding from the surfaces of the fracture, and the soft parts.

3. A gradual increase in the quantity and consistence of the preceding substances blended together, forming every day a stronger and stronger connexion between the parts; then their change to a red intermediate substance between the fragments, and between the bone and the periosteum, to a substance which is at first soft, but in the end acquires the characters of bone.

4. At the fractured part, a reunion of the periosteum and soft parts, which are equally indurated and confused together, with the intermediate substance between the fragments.

5. A diminution, and then an obliteration, of the medullary cavity, at first by a cartilaginous, and then a bony deposition.

6. Successive ossification of the whole of the swelling, composing the callus, and of the substance between the fragments, preceded by a fibrous and cartilaginous state.

7. The return of the soft parts around the fracture and then of the periosteum, to their natural state.

8. After the union of the surfaces of the fracture, the medullary cavity and texture are gradually re-established, and the swelling, formed by the callus, always diminishes.

But, in compound fractures, besides these circumstances, the production of granulations from the surfaces of the bone is also to be taken into the account. (See *Dict. des Sciences Med. T.* 38, *p.* 436.) This difference from what happens in the process of union of simple fractures is also particularly noticed by Mr. Wilson: "From the parts being exposed (in a compound fracture), the first bond of union, viz. the coagulable lymph of the blood is removed, or destroyed before it can become vascular. Inflammation in consequence of the injury comes on, suppuration takes place, and, when the parts are healthy, granulations arise. These granulations from the broken extremities of the bone soon assume the ossifying disposition, and when they come in contact with each other unite." (*On the Skeleton, Diseases of the Bones, &c. p.* 233, *8vo. Lond.* 1820.) It is a curious fact, that broken cartilages are united by means of bone; a circumstance which has often been noticed in respect to the cartilages of the ribs.

Whatever may be the process, by which callus is formed, it is during the first two or three weeks after the fracture, that the fragments undergo the changes, which promote their reunion. But, it is between the twentieth and thirtieth, and especially between the thirtieth and fiftieth days, that nature labours effectually in consolidating the callus. Hence, at this period, our care to retain the ends of the fracture in exact contact and perfectly at rest should be redoubled; for, though there are a few instances, in which deformity really proceeds from irregular ossifications, it is a fact, that the deformity almost always originates from the fracture being disturbed and not kept properly reduced. (*Boyer, Traité des Mal. Chir. T.* 3, *p.* 86, *&c.*)

4. *Of the Conduct to be adopted at the ordinary Period of the Consolidation of Fractures; and of the Treatment of False Joints.*

When the requisite time for a broken bone to become firmly united has elapsed, it is proper to examine carefully and cautiously the place of the fracture, in order to learn whether the callus has acquired a suitable degree of strength. If the bone should be found to bend in the least at the injured part, the callus is not sufficiently strong, and the limb should be immediately put up in the apparatus again, with a view of preventing a new fracture, or, at all events, deformity.

For the same reason, the patient should not be allowed to make use of his limb, immediately the fracture has united. In fractures of the lower extremity, he ought to use crutches, and only let the weight of the trunk by degrees bear upon the injured limb. From neglect of this precaution, the callus has been known to be absorbed, the limb to be shortened, and the patient become a cripple. An accidental slip may also produce the fracture again; for, notwithstanding the assertion of writers, the callus, so far from being firmer than the rest of the bone, is not so strong till after a certain time. (*Boyer, T.* 3. *p.* 93.)

If, when the necessary time for the completion of the union has expired, the callus is not yet firm, we must examine; 1st, The relative position of the fragments, and the consistence of the callus. 2dly, The causes, which may have retarded its consolidation.

That the state of the constitution has considerable influence over the process, by which broken bones are reunited, is unquestionable. Schmucker found the formation of callus, even in the most simple fractures, sometimes delayed eight months, and in one example more than a year; but, the patients were all of them unhealthy subjects. (*Vermischte, Chir. Schriften*, 1 *B. p.* 26.)

There are certain indescribable constitutions, in which bones, more particularly, however, the os brachii, will not unite again after being broken. These temperaments are also very various; at least, I infer so from two subjects, to whom I paid particular attention. One was a strong, robust man, whose chief peculiarity seemed to be his indifference to pain: the ends of his broken humerus were cut down too, turned out, and sawn off, by Mr. Long, in St. Bartholomew's hospital, and the limb was afterwards put in splints, and taken the greatest care of; but no union followed. The other case was a broken tibia and fibula, which remained disunited for about four months; but, afterwards, grew together. The latter subject was a complete instance of hypochondriasis. I afterwards saw a woman, under Sir James Earle, in the above hospital, whose os brachii did not unite in the least, though it had been broken several months. Every attempt to move the bone occasioned excruciating torture. The woman died of some illness in the hospital, and, on dissecting the arm, the cause of the fracture not having united was found to arise from the upper, sharp, pointed extremity of the lower portion of the broken bone having been forcibly drawn up by the muscles, and penetrated the substance of the biceps, in which it still remained. I am indebted to Mr. Earle for the description of the appearance in the dissection, and I do not know, that this kind of impediment to the union of a fracture has been noticed by any earlier writer than Mr. Charles White, who appears to have conceived the possibility of the occurrence. (*Cases in Surgery, p.* 70, *Edit.* 1770.)

The causes of fractures remaining disunited, will, according to Richerand, be found to depend, either upon the broken ends of the bone not being properly in contact; the limb having been moved too much; the advanced age of the patient; or, upon a general inertia and languor of the constitution. (*Nosographie Chir. Tom.* 3, *p.* 37, *Edit.* 2.)

It is observed by Larrey, that the gunshot wounds of the extremities, complicated with fracture, especially with that of the humerus, received by the soldiers of the French army in Syria, were almost all followed by the formation of accidental joints. The two fragments of the broken bone continued moveable, their asperities and projecting angles having been destroyed by friction, and their ends being rounded and covered with a cartilaginous substance, so as to facilitate the motions which the patients executed in various directions, in an imperfect manner, and without pain. Larrey acquaints us, that many invalids were sent back to France with such infirmity.

"I ascribe," he says, "the causes of these accidental articulations:

"1. To the continual motion, to which the wounded soldiers were exposed, after their departure from Syria, till their arrival in Egypt, in consequence of their having been obliged either to walk this journey on foot, or to be carried it on beasts.

"2. To the bad quality of the food, and the brackish water, which the men were under the necessity of drinking in this painful journey.

"3. To the state of the atmosphere of Syria, almost entirely destitute of vital air, and impregnated with pernicious gases, issuing from the numerous marshes, near which we were a long while stationed.

"All these causes may have prevented the formation of callus, either by diminishing the quantity of the phosphate of lime, or moving the bones out of that state of coaptation, in which they should constantly lie, in order to unite.

"Bandages, embrocations, rest, and regimen, proved quite ineffectual."—(*Larrey, Mém. de Chir. Mil. T.* 2, *p.* 131, 132. *Langenbeck, N. Bibl. B.* 1, *p.* 81.)

The presence of an ulcer, a sinus, loose splinters of bone, a necrosis, or other suppurating disease, near a fracture, is a circumstance, that often appears seriously to retard, or completely to prevent the formation of callus. How frequently have I noticed, in cases of compound fracture, that, while the wound suppurates largely, and while there are spiculæ and dead portions of bone unextracted, no solid union takes place; but, that as soon as the wound, ulcer, or sinus admits of being healed, and the suppuration ceases, the callus begins to form in the most favourable manner. Schmucker relates a case, illustrating the truth of these observations, where the tibia and fibula were broken so obliquely, that the ends of the fracture could not be made to lie well, a necrosis of a portion of the tibia followed, and no callus was formed at the end of eight months, when a sinus on each side of the leg still continued. This eminent surgeon now laid the sinuses open, and extracted the dead pieces of bone, by which means, the impediment to the formation of callus was removed, and the fracture, which had 'till then remained loose and moveable, became firmly united in two months. (*Vermischte, Chir. Schrift.* 1 *B. p.* 25, 26.)

False or preternatural articulations, which occur in cases of fracture without union, have been generally supposed to resemble common joints. According to Boyer, this opinion is incorrect. The ends of the fracture, which are sometimes rounded, and sometimes pointed, are connected together by a cellular and ligamentous substance. But, their surfaces are not covered by a smooth cartilaginous matter, nor is there constantly a caspular ligament. "I am convinced of this fact, by the dissection of several ununited fractures, the fragments of which are preserved in my museum." (*Boyer, T.* 3, *p.* 94.) And, in another place, the same Professor, speaking of these false joints, remarks: "I repeat that I have never found, in their structure, any thing, which could be compared with an articulation; neither caspular ligament, nor smooth cartilaginous surfaces. On the contrary, I have invariably found, in the false joints of the thigh-bone and humerus, which I have had opportunities of dissecting, a fibrous ligamentous substance extending from one fragment to the other, and it is very probable, that, with some modifications, it is the same with all the other cases, which I have not seen.

"But in the fore-arm, the ends of the fracture may assume a structure, which bears a greater resemblance to an articulation. This is what happened in an example, which was communicated to Bayle by Sylvestre, in the Republique des Lettres, Juillet 1685, p. 718, &c. A similar case is recorded by Fabricius Hildanus, Obs. 91. Centur. 3." (*Boyer, Traité des Mal. Chir. T.* 3, *p* 101—103.)

On this subject, Langenbeck observes, that the edges of the fragments heal, and resemble those of a harelip. "When the parts are incessantly moved, the end of one fragment becomes excavated, in the form of an articular cavity. I have in my possession (says he) a lower jaw, and an olecranon, the fractures of which are not united. For the connecting medium, nature has provided a white substance, resembling ligament. In a male patient, I have also seen an articular connexion established in the body of the thigh-bone, subsequently to a fracture." (*Neue Bibl. B.* 1, *p.* 93.) When a capsule is formed, it is alleged not to be of a ligamentous nature. (*Bichat, Anatomie Générale, T.* 3, *p.* 191.)

In the Hunterian Collection may be seen a false joint in the bones of the fore-arm, where the resemblance to a natural articulation was greater than what Boyer has seen in other situations.

A valuable dissertation on false joints has been published by Reisseisen, entitled "*De Articulationibus analogis, quæ fracturis ossium superveniunt*;" but, I am sorry, that it has not been in my power to meet with a copy of it.

A false joint in the arm, or fore-arm, does not absolutely prevent the motion of the limb, which may yet be of considerable use; but, when the disease is in the thigh, or leg, the member cannot support the weight of the body, and the patient is unable to walk without crutches.

The diversity of causes, which may be concerned in preventing the union of fractures, plainly shows, that the treatment should be different in different cases.

When the want of union is ascribable to the ends of the fracture not being in a state of coaptation, and to their having been moved about too frequently, the obvious indications are, to set the fracture better, and to take adequate measures for keeping its extremities in contact and perfectly motionless.

If the union has been prevented by a portion of muscle or other soft part, getting between the ends of the bone, the only means of affording a chance of union, would be cutting through the integuments, removing the displaced soft parts, and placing the ends of the bone in contact. (*Wardrop, in Med. Chir. Trans. Vol.* 5, *p.* 363.)

When the advanced age of the patient seems to be the cause of the union not taking place, the application of the proper apparatus is to be continued a considerable time, since experience proves, that, in old subjects, the cure of fractures often requires many months. In such examples, also, tonic and cordial medicines, with a nutritive diet, are highly proper.

When several months have elapsed since the accident, and there is reason to apprehend that a preternatural joint is formed, a variety of plans have been proposed and practised.

The most ancient method of treatment is that of forcibly rubbing the ends of the fracture against each other, so as to make them inflame, and take on a disposition to form callus. This plan was recommended by the late Mr. John Hunter, and has had the approbation of many other distinguished modern practitioners. Mr. Hunter used even to advise us, in the case of a disunited fracture of the leg, or thigh, to let the patient get up, and attempt to walk with the splints on the limb, so that the requisite irritation might be produced. The idea of exciting a degree of inflammation in the situation of the fracture, certainly appears rational, and I believe, the practice has been attended with a limited degree of success. Mr. White records an example, in which he cured a broken thigh on this principle, a strong leather case having been made for the limb. (*Cases in Surgery, p.* 75.) The method is spoken of in Celsus: *si vetustas occupavit, membrum extendendum est ut aliquid lædatur: ossa inter se manu dimovenda, ut concurrendo exasperentur, et ut si quid pingue est, eradatur, totumque id quasi recens fiat*; *&c.*

The foregoing treatment, however, is only likely to answer, before a new joint, or, at all events, a ligamentous fibrous connexion, is completely formed, and when the limb has hitherto been kept entirely motionless.

When the case is old, and there is every cause for believing that a preternatural articulation, or fibrous ligamentous connexion has taken place, we are advised to cut down to the ends of the bone, rasp or saw them off, and then treat the limb, just as if the case were a recent compound fracture.

This bold practice was first suggested by Mr. C. White. "Robert Elliot, of Eyham, in Derbyshire, a very healthful boy, nine years old, had the misfortune, about midsummer, in the year 1759, by a fall, to fracture the humerus, near the middle of the bone. He was immediately taken to a bone-setter in that neighbourhood, who applied a bandage and splints to his arm, and treated him as properly," says Mr. White, "as I suppose he was capable of for two or three months. His endeavours, however, were by no means productive of the desired effect, the bones not being at all united. A surgeon of eminence, in Bakewell, was afterwards called in; but as he soon found he could be of no service to him, and as the case was very curious, he advised the lad's friends to send him to the Infirmary at Manchester. He was accordingly brought thither the Christmas following, and admitted an in-patient. Upon examination, we found it to be a simple oblique fracture, and that the ends of the bone rode over each other; his arm was become not only entirely useless, but even a burthen to him, and not likely to be otherwise, as there was little probability that it could ever unite, it being now six months since the accident happened.

"Amputation was therefore proposed as the only method of relief: but I could not give my consent to it, for as the boy was young, and had a good constitution, it was hardly possible that it could be owing to any fault in the solids or fluids, but that either nature was disappointed in her work by frequent friction, while the callus was forming, or rather, that the oblique ends of the bone, being sharp, had divided a part of a muscle, and some portion of it had probably insinuated itself betwixt the two ends of the bone, preventing their union. Whichever of these might be the case, I was of opinion," continues Mr. White, "that he might be relieved by the following operation, viz. by making a longitudinal incision down to the bone, by bringing out one of the ends of it, which might be done with great ease as the arm was flexible, and cutting it off, either by the saw or cutting-pincers, then by bringing out the other, and cutting off that likewise, and afterwards by replacing them end to end, and treating the whole as a compound fracture.

"The objections, made by the other gentlemen concerned, to this proposal, were, first, the danger of wounding the humeral artery by the knife. Secondly, the laceration of the artery by bringing out the ends of the bones. And, thirdly, that we had no authority for such an operation. As to the first, that was easily obviated, by making the incision on the side of the arm, opposite to the humeral artery. The place of election appeared to me to be at the external and lower edge of the deltoid muscle, as the fracture was very near to the insertion of that muscle into the humerus; the danger of wounding the vessel not only being by that means avoided, but, after the operation, while the patient was confined to his bed, the matter would be prevented from lodging, and the wound be easily come at, to renew the dressings. The second objection will not appear to be very great, when we consider that in compound fractures the bone is frequently thrust with great violence through the integuments, and seldom attended with laceration of any considerable artery; and as this would be done with great caution, that danger would appear very trifling. The third and last objection is no more than a general one to all improvements.

" This method which I have been proposing," says Mr. White, " was at last resolved upon, and I assisted in the operation, which was performed by a gentleman of great abilities in his profession, on January 3, in the present year (1760.) The patient did not lose above a spoonful of blood in the operation, though the tourniquet was not made use of. When the operation and dressings were finished, the limb was placed in a fracture-box, contrived on purpose, the lad confined to his bed, and the rest of the treatment was nothing different from that of a compound fracture.

" The wound was nearly healed in a fortnight's time, when an erysipelas came on, and spread itself all over the arm, attended with some degree of swelling; this by fomentations, and the antiphlogistic method, soon went off, and the cure proceeded happily, without any other interruption. In about six weeks after the operation the callus began to form, and is now quite firm. The arm is as long as the other, but somewhat smaller, in consequence of such long-continued bandages; he daily acquires strength in it, and will soon be fit to be discharged." (*Cases in Surgery, p.* 69, *&c.*)

In another instance of a broken tibia, which continued disunited an extraordinary length of time, Mr. White practised an operation, somewhat similar to the foregoing one, with complete success. He made a longitudinal incision, about four inches in length, through the integuments, which covered the fracture. By the application of a trephine, he cut off the upper end of the bone, and, as the lower end could not be easily sawn off, he contented himself with scraping it. In the course of the subsequent treatment, he had occasion to take off, with the cutting-pincers, a small angle of tibia, and to touch the lower part of the bone with the butter of antimony, as well as to introduce the same caustic between the extremities of the fracture, in order to destroy a substance, which intervened. A trifling exfoliation followed. In twelve weeks the bone was firmly united. (*Op. cit. p.* 81, 82.)

Besides Mr. White's cases, there are now some other instances upon record, where the operation, which he first proposed, has succeeded. In the year 1813, Langenbeck operated upon a humerus in the foregoing manner, and the result was perfectly successful. The ununited fracture was situated at the insertion of the deltoid. (*Neue Bibl. B.* 1, *p.* 95.) Mr. Rowlands, of Chester, by a similar operation, cured a fractured thigh, which had lost all disposition to unite. (See *Med. Chir. Trans. Vol.* 2, *p.* 47.) Viguerie, surgeon to the Hotel Dieu, at Toulouse, has also practised Mr. White's operation with success. (See *Larrey, Mém. de Chir. Militaire, T.* 2, *p.* 132.)

On the other hand, the operation has frequently failed. In the instance, in which I saw it executed on the humerus by Mr. Long, in St. Bartholomew's Hospital, it did not answer, though the ends of the bone were most fairly sawn off, and the case treated with particular care and skill. Boyer states, that he once performed the same operation in a similar case; but, that it had not the desired effect. (*Traité des Mal. Chir. T.* 3, *p.* 110.) Dr. Physic, of New York, when he was a student in 1785, saw this proceeding unsuccessfully adopted in a case, where the humerus remained disunited. (See *Medical Repository, Vol.* 1, *New York*, 1804.) Besides these examples, I have heard of others, in which Mr. Cline and other practitioners have tried the experiment with no better success. What is still more discouraging, the operation has sometimes proved fatal. (*Richerand, Nosogr. Chir. T.* 3, *p.* 39. *Edit.* 2. *Larrey, Mém. de Chirurgie Militaire, T.* 2, *p.* 132.)

The difficulties, the danger, and the frequent ill success of the foregoing operation, rendered another mode of treatment extremely desirable, when Dr. Physic, of New York, suggested the plan of introducing a seton through the preternatural joint, with a view of exciting inflammation, and bringing about an union of the bone. This suggestion promises to be a considerable improvement in modern surgery. Dr. Physic had an opportunity of performing the new operation on the 18th December, 1802, in an example of disunited humerus, twenty months after the occurrence of the accident. " Before passing the needle (says Dr. Physic) I desired the assistants to make some extension of the arm, in order that the seton might be introduced, as much as possible, between the ends of the bone. Some lint and a pledget were applied to the orifices made by the seton-needle, and secured by a roller. The patient suffered very little pain from the operation. After a few days, the inflammation, (which was not greater than what is commonly excited by a similar operation through the flesh of any other part) was succeeded by a moderate suppuration. The arm was now again extended, and splints applied. The dressings were renewed daily for twelve weeks, during which time no amendment was perceived; but, soon afterwards, the bending of the arm at the fracture was observed not to be so easy as it had been, and the patient complained of much more pain, than usual, whenever an attempt was made to bend it at that place. From this time, the formation of the new bony union went on rapidly, and on the 4th of May, 1803, was so perfectly completed, that the patient could move his arm in all directions, as well as before the accident happened. The seton was now removed, and the small sores occasioned by it healed up entirely in a few days. On the 28th of May, 1803, he was discharged from the hospital perfectly well, and he has since repeatedly told me, his arm is as strong as ever it was." (*Physic, in Medical Repository, Vol.* 1, *New York.*) In the London Medical Repository for

Aug. 1823, a case is also noticed, in which Dr. Physic cured an ununited fracture of the lower jaw, by means of a seton.

On this subject an interesting memoir was read by Laroche to the Ecole de Médecine at Paris (Germinal, an 13). It was entitled "*Dissertation sur la non réunion de quelques fractures, et en particulier de celles du bras, et sur un moyen nouveau de guérir les fausses articulations qui en resultent.*" The author of this production affirms, that, when he was at Augsburgh, he saw Baron Percy, then with the army of the Rhine, pass a seton through the imperfectly healed cicatrix of a compound fracture of the thigh, which fracture seemed to have lost all disposition to unite. The method answered so well, that in two months the patient was able to walk without crutches.

Mr. Brodie has also successfully employed the seton in a case of ununited broken thigh. The patient was a boy, about 13. (See *Med. Chir. Trans. Vol.* 5, *p.* 387, *&c.*) In this country, the same operation has been practised for the cure of a disunited humerus by Mr. Stansfield, of Leeds. (See *Op. cit. Vol.* 7, *p.* 103, *&c.*) It appears, also, that Mr. Charles Bell applied the method to a fracture of the leg, at the time when Roux was in England. The patient was a child six years old, and the broken bones had continued without union three years. The case had been originally mistaken by some unskilful surgeon for a mere contusion. Roux knew not whether the operation succeeded or not. (*Parallèle de la Chir. Angloise, &c. p.* 195.)

We are not to expect, however, that Dr. Physic's new operation will succeed in every instance. Like most other surgical means, it is liable to occasional failures, amongst which, I believe, we must include the attempt, made on a disunited thigh by Mr. Wardrop, (See *Med. Chir. Trans. Vol.* 5, *p.* 365.) though a partial amendment is mentioned. Mr. Hutchison was also obliged to take out the seton, in a case of ununited humerus, and no cure was effected. (See *Practical Obs. p.* 162.) Another instance of failure has likewise been mentioned to me, and an additional one has been recorded by Mr. Earle. (See *Med. Chir. Trans. Vol.* 12, *p.* 195.)

In the same case, and also in another, which I saw under this gentleman's care, the plan of cutting down to the ends of the fracture, and rubbing them with caustic potassa, was tried, but without success. Of all these various methods, I consider the last, as the least likely to have a favourable result.

FRACTURES OF THE OSSA NASI.

These bones, from their situation, are much exposed to fractures. The fragments are sometimes not deranged; but, most frequently, they are depressed. In order to replace them, the surgeon must pass a female catheter, a ring-handled forceps, or any such instrument, into the nostrils, and, using it as a lever, push the fragments outwards: while, with the index-finger of the left hand, he prevents them from being pushed our too far. When the fragments are disposed to fall inwards again, some authors advise supporting them with an elastic gum cannula, or lint, introduced into the nostril; but I am inclined to believe with Mr. C. Bell, that no tubes can be employed so as to support the broken bones; and when these have been replaced, they will not readily change their position, as they are acted upon by no muscles. (See *Operative Surgery, T.* 2, *p.* 222.)

Besides, as Delpech remarks, since the tubes cannot reach the fragments, they cannot support them, and they must be attended with all the inconvenience of foreign bodies placed in contact with parts already inflamed, or about to become so. (*Précis des Mal. Chir. T.* 1, *p.* 222.)

As fractures of the ossa nasi are the result of falls, and direct blows on the face, the soft parts are always either very much contused or wounded.

Fractures of the ossa nasi are sometimes attended with very dangerous symptoms; depending either upon the concussion of the brain, produced by the same blow, which causes the fracture; or, on the cribriform lamella and the crista galli of the os ethmoides being driven inwards so as to injure and compress the brain. This last danger, however, some modern surgeons consider as void of foundation, and whenever the symptoms indicate an affection of the brain, the nature of the case is referred to the intimate connexion between the bones of the nose and the os frontis. (*Delpech, Précis des Mal. Chir. T.* 1, *p.* 221, *8vo. Paris,* 1816.)

When there are symptoms of pressure on the brain, (see *Head, Injuries of,*) and the ossa nasi are much depressed, the surgeon must immediately raise them, and endeavour to draw gently forwards the perpendicular process of the os ethmoides, which is connected with the cribriform lamella and crista galli. Perhaps, a pair of closed common forceps introduced into each nostril, might best enable the surgeon to do what is necessary. Bleeding and the antiphlogistic treatment are always proper; for, the vicinity of the eye renders it liable to become inflamed; and when there are symptoms of injury of the brain, extravasation, &c. the necessity of such practice is still more strongly indicated.

FRACTURES OF THE LOWER JAW.

This bone is sometimes fractured near the chin; but, seldom so as to produce a division of the symphysis, the solution of continuity generally happening between this part and the insertion of the masseter. In other instances, the fracture occurs near the angles of the jaw, that is to say, between the insertion of the masseter and the root of the coronoid process. The bone may also be broken in two places at the same time; in which event, the middle portion is extremely difficult to keep right, because many of the muscles, which draw the lower jaw downwards, are attached to that part.

The condyles and coronoid processes are also sometimes broken; the former the most frequently.

Fractures of the lower jaw may be either perpendicular to its basis, oblique, or longitudinal: of the latter, examples have been known, in which a portion of the alveolar process with the teeth in it, was detached from the rest of the bone.

The soft parts are generally contused and wounded. J. L. Petit mentions one case, in which the bone was broken, and the coronoid process quite denuded, by the kick of a horse.

Fractures of the lower jaw are subject to displacement in the following way. When the fracture is near the symphysis, the side on which the processus innominatus is situated is drawn downward and backward by the sub-maxillary muscles, while the other fragment is supported by the muscles which close the jaw. When the fracture is more backward, the displacement occurs in the same way, but not so easily. When the bone is fractured in two places, the middle portion is always pulled downwards and backwards by the muscles attached to the chin, while the two lateral pieces are kept up by the levator muscles. When the ramus of the jaw is broken, the masseter, being attached to both pieces, prevents any considerable degree of displacement. When the neck of the condyle is fractured, the pterygoideus externus may pull the condyle forwards.

When a blow is received on the lower jaw, or the bone is injured by a fall, or by the pressure of some heavy body; when an acute pain is experienced in the part, and an inequality can be felt at the basis of the bone; when some of the teeth, corresponding to that inequality, are lower than the others; and when a crepitus is perceptible on moving the two pieces of the jaw on each other; there can be no doubt of a fracture. When the gums are lacerated, or the bone denuded by a wound, the case is (if possible) still more manifest.

Fractures of the rami and condyles produce great pain near the ear, particularly when the jaw is moved; and a crepitus may also be felt.

Fractures of the lower jaw, whether simple or double, are easily set, by pushing the displaced part upward, and a little forward, and then pressing on the basis of the bone, so as to bring it exactly on a level with the portion, which has preserved its natural position. Indeed, the correctness of the reduction can always be rightly judged of by attending to the line, which the base of the jaw ought to form, and observing that the arch of the teeth is as regular as nature will allow. The maintenance of the reduction, however, is difficult; and can only be well executed by supporting the lower jaw, and keeping it applied to the upper one. As the latter indication cannot be properly fulfilled in persons, whose teeth are very irregular, it is sometimes necessary to interpose an even piece of cork between the teeth on each side of the mouth, and against this cork the lower jaw is to be kept up with the bandage presently noticed, while the aperture, left between the incisores in the situation where no cork is placed, allows food and medicines to be introduced with a small spoon.

As soon as the fracture is set, the surgeon should adapt some thick pasteboard, previously wet and softened with vinegar, to the outside of the jaw, both along its side and under its basis. Over this moistened pasteboard, a bandage with four tails is to be applied, the centre being placed on the patient's chin, while the two posterior tails are to be pinned to the front part of a nightcap, and the two anterior ones fastened to a part of the same cap more backward. When the pasteboard becomes dry, it forms the most convenient apparatus imaginable for surrounding and supporting the fracture. A piece of soap-plaster may now be applied to the skin underneath, which will prevent any ill effects of the hardness and pressure of the pasteboard.

Until the bone is firmly united, the patient should be allowed only such food as does not require mastication, and it may be given by means of a small spoon introduced between the teeth. Broths, soups, jellies, tea, and other slops, appear most eligible.

In order to keep the middle portion of the bone from being drawn downwards and backwards towards the larynx, it is frequently necessary to apply tolerably thick compresses just under and behind the chin; which are to be well supported by the bandage already described.

I need hardly state the necessity of enjoining the patient to avoid talking, or moving the jaw more than can possibly be avoided.

When the condyle is fractured, as it is incessantly drawn forward by the action of the pterygoideus externus, and, on account of its deep situation, cannot be pressed back, the lower portion must, if possible, be pushed into contact with it. For this purpose, the bandage must be made to operate particularly on the angle of the jaw, where a thick compress should be placed.

Compound fractures of the lower jaw are to be treated on the same principles, as similar injuries of other bones. If possible, the external wound should be healed by the first intention; and, when this attempt fails, care must be taken to keep the wound clean by changing the dressings about once in three days; but not oftener, lest the fracture suffer too much disturbance. It is observed, that compound fractures of the jaw, and even simple ones, which are followed by abscesses, are particularly liable to be succeeded by troublesome and tedious exfoliations.

In very bad fractures, in which all motion of the jaw must have the most pernicious effect, I consider it prudent to administer every kind of nourishment in a fluid form, through an elastic gum catheter, introduced through one of the nostrils down the œsophagus.

It now and then happens, that fractures of the lower jaw continue ununited: Dr. Physic's successful treatment of one such case with a seton, I have already noticed.

FRACTURES OF THE VERTEBRÆ.

On account of the shortness and thickness of these bones, they cannot be broken, without considerable violence. The spinous processes, which project backwards, are the most exposed to such injury; for they are the weakest parts of the vertebræ, and most superficially situated. On this account it is possible for them to be broken, without any mischief being done to the spinal marrow. The violence, which is great enough to break the bodies of the vertebræ, must produce a greater, or less concussion, or other mischief, of the spinal marrow; from which accident much more perilous consequences are to be apprehended, than from the injury of the bones, abstractedly considered. The displaced pieces of bone may press on the spinal marrow, or even wound it, so as to occasion a paralytic affection of all the parts, which derive their nerves from the continuation of this substance below the fracture.

Sir Astley Cooper divides fractures of the bodies of the vertebræ with displacement into two classes; first, those which occur above the third cervical vertebræ; and secondly, others which happen below that bone. The first cases, he says, are almost always *immediately* fatal, if the displacement be to the usual extent. In the second description of cases, death takes place at various periods after the injury. The reason of this difference is ascribed to the circumstance of the phrenic nerve originating from the third and fourth cervical pairs, whence, in the first class of cases, death is immediately produced by paralysis of the diaphragm, and the stoppage of respiration. (*On Dislocations, p.* 552.)

As the mere concussion of the spine may occasion symptoms, which very much resemble those, usually occurring, when the vertebræ are fractured, the diagnosis is generally obscure. An inequality in the line of the spinous processes, and a crepitus, may sometimes be distinctly felt. The lower extremities, the rectum, and bladder, are generally paralytic; the patient is afflicted with retention of urine and feces, or with an involuntary discharge of the latter. (*Boyer.*)

If the lumbar vertebræ be displaced, the lower extremities are rendered so completely insensible that they may be pinched, burnt, or blistered, without the patient suffering any pain. The penis, in such cases, is generally erect. In general, also, according to Sir Astley Cooper's observations, patients, with fractured lumbar vertebræ, die within a month, or six weeks; but, he knew of one patient that lived two years, and then died of gangrene of the nates. In fractures and displacement of the dorsal vertebræ, the symptoms are very similar; but, the paralysis extends higher, and the abdomen becomes excessively inflated. Death commonly follows in two, or three weeks; but, Sir Astley Cooper remembers one case, in which a gentleman survived the accident nine months. Fractures of the cervical vertebræ, below the origin of the phrenic nerve, occasion paralysis of the arms, though it is seldom complete. Sometimes, when the fracture is oblique, one arm is more affected than the other. As the intercostal muscles are paralytic, great difficulty of respiration prevails. The abdomen is also considerably inflated. Death generally follows in from three to seven days.

Sir Astley Cooper notices the following, as the appearances found in the dissection of such cases. The spinous process of the displaced vertebra is depressed; the articular processes are fractured; the body of the vertebra is broken through, the separation rarely happening in the intervertebral substance. The body of the vertebra usually projects forward half an inch, or an inch. Between the vertebra and the sheath of the spinal marrow, blood is extravasated, and frequently on the latter part itself. When the displacement is slight, the spinal marrow is compressed and bruised. When greater, it is torn through by the bony arch of the spinous processes, and a bulb is formed at each end, but the dura mater continues whole. (See *A. Cooper on Dislocations, &c. p.* 554, *&c.*)

Fractures of the spinous processes, without other serious mischief, are not dangerous; and are the only instances of fractures of the vertebræ, which admit of being detected with certainty.

Any attempt to set fractures of the bodies of the vertebræ, even were they known to exist, would be both useless and dangerous. General treatment can alone be employed. Cupping will tend to prevent inflammation in the situation of the injury. When the patient is affected with a flatulent distention of the abdomen, vomiting, hiccough, &c. the belly may be rubbed with camphorated liniment, and purgative clysters, and antispasmodics given. If requisite, the urine must be drawn off with a catheter. When the bladder, rectum, and lower extremities are paralytic, it is common to rub the back, loins, sacrum, and limbs with liniments containing the tinctura lyttæ. (*Boyer.*) With respect to the external and internal use of stimulants, however, it can never be judicious, when there is reason to apprehend much inflammation of the injured parts; and as for the idea of thus restoring the nervous influence, there can be little chance of success, the cause of its interruption being here of a mechanical nature. (*Delpech, Mal. Chir. T.* 1, *p.* 222.)

Some authors recommend trepanning, or cutting out a portion of the fractured bone, when the compression of the spinal marrow, or its injury by a splinter, is suspected; but according to my judgment, the indication can never be sufficiently clear to authorize the operation, which, on account of the great depth of the intervening soft parts, must be very tedious, and even difficult to effect, without a great risk of increasing the injury, which the spinal marrow may already have received. An unsuccessful operation of this kind was once performed by Mr. H. Cline, and another by Mr. Tyrrell.

Some cases, published by Mr. C. Bell, tend to prove, that the danger to be apprehended from injuries of the vertebræ, is the same as that which accompanies injuries of the brain. Hence, he joins the generality of practitioners in recommending general and local bleeding, and keeping the patient perfectly quiet. And, with respect to operations for the removal of fragments of bone, it is his decided belief, that an incision through the skin and muscles covering the spine, and the withdrawing of a portion of the circle of bone, which surrounds the marrow, would be inevitably fatal, the membranes of that part being particularly susceptible of inflammation and suppuration. And, even if a sharp spicula of fractured bone had run into the spinal marrow, and caused palsy of the lower parts of the body, Mr. C. Bell thinks that exposing the medulla to extract the fragment would so aggravate the mischief, that inflammation, suppuration, and death, would be the inevitable consequences. (*Surgical Obs. Vol.* 1, *p.* 157.) The same author describes inflammation of the spinal marrow as "attended with an almost universal nervous irritation, which is presently followed by excitement of the brain; in the mean time, matter is poured into the sheath of the spinal marrow, and either by its pressure causing palsy, or by its irritation disturbing the functions of the part, so as to be attended with the same consequences. The excitement of the brain being followed by effusion, death ensues." (*P.* 159.) Cases are also referred to, where palsy of the lower extremities comes on several months after an injury of the spine, owing to thickening of the membrane of the medulla, or disease of the latter part itself. Here

Mr. C. Bell recommends perseverance in local bleeding and deep issues. *(P. 160.)*

A fracture of the processus dentatus proves instantly fatal, as happened in the example mentioned by Sir A. Cooper. (*On Dislocations, &c. p.* 548.) In the practice of Mr. Cline, a case occurred, in which a boy, with a fracture of the atlas, lived a year after the accident. *(A. Cooper, Op. cit. p.* 549. See also *L. T. Soemmering, Bemerkungen über Verrenkung und Bruch des Ruckgraths*, 8*vo. Berlin*, 1793. *F. A. F. Cuenotte, Dis. Med. Chir. Sistens Casum Subluxationis vertebræ Dorsi cum Fractura complicatæ, post factam repositionem et varia dira symptomata Duodecima demum Septimana funestæ. Argent.* 1761. *Case of Fractured Spine, Lancet, Vol.* 2, *p.* 97.)

FRACTURES OF THE STERNUM.

The sternum is not frequently broken, and the reason of this fact is imputed to the position of this bone, resting, as it were, upon the cartilages of the ribs, and also, in some measure to its spongy texture. When the accident does occur, it is from the direct application of external violence to the injured part, and hence the fracture is always accompanied with great contusion, or even a wound of the integuments, and more or less injury of the thoracic viscera. As Boyer remarks, the sternum, in consequence of the elasticity of the cartilages of the ribs, may be readily propelled backward by pressure in this direction, and the result is an actual change in the form, and a real diminution of the chest. Now, since this cavity is always accurately filled by its contents, these alterations cannot happen in a considerable and sudden manner, without a risk of the thoracic viscera being contused and even ruptured. Thus, when the sternum has been fractured by violent blows on the chest, the heart and lungs have been found severely contused, and sometimes lacerated; and there will always be greater danger of such mischief, when the fracture is attended with depression of one, or more of the fragments. In some cases, a large quantity of blood is effused in the cellular membrane of the anterior mediastinum, and, in others, the accident is followed by inflammation, and suppuration in the same situation, and necrosis of the broken part of the bone. Since the lungs are also liable to be ruptured by the same force which causes the fracture, or wounded by the depressed pieces of bone, emphysema may become another complication, as we see exemplified in a case related by Flajani. (*Collezione d'Osservaz. &c. di Chir. T.* 3, *p.* 214, 8*vo. Roma*, 1802.)

A fracture of the sternum is rendered obvious by the inequalities perceptible, when the surface of the bone is examined with the fingers; by a depression, or elevation of the broken pieces; a crepitus and an unusual moveableness of the injured part in respiration. In many cases, the fracture may be seen, the soft parts being torn, or otherwise wounded. The breathing is difficult, and mostly accompanied with cough, spitting of blood, palpitations, and inability to lie on the back. According to the observations of Petit and Baldinger, several of these latter symptoms may continue with less intensity, a long while after the fracture is cured. *(Levéillé Nouvelle Doctrine Chir. T.* 2, *p.* 243.)

Fractures of the sternum, when mere solutions of continuity, only require common treatment; viz. a piece of soap-plaster to the situation of the injury, a roller round the chest, quietude, bleeding, and a low regimen, with a view of preventing what may be considered as the most dangerous consequence, inflammation of the parts within the chest.

In cases, attended with great depression of the fractured bone, the necessary incisions should be made, in order to raise with an elevator the portions of the bone driven inward, or to extract with forceps any loose splinters, which seem to be similarly circumstanced. However, it is not often necessary to trephine the sternum, either to raise a depressed portion of the bone, or to give vent to extravasated fluid. In the first of these circumstances, I believe with Mr. C. Bell, that the formal application of the trephine can never be right, or necessary, though the surgeon may be called upon to extract loose splinters. (See *Operative Surgery, Vol.* 2, *p.* 218.) Such an operation, however, may occasionally be proper when abscesses form under the sternum, or the bone is affected with necrosis, and the natural separation of the diseased parts is likely to occupy a considerable time.

Fractures of the sternum are more frequently produced by gun-shot violence, than any other cause, and, in these cases, there are generally many splinters, requiring extraction. At the battle of Marengo, the French general Champeux received such a wound, with which he lived nearly a month: the injury was attended with so many splinters, that when they were removed, the pulsations of the heart were visible to a considerable extent. (*Levéillé, Vol. cit. p.* 244.)

The ensiform cartilage, when ossified in old subjects, is liable to fracture. Little more, however, can be done in such a case, than relaxing the abdominal muscles by raising the thorax and pelvis, and then applying a piece of soap-plaster and a roller over the part, for the purpose of keeping it steady. When the blow has been violent, the patient should always be bled.

FRACTURES OF THE RIBS.

These generally happen near the greatest convexity of the bones, several of which are often broken together. The first rib being protected by the clavicle, and the lower ribs being very flexible, are less liable to be fractured, than the middle ones.

When the spicula of a fractured rib is beaten inward, it may lacerate the pleura, wound the lungs, and cause the dangerous train of symptoms attendant on emphysema. (See *Emphysema.*)

A pointed extremity of the rib, projecting inwards, may also cause an extravasation of blood; or, by its irritation, produce inflammation in the chest. A fracture, which is not at all displaced, is very difficult to detect, particularly in fat subjects; and, no doubt, is very frequently never discovered. The surgeon should place his hand on the part, where the patient seems to experience a pricking pain in the motions of respiration, or where the violence has been applied. The patient should then be requested to cough, in which action the ribs must necessarily undergo a sudden motion, by which a crepitus will often be rendered perceptible. All the best practitioners, however, are in the habit of adopting the same treatment, when there is reason to suspect a rib to be fractured, as if this were actually known to be the case by the occurrence of a crepitus, or the projection of one end of the fracture; which, indeed, in the instances, which are displaced, makes the nature of the accident sufficiently plain.

A broken rib cannot be displaced either in the direction of the diameter of the bone, or in that of its length. The ribs, being fixed posteriorly to the spine, and anteriorly to the sternum, cannot become shortened. Nor can one of the broken pieces become higher, or lower, than the other, because the same muscles are attached to both fragments, and keep them at an equal distance from the neighbouring ribs. The only possible displacement, is either outward or inward. *(Boyer.)*

Simple fractures of the ribs, free from urgent symptoms, require very simple treatment. The grand object is to keep the broken bones as motionless as possible. For this purpose, after a piece of soap-plaster has been applied to the side, and over it proper compresses, a broad linen roller is to be firmly put round the chest, so as to impede the motion of the ribs; and compel the patient to perform respiration chiefly by the descent and elevation of the diaphragm. A scapulary will prevent the bandage from slipping downwards. When the fractured part is depressed inward, the compresses should be placed on the anterior and posterior part of the bone. As a roller is apt to become slack, many surgeons, with good reason, prefer a piece of strong linen, large enough to surround the chest, and laced with pack-thread, so as to compress the ribs in the due degree.

When there is reason, from the symptoms, to think the lungs injured, or disposed to inflame, copious and repeated bleedings should be practised. Indeed, as peripneumony is always liable to succeed the accident, and is a most dangerous occurrence, every person free from debility, either having a broken rib, or supposed to have such, should always be bled in the first instance. The spermaceti mixture, with opium, is an excellent medicine for appeasing any cough, which may disturb the fracture, and give the patient infinite pain.

FRACTURES OF THE SACRUM.

Although more superficial than the other bones of the pelvis, the sacrum is less frequently fractured; a fact, explicable, as Boyer has remarked, by its thickness, its spongy texture, and the advantageous way in which it supports the weight and efforts of the whole trunk. For the sacrum to be broken, the violence must be very great, like that resulting from the fall of a very heavy body, or the passage of a carriage-wheel on the convex side of the bone, or a fall from a great height on that part. On the other hand, fractures of the sacrum, when they do happen, are more serious, than those of the ossa innominata, because, in addition to the great degree of contusion and laceration, with which they in common with the latter cases are complicated, there is almost always great damage done to the sacral nerves; a kind of injury which may have fatal consequences. Hence, retention of urine, inability to retain this fluid, involuntary discharge of the feces, paralysis of the lower extremities, &c. Another principal danger also depends upon the injury, which the pelvic viscera may have suffered from the same violence, which broke the bone.

When the fracture is situated at the upper part of the sacrum, which seldom happens on account of the thickness of the bone in that situation, there is no displacement, unless the bone is smashed, and the fragments are driven inwards by the same force, which produced the fracture, a case, which always implies severe injury of the external and internal soft parts. But, when the fracture occupies the lower portion of the bone, where it is less thick, the inferior fragment may be displaced inwards, towards the rectum. And, as Boyer observes, fractures of the higher part of the bone are not in general easily detected. (*Traité des Mal. Chir. T.* 3, *p.* 152.)

When the violence has been such as to make it probable, that it has extended its effects to the pelvic viscera, every means in the power of art must be adopted for the prevention of inflammation. In particular, copious bleeding should be practised, and, if necessary, repeated. Leeches should also be applied to the vicinity of the sacrum, and the parts kept cool with the lotio plumbi acetatis. Any difficulty either in the expulsion, or retention of the urine and feces, will likewise claim immediate and constant attention. (See *Urine, Retention of; Incontinence of, &c.*) With regard to the particular means for promoting the union of the fractured sacrum, quietude is the most important, and, after the risk of inflammation is over, all that can be done is to apply a piece of the emplastrum saponis to the part, and put a roller round the pelvis, or a T bandage.

FRACTURES OF THE OS COCCYGIS.

Though much slighter than the sacrum, it is less frequently broken, because less exposed to external force, and capable of a degree of motion, by which it eludes the effect of violence. But, in elderly persons, in whom the different pieces of the os coccygis are connected by anchylosis, a fall on the buttock may fracture this bone. The accident is known by the moveableness of the fragments, and the acute pain produced when the thighs are moved, the fragments being then disturbed by the action of the glutei muscles, some of whose fibres are attached to them. (*Boyer*, *T.* 3, *p.* 160.)

The treatment of fractures of the os coccygis consists in enjoining quietude, employing discutient, or emollient applications, according to the particular state of the soft parts, and taking blood away from the patient; adopting the antiphlogistic regimen, and enjoining the patient to avoid lying on his back, or sitting down. He should also avoid walking, so as to put the glutei muscles into action, which would disturb the broken bone. All formal attempts at reduction are not only useless in respect to the fracture, but highly injurious to the soft parts, which are not in a state to bear handling without ill effects.

FRACTURES OF THE OSSA INNOMINATA.

The situation and shape of the ossa innominata, and the thickness of the soft parts by which they are covered, explain why they are but seldom fractured. When such accidents happen, they are generally produced by the passage of heavy carriage wheels, over the pelvis, falls from great heights, the kick of a horse, &c. and are always attended with considerable contusion of the external soft parts, and sometimes with great injury of the pelvic viscera. The anterior superior spinous process of the ilium is sometimes broken off, by the kick of a horse. (*Boyer.*)

The two ossa innominata may be broken together; but commonly only one of them is thus injured. Most frequently, the fracture takes place in the upper expanded portion of the bone, known under the name of the ilium, though sometimes it happens either in the ischium, or the os pubis. The solution of continuity may be limited to one part of the bone, or extend to several parts of it; and there may be a greater or lesser number of fragments, and these attended, or not, with displacement. In many instances, in which the pelvis has been violently jambed between two bodies, or run over by a heavy carriage, the bones of the pelvis, besides being fractured, are dislocated, some interesting examples of which accident have been recently published. (*A. Cooper's Surgical Essays, Part* 1, *p.* 49, *&c.*)

During my apprenticeship, at St. Bartholomew's hospital, several cases occurred, in which the os ilium, os ischium, and os pubis, were found fractured on opening the bodies after death; and, when the great violence necessary to produce the accident is considered, we cannot wonder that the injured state of the pelvic viscera should frequently prove fatal. Fractures of the ossa innominata are unavoidably attended with more or less contusion of the soft parts on the outside of the pelvis, and when the violence has been very great, the pelvic viscera may be seriously bruised, crushed, or lacerated; and the large nerves, contained in the pelvis, or the spinal marrow itself injured: hence, extravasation of blood or urine in the cellular membrane of the pelvis, ecchymoses deeply situated even in the substance of the muscles, or other organs, injury of the kidneys; complete loss of motion, a paralysis of the lower extremities; discharge of blood, or a black bilious matter by vomiting, or stool, either immediately, or at more or less distant periods from that of the accident; retention of urine; fever; painful tension of the abdomen, from inflammation of the peritoneum and bowels; the formation of abscesses, which are sometimes of great extent; sloughing; and death. (*Boyer, Traité des Mal. Chir. T.* 3, *p.* 154.)

As the same author has observed, the violence, occasioning a fracture of the ossa innominata, may produce a displacement of the fragments, and carry them more or less away from their natural situation. When the pubes, or ischium, is broken, the splinters may be propelled into the canal of the urethra, or even through the bladder, and give rise to extravasation of the urine, or by merely compressing these organs, they may cause more or less interruption of their functions. But, unless the fragments be displaced by the same force, which caused the fracture, they can hardly be drawn out of their place by any other circumstance, since they are retained by the muscles attached to both fragments, and by surrounding ligamentous expansions.

Owing to the deep situation of fractures of the pelvis, and to there being no displacement, nor mobility of the fragments, the diagnosis is sometimes attended with great difficulty. A suspicion of the accident may be entertained, when the pelvis has suffered great violence, the patient experiences great agony, and all motion of the trunk and lower extremities is difficult and painful. Under these circumstances, if the fracture should be in the ilium, especially its upper and front portion, or in the os pubis, the mobility of the fragments, or even a crepitus, may be distinguished in a thin subject, if when he is lying horizontally, with his thighs and legs bent, and his head and chest elevated, the projecting part of the os innominatum be taken hold of, and an attempt be made to move the fragments in opposite directions. In this business, however, one caution is given by Boyer, viz. not to mistake the crepitation of an emphysema, often attending large extravasations of blood, for the grating of the fractured bone.

In cases, in which the fracture affects a part of the os innominatum very deeply placed, and it is limited to a single point of the os pubis, or the ischium, so that no detached moveable fragment has been produced, the exact nature of the case is rarely made out with certainty, before the patient's death, and the dissection of the parts.

Fractures of the ossa innominata are cases, accompanied with serious danger. When the fragments are displaced, and do not admit of being rectified again, the disorder arising from this cause may have fatal consequences. And as Boyer observes, even when such displacement does not exist, these fractures are not the less to be apprehended, on account of the injury, which the spinal marrow and the nerves, vessels, muscles, and viscera within the pelvis are likely to have sustained. These complications, which are almost inseparable from the fracture, may prove indeed directly fatal, or destroy the patient at a period more or less remote from the time of the accident. One terrible accident of this kind, which I saw about two years ago, with Mr. Ives, of Chobham, proved fatal in about half an hour. Sometimes, however, the fracture is not extensive, and the violence which produced it, has not caused any very serious injury of the viscera and soft parts: but, examples of this kind are uncommon.

In these last cases, which are the most simple, a cure of the fracture may be easily effected by means of rest; a position in which all the chief muscles attached to the pelvis are relaxed; discutient applications; and a roller, or T bandage. (*Boyer, Traité des Mal. Chir. T.* 3, *p.* 156.) The grand indication is to obviate the consequences of inflammation of the parts within the pelvis, and even of the peritonæum and abdominal viscera, by copious and repeated bloodletting. Any complaints, respecting the evacuation of the urine and feces, must also receive immediate attention. When there is great contusion, and the bones are very badly broken, the patient cannot move nor go to stool, without suffering the most excruciating pain. To afford some assistance in such circumstances, Boyer, in a particular case, passed a piece of strong girth web under the pelvis, and, collecting the corners into one, fastened them to a pulley suspended from the top of the bed. This enabled the patient to raise himself with very little efforts, so that a flat vessel could be placed under him. It appears to me, that a bed, constructed on the principles recommended by the late Sir James Earle, might be of infinite service in these cases as well as in many others, particularly compound fractures and paralytic affections from diseased vertebræ. (See *Observations on Fractures of the Lower Limbs; to which is added, an account of a contrivance to administer cleanliness and comfort to the bed-ridden; by Sir J. Earle*, 1807.) Mr. Earle has also exerted his mechanical ingenuity with great success in the invention of a bed, admirably well calculated for the treatment of fractures, and other cases, in which it is an object of high importance, to enable the patient to empty the bowels without changing his position.

Sometimes, notwithstanding the rigorous adoption of antiphlogistic measures, abscesses cannot be prevented from forming in the pelvis; particularly, when there are detached splinters driven inwards. These collections of matter should be opened, as soon as a distinct fluctuation can be felt. The splinters may wound the urethra or bladder, and cause an extravasation of urine. Desault extracted a splinter, which had had this effect from the bottom of a wound, made for the discharge of the effused urine. In these cases, a catheter should be kept introduced, in order to prevent the urine from collecting in the bladder, and afterwards insinuating itself into the cavity of the abdomen. (*Chopart.*) A very interesting case of fracture of the ossa innominata attended with rupture of the bladder, and followed by a fatal peritonitis, has been recorded by Cloquet. (*Nouveau Journ. de Medecine, Mars*, 1820.) The ossa pubis were forced half-an-inch from each other. The horizontal branch of the pubes, and the ascending ramus of the ischium were broken; the sacrum dislocated from the ossa ilium, and driven forwards within the cavity of the pelvis. The right sacro-iliac symphysis was broken only at its forepart, and its bones still retained their connexion. Vast quantities of blood were found extravasated in the lumbar region, and about the pudenda. As soon as the abdomen was opened, three pints of a yellowish fluid, having an urinary smell, immediately gushed out. In this case, catheters of various sizes were introduced, even a syringe adapted to them was used, but, nothing could be thus drawn off, but a few drops of blood. The possibility of mistaking a fracture of the acetabulum for a dislocation of the thigh-bone, and the differences of these cases, as explained by Sir A. Cooper, have been mentioned in the article *Dislocation*, *p.* 395.

FRACTURES OF THE THIGH.

The os femoris is liable to be broken at every point, from its condyles to its very head; but it is at the middle third of this extent, that fractures mostly occur. The fracture is sometimes transverse, but more frequently oblique. The latter direction of the injury makes a serious difference in the difficulty of curing the case, without future deformity, or lameness. Sometimes the fracture is comminuted, the bone being broken in more places than one; and sometimes the case is attended with a wound, communicating with the fracture, and making it what is termed *compound*. As Petit remarks, however, the thigh-bone is less seldom broken into several pieces, than other bones more superficially situated.

A fractured thigh is attended with the following symptoms; a local acute pain at the instant of the accident; a sudden inability to move the limb; a preternatural mobility of one portion of the bone; sometimes a very distinct crepitus, when the two ends of the fracture are pressed against each other; deformity, in regard to the length, thickness, and direction of the limb. The latter change, viz. the deformity, ought to be accurately understood; for, having a continual tendency to recur, especially, in oblique fractures, our chief trouble in the treatment is to prevent it. (*Desault, par Bichat, T.* 1, *p.* 181.)

Almost all fractures of the thigh are attended with deformity. When this is considered, in relation to length, it appears, that, in oblique fractures, the broken limb is always shorter than the opposite one; a circumstance denoting, that the ends of the fracture ride over each other. We may also easily convince ourselves, by examination, that the deformity is owing to the lower end of the fracture having ascended above the upper one, which remains stationary. What power, except the muscles, can communicate to the lower portion of the fractured bone, a motion from below upwards? At one end, attached to the pelvis, and, at the other, to this part of the bone, the patella, the tibia, and fibula, they make the former insertion their fixed point, and drawing upward the leg, the knee, and the lower portion of the thigh, they cause directly, or indirectly, the displacement in question. In producing this effect, the triceps, semitendinous, semi-membranosus, rectus, gracilis, sartorius, &c. are the chief agents.

For the purpose of exemplifying the power of the muscles to displace the ends of the fracture, mention is made, in Desault's works by Bichat, of a carpenter, who fell from a scaffold, and broke his thigh. The limb, the next day, was as long as the other; but the man had a complete palsy of his lower extremities, and could not discharge his urine. The moxa was applied, the muscles soon regained their power, and then the shortening of the limb began to make its appearance.

Besides the action of muscles, there is another cause of displacement. However firm the bed may be on which the patient is laid, the buttocks, more prominent than the rest of the body, soon form a depression in the bedding, and thence follows an inclination in the plane on which the trunk lies, which gliding from above downward, pushes before it the upper end of the fracture, and makes it ride over the lower one. The muscles, irritated by the points of bone, increase their contraction, and draw upward the lower part of the bone; and from this double motion of the two ends of the fracture in opposite directions, their riding over each other results.

Transverse fractures are less liable to be displaced in the longitudinal direction of the bone, because, when once in contact, the ends of the fracture form a mutual resistance to each other; the lower end, drawn upward by the muscles, meets with resistance from the upper one, which being itself inclined downward by the weight of the trunk, pushes the former before it, and thus both retain their position in relation to each other.

The deformity of a fractured thigh. in the transverse direction, always accompanies that which is longitudinal; but, sometimes, it exists alone. This is the case, when, in a transverse fracture, the two ends of the bone lose their contact; one being carried outward, the other inward; or, one remaining in its place, while the other is separated. The upper end of the fracture is not now, as in the foregoing instance, motionless in regard to the muscular action; the contraction of the pectineus, psoas, iliacus internus, and upper part of the triceps, draws it from its natural direction, and contributes to displace it.

The deformity of the limb, in regard to its direction, is either the consequence of the blow, which produced the fracture, or, what is more common, of the ill-directed exertions of persons who carry the patient. Thus, we see, that an injudicious posture bends the two portions, so as to make an angle.

Whatever may be the kind of deformity, the lower end of the fracture may retain the natural position in which it is placed, or else undergo a rotatory motion on its axis outward, which is very common, or inward, which is more unusual. This rotation always aggravates the displaced state of the fracture, and should be attended to in the reduction. (*Desault, par Bichat, T.* 1, *p.* 180, 185.)

Every one at all initiated in the surgical profession knows, that there are two very different methods of treating fractured thighs. In one, which was recommended and practised by Desault, and is still universally preferred in France, the limb is kept in a straight extended position. In the other, the limb is laid upon its side with the knee bent, a mode, which was extolled by the celebrated Mr. Pott, and since his time has found many partisans in this country. To these two positions for fractured thighs may now be added that, in which the patient lies upon his back, with his thigh and leg in the bent position, supported on two oblique planes, or surfaces, the apex, or angle of which is beneath the ham. This last position, however, has been more particularly recommended for fractures of the neck of the femur, though, if it be advantageous for them, I see no reason for not giving it a fair trial in other fractures of that bone.

That Mr. Pott lost sight of certain advantages of the straight position; that he was blind to the imperfections of the bent posture; and that he exaggerated the power, which we have, of relaxing all the muscles of a limb by position; few reflecting surgeons of the present day will be inclined to deny.

Were we to resign the privilege of thinking for ourselves, and implicitly to mould our opinions, according to any authority, however high, we should often fall into very avoidable errors. Were we to believe the literal sense of several passages in Mr. Pott's remarks upon Fractures, we should suppose it possible and practicable to relax at once, by a certain posture of the limb, every muscle connected with a fractured bone. In the first vol. of his works, page 389, edit. 1783, he observes, in speaking of what must best answer the purpose of incapacitating the muscles from displacing the fracture: "Is it not obvious, that putting the limb into such position as shall relax the whole set of muscles, belonging to, or in connexion with, the broken bone, must best answer such purpose?" and, in the next page, "What is the reason why no man, however superficially acquainted with his art, ever finds much trouble in setting a fractured os humeri? is it not because both patient and surgeon concur in putting the arm into a state of flexion, that is, into such a state as relaxes all the muscles surrounding the broken bone?" Also in page 393, he continues, "Change of posture must be the remedy, or rather the placing the limb in such manner as to relax all its muscles." That to have all the muscles relaxed in cases of fracture would be desirable, were it also practicable, every one will admit; but the possibility of accomplishing it, so long as different muscles have different uses, different situations, and different attachments to the bones, every one must grant to be no more than visionary. For instance, do not the patient and surgeon, in the case of fractured os humeri, adverted to above, rather concur in putting the fibres of the triceps and anconeus into a state of tension, at the same moment that they relax the biceps and brachialis internus?

The position of the fractured os femoris, says Mr. Pott, should be on its outside, resting on the great trochanter; the patient's whole body should be inclined to the same side; the knee should be in a middle state between perfect flexion, or extension, or half-bent; the leg and foot, lying on their outside also, should be well supported by smooth pillows, and should be rather higher in their level, than the thigh; one very broad splint of deal, hollowed out and well covered with wool, rag, or tow, should be placed under the thigh, from above the trochanter quite below the knee; and another somewhat shorter should extend from the groin below the knee on the inside, or rather in this posture on the upper side. The bandage should be of the eighteen-tail kind, and when the bone has been set, and the thigh well placed on the pillow, it should not without necessity, (which necessity in this method will seldom occur) be ever moved from it again, until the fracture is united; and this union will always be accomplished, in more or less time, in proportion as the limb shall have been more or less disturbed. (*Pott.*)

Here only two splints are mentioned; the surgeons of the present day usually employ four. After placing the patient in a proper position, the necessary extension is to be made. Then the under-splint, having upon it a broad soft pad, and an eighteen-tailed bandage, is to be laid under the thigh, from the great trochanter to the outer condyle. The surgeon, before applying the soap plaster, laying down the tails of the bandage, and putting on the other three splints, is to take care that the fracture lies as evenly as possible.

In the position for a fractured thigh, Mr.

Pott, we find, directs the leg and foot to be rather higher in their level, than the thigh; with what particular design, I have not myself been able to make out. Whoever meditates upon the consequence of elevating the leg and foot above the level of the thigh, in the bent position, will know, that it is to twist the condyles of the os femoris more outward, than is natural. When a patient is placed, according to Mr. Pott's direction, upon a common bed, the middle soon sinks so much that the leg becomes situated very considerably higher than the thigh, and I am disposed to think, that this is one cause, why so many broken thighs are united in so deformed a manner, that the foot remains permanently distorted outward. The great propensity of the triceps, and other muscles to produce this effect, may also serve to explain the frequency of the deformity. It is not merely the depression of the middle of the bed which is disadvantageous: as the weight of the patient's body falls more upon one side of the bed, than the other, in the bent position of the limb, unless the sacking be tight and the mattress very firm, it happens, that such a declivity is formed, as to render it exceedingly difficult, if not impracticable, to make the patient continue duly upon his side. It cannot be enjoined too forcibly, that fractured thighs should always be laid upon beds not likely to sink much. When this happens, no rational dependence can be put in the efficacy of the bent position, and, as Desault has explained, the same thing is hurtful also in the straight posture.

The most enthusiastic advocates for the bent position must allow, that it leaves the leg and foot too moveable and unsupported, and, that though it may relax the muscles, which have the most power to disturb the coaptation of a fractured thigh, it yet leaves a mass of muscle unrelaxed, quite sufficient to displace the ends of the bone. Hence, practitioners should endeavour to improve the apparatus employed, so that it may make a permanent resistance to the action of the muscles, and in the straight position such resistance may certainly be practised with most effect and convenience.

The whole tenor of Mr. Pott's observations on fractures would lead one to suppose, that from the moment a muscle is partially relaxed, it becomes incapable of acting on, or displacing a fracture. But, if this were correct, (which it cannot be) we should not have the power of completely bending, or extending our limbs; for as soon as the set of muscles, designed for this purpose, were partly relaxed by the half-flexion, or half-extension of the joint, they would be deprived of all further power. Therefore, in addition to the arguments to be brought against the bent posture, arising from its not actually relaxing all the muscles connected with the broken bone, we are also to take into the account the fact, that the partial relaxation of any muscle by no means incapacitates it from acting.

In the earlier editions of this Dictionary, I expressed a preference to Mr. Pott's method of treating broken thighs. More mature reflection, however, and subsequent experience, have made me a convert to the sentiments of Desault on this subject. The terrible compound fractured thighs, which I had under my care in the campaign in Holland in the year 1814, could not have been at all retained by any apparatus put merely upon the thigh itself. The superiority of long splints, extending the whole length of the limb, was in these cases particularly manifest. With such splints, which maintain steady the fracture itself, the knee, leg, ankle, and foot, your patient may, in fact, even be removed upon an emergency from one place to another, without any considerable disturbance of the broken part. But, how could this be done in the bent position, with short splints, merely applied to the thigh, affording no support to the leg, and not confining the motions of the knee, and foot?

There are some excellent remarks on the treatment of fractured thighs in the writings of Desault. It is observed, that, if we compare the natural powers of displacement with the artificial resistance of almost every apparatus, we shall find, that the disproportion between such forces is too great to let the former yield to the latter. The action of the muscles, however, which is always at first very strong, may afterwards be gradually diminished by the extension exercised on them. A power incessantly operating can effect, what another greater power temporarily applied, cannot at once accomplish, and the compression of circular bandages tends also to lessen the force of the muscles.

Desault cured in the Hôtel-Dieu an immense number of fractured thighs, without any kind of deformity. This success, it is said, was owing particularly to the well-combined employment of extension, and compression of the muscles. The advantage of keeping the muscles a long while extended, in order to diminish their power, is especially evident in the reduction of certain dislocations, as those of the shoulder, in which we often cannot succeed till the muscles have been kept on the stretch for a greater, or lesser time. The fracture of the patella and olecranon equally demonstrates the utility of compression for the same purpose; as when the muscles are not steadily compressed by the bandage, they draw upward the fragment of bone with double or triple force.

To the reduction of fractured thighs in the bent posture, Desault entertained the following objections: the difficulty of making the extension and counter-extension, when the limb is so placed; the necessity of then applying them to the fractured bone itself, instead of a situation remote from the fracture, as, for example, the lower part of the leg; the impossibility of comparing with precision the broken thigh with the sound one, in order to judge of the regularity of its shape; the irksomeness of this position long continued, though it may at first seem most natural; the inconvenient and painful pressure of a part of the trunk on the great trochanter of the affected side; the derangement, to which the limb is exposed when the patient has a motion; the difficulty of fixing the leg firmly enough to prevent the effect of its motion on the thigh-bone; the manifest impossibility of adopting this method, when both thighs are fractured; lastly, experience in France having been little in favour of such posture.

Also, what is gained by the relaxation of some muscles, is lost by the tension of others. For such reasons, (certainly strong ones,) Desault abandoned the bent position, and always employed the straight one, which was advised by Hippocrates.

Petit, Heister, and Duverney, recommend the extending means to be applied just above the condyles of the os femoris. Dupouy remarked that this practice rendered it necessary to employ very great force, and he preferred extension from the foot. Fabre took also into consideration the inconvenience of the pressure, made on the muscles, which, irritating and stimulating them to action, multiplies the obstacles to the setting of the fracture. For nearly similar motives, Desault espoused their doctrine, introduced it at the Hôtel-Dieu, and the success which he experienced from the practice, contributed materially to its more extensive adoption.

Desault, as we have stated, preferred the straight posture, and laid his patients on surfaces, not likely to sink with the weight of the body. The feather-beds, formerly in common use at the Hôtel-Dieu, had this inconvenience; for these, in cases of fractures, Desault substituted a firm, tolerably hard mattress, which did not allow the continual change of posture to occur, which a soft bed does. The object of every apparatus being to keep the ends of the fracture from being displaced, the mechanism of every contrivance, for this purpose, should be directed against the causes of the displacement. These are, 1. the action of the muscles, drawing upward the lower end of the fracture; 2. the weight of the trunk propelling downward the upper end. Hence, every apparatus, intended to prevent displacement of a thigh fractured obliquely, should, 1. draw and keep downward the lower end of the fracture; 2. carry and maintain upward the upper end of the fracture, and the trunk, which is above it. This principle is of general application, and only subject to a few exceptions in transverse fractures, attended merely with displacement in the direction of the diameter of the limb, or else none at all. 3. There must also be in the apparatus a resistance to the rotation of the lower portion of the broken bone, so as to keep the limb steady, even in case of any sudden motion.

If we compare the operation of the different pieces of our apparatus with the above indications, Desault says, we shall find, that, without permanent extension, they are not very effectual. With regard to bandages, whether a roller, or eighteen-tailed bandage, be used, they all have one common mode of operating; they press the muscles towards the ends of the fracture, so as to make them form a kind of natural case for the fracture, and thus they make lateral resistance against the parts. In this manner, bandages materially aid in preventing displacement side-ways, and are particularly useful in transverse fractures. But, what is there to hinder the two inclined surfaces of an oblique fracture from slipping one over the other? What power is there to keep the limb from receiving the effects of accidental shocks? Is the pelvis kept back? Is the action of the muscles resisted? The latter is indeed somewhat diminished by the pressure, and this is the chief use of the bandage; but, will such compression be enough to prevent the longitudinal displacement of the broken bone, especially, if the bandage be applied slackly, as some advise?

These remarks apply also to compresses; *petit moyen contre une grande cause.*

Splints are useful in firmly fixing the limb, and guarding it from the effects of accidental shocks, or of contractions of the muscles. They operate more powerfully than bandages, in preventing lateral displacement, and, hence, they suffice for transverse fractures, without permanent extension. They also resist the rotation of the thigh outward, or inward. But, when the breach of continuity is oblique, will they hinder the ends of the bone from gliding over each other, and the consequent shortening of the limb? They obviously could only do so, by the friction of the different pieces of the apparatus, especially the tapes, which fasten it, and then, to make the resistance effectual, they must be tied so tightly as to create danger of mortification. Will the splints prevent the trunk from descending, and propelling before it the upper end of the fracture? Will they hinder the action of the muscles on the lower end? Will they, in short, fulfil all the above indications? Their chief use is to prevent lateral displacement, and keep the limb steady. Hence, they should extend along the leg, as well as the thigh, which cannot fail to be disturbed whenever the lower part of the limb is allowed to move.

The pads serve principally to keep the limb from being galled by the splints, and their action in preventing displacement of the fracture must be but trivial.

According to Desault, the ordinary pieces of apparatus, which do not execute any permanent extension, may suffice for transverse fractures; but, they are always ineffectual, when the division is oblique, because they do not fulfil the twofold indication of drawing downward the lower end of the fracture, and keeping the other one upward.

He inculcated, that the object, particularly to be aimed at, was such a disposition that the foot, leg, thigh, and pelvis, should constitute but one whole; so that, though the different parts thereof might be drawn in different directions, yet they would still, with respect to one another, preserve the same mutual relation. He invented the following apparatus to answer these purposes.

A strong splint, long enough to extend from the crista of the os ilium to a certain length beyond the sole of the foot, and rather more than two inches and a half broad, with each of its extremities pierced in the form of a mortise, and terminating in a semicircular niche, is a principal part of Desault's apparatus. It is applied to the exterior side of the thigh, by means of two strong linen rollers, each more than a yard long.

The middle part of one roller is to be applied to the inside of the thigh, at its upper part; its ends are brought to the exterior side of the thigh, passed through the mortise, and knotted on the semicircular niche. Pads are to be previously placed under its middle part, in order to prevent any disagreeable pressure; as well as on the tuberosity of the ischium, which Desault considered as the principal point of action of this band.

The inferior part of the leg is next covered with pads, on which the middle part of the second roller is placed, the extremities of which cross on the instep and upper part of the foot, then on the sole, after which they are conveyed outward, and one end passed through the mortise and knotted with the other on the niche, with such a degree of force as to pull the inferior portion of the femur downward, and push the splint upward, and, by this means, the pelvis, and superior portion of the fractured bone. On the internal side of the limb is placed a second splint, which extends, from the superior part of the thigh, to a certain distance beyond the foot. A third is placed on the anterior part of the limb from the abdomen to the knee. The superior extremities of the anterior and exterior splints are fixed by means of a bandage passed round the pelvis. A roller, the middle part of which is placed under the sole of the foot, and the extremities crossed on its superior surface, and fastened to the splints, operates with them in preventing the foot from moving.

Before applying the apparatus, Desault covered the whole limb with compresses, wet with a solution of the acetate of lead. Over these, Scultetus's bandage was put, and a roller round the foot, all wet with the same lotion. For more particulars, the reader is referred to the *Parisian Chirurgical Journal, Vol.* 1. *Œuvres Chir. de Desault par Bichat, T.* 1. *Rosalino Giardina, Memoria sulla Fratture, con alcune Modificazione all' Apparato di Desault. 8vo. Palermo*, 1814. *Boyer, Traité des Maladies Chir. T.* 3. *Richerand, Nosogr. Chir. T.* 3, *Edit.* 4. Boyer's apparatus for fractured thighs is described in the 2d vol. of the First Lines of the Practice of Surgery, ed. 4.

Instead of the position advised by Pott, or that recommended by Desault and Boyer, Mr. C. Bell prefers the posture, in which the patient lies upon his back, with the limb supported in the bent attitude by means of a wooden frame. This machine is simple enough, consisting of boards, ten or eleven inches in breadth, one reaching from the heel to the ham, the other from the ham to the tuberosity of the ischium. Under the knee-joint, they are united at an angle, while a horizontal board connects their lower ends together. Thus they form two sloping surfaces, to which cushions are adapted, and over which the limb can be placed in an easy bent position. Near the edge of the inclined boards, holes are made, furnished with pegs. After the bone has been set, a long splint is applied from the hip to the side of the knee, and another along the inside of the thigh. (See *Operative Surgery, Vol.* 2, *p.* 189.) I entertain a very favourable opinion of this mode of placing fractured thighs. However, the foregoing apparatus does not sufficiently secure the leg and foot from motion, though with the aid of a roller and a foot-board, this advantage might easily be obtained. The fracture-apparatus, devised by my friend Mr. Earle, is excellently calculated for this mode of treatment, with these additional recommendations, that the obliquity of the two surfaces, on which the limb reposes, can be altered as occasion may require: there is a foot-board for the support of the foot, and a contrivance, by which the patient is enabled to have stools, without moving himself or changing his posture in the slightest degree. (See his *Practical Observations in Surgery, p.* 125, *&c. 8vo. Lond.* 1823.)

Fractures of the Neck of the Thigh-bone.

As this is a subject which has of late years excited considerable discussion, the reader cannot be too particular in noticing, that three distinct kinds of fracture, very different in their nature, treatment, and result, have been generally confounded together under the name of "fractures of the neck of the thigh-bone;" for, much of the dispute, that has prevailed, whether these fractures will unite like those of other bones, seems to have proceeded from the three species of fracture not having been properly discriminated. Two of the cases unite by means of callus, like other fractures; but, the other, as it usually occurs, does not admit of a similar mode of union; or at all events, the fact has not yet been demonstrated. Sir Astley Cooper has therefore divided these cases, first, into *fractures, which happen through the neck of the bone, entirely within the capsular ligament;* being the examples, in which an union by bone has not yet been proved: secondly, into fractures through the neck of the bone *at its junction with the trochanter major, which fractures are of course external to the capsular ligament:* thirdly, into *fractures through the trochanter major, beyond its junction with the neck of the bone.* (*On Dislocations, &c. p.* 114—116.)

Fractures of the neck of the thigh-bone are infinitely more frequent, than dislocations at the hip, and may arise from a fall, either upon the great trochanter, the sole of the foot, or the knee. According to Desault, the first accident produces the injury much more frequently, than the two latter. Of thirty cases, which were seen by Desault, four-and-twenty arose from falls on the side. All those, inserted by Sabatier in his interesting Memoir, were the result of a similar accident. These authors, it is to be remarked, are not speaking particularly of the fracture within the capsular ligament, and hence perhaps the reason of their sentiments differing from that of Sir Astley Cooper, who observes, that, in London, the fracture within the capsule is most commonly produced by a person slipping off the edge of the foot-pavement. According to this eminent surgeon, a fracture of the neck of the thigh-bone, within the capsular ligament, seldom happens but at an advanced period of life, and the reason of the facility, with which the injury takes place in old persons, he ascribes to the interstitial absorption, which that part of the femur undergoes in individuals past a certain age, whereby it becomes shortened, and altered in its angle with the shaft of the bone. He admits, however, that the accident is frequently caused by a fall upon the trochanter major. (*Surgical Essays, Part* 2, *p.* 35, 36. *Also Larrey, Journ. Complém. T.* 8, *p.* 98, *8vo. Paris,* 1820.) Fractures of the neck of the thigh-bone within the capsule are more common in women, than men. (*J. Wilson on the Skeleton, &c. p.* 245. *A. Cooper on Dislocations, &c. p.* 122.)

The division is more frequently transverse than oblique; the neck being sometimes, in the former case, wedged in the body of the bone, as Desault found in several instances; a model of one of which, in wax, is preserved in the collection of *L'Ecole de Santé*, and the natural specimen of which was in the possession of Bichat. A fracture of the neck of the thigh-bone is sometimes complicated with that of the trochanter major.

With respect to the diagnosis of a fracture within the capsular ligament, an acute pain is felt, a sudden inability to walk occurs; and the patient cannot raise himself from the ground. The latter circumstance, however, is not invariable. In the fourth vol. of the *Mem. de l'Acad. de Chirurgie*, a case is related, in which the patient walked home after the accident, and even got up the next day. Desault published a similar example. The locking of one end of the fracture in the other, may offer an explanation of this circumstance. The dissections, made by Dr. Colles, have recently led to another discovery, viz. that sometimes the solution of continuity does not extend completely through the neck of the femur. (See *Dublin Hospital Reports*, *Vol.* 2.) Three cases proving this fact are there adduced; a fact, which at once explains the ability of some patients to walk directly after the injury, and the absence of all retraction of the limb.

A shortening of the limb almost always takes place: the "leg becomes from one to two inches shorter, than the other; for the connexion of the trochanter major with the head of the bone, by means of the cervix being destroyed by the fracture, the trochanter is drawn up by the muscles, as high as the ligament will permit, and consequently rests upon the edge of the acetabulum, and upon the ilium above it." (*Sir A. Cooper on Dislocations, &c. p.* 117.) The action of the muscles drawing upward the lower end of the fracture, the weight of the trunk in propelling downward the pelvis and upper end of the fracture, are the two causes of the shortening of the limb. In general, a slight effort suffices for the restoration of the natural length of the limb; but, the shortness recurs almost as soon as the extension ceases. "This evidence of the nature of the accident continues," as Sir A. Cooper correctly remarks, "until the muscles acquire a fixed contraction, which enables them to resist any extension, which is not of the most powerful kind." (*Surgical Essays*, *Part* 2, *p.* 31.) Goursault and Sabatier remark, that sometimes the shortening of the member does not take place till a long while after the accident. In opposition to the common belief, that the limb is shortened, Baron Larrey asserts, that the member is at first actually lengthened. (*Journ. Complém. T.* 8, *p.* 99.) This statement I have never seen confirmed, and it is contradicted by daily experience. And, to prove how widely Larrey differs from Sir A. Cooper, the following passage will suffice. "In order to form a still more decided judgment of this accident (says the latter writer) after the patient has been examined in the recumbent posture, let him be directed to stand by his bedside, supported by an assistant, so as to bear his weight upon the sound limb. Immediately he does this, the surgeon observes most distinctly the shortened state of the injured leg, the toes resting on the ground, but the heel not reaching it, the everted foot and knee, and the diminished prominence of the hip." (*Surgical Essays*, *Part.* 2, *p.* 34.) The lessened projection of the trochanter major arises from its not being supported by the neck of the bone as it always is in the natural state of the parts. A swelling is observable at the upper and front part of the thigh, always proportioned to the retraction, of which it appears to be an effect.

The projection of the great trochanter is almost entirely effaced. Directed upwards and backwards, this eminence becomes approximated to the crista of the os ilium; but, if pushed in the opposite direction, it readily yields; and, when it has arrived at its natural level, the patient becomes capable of moving his thigh.

The knee is a little bent. Abduction of the limb always occasions acute pain, and it is noticed by Sir A. Cooper, that the rotation inwards is particularly painful, because the broken extremity of the bone then rubs against the capsular ligament. (*Vol. cit. p.* 33.) If, while the hand is placed on the great trochanter, the limb is rotated on its axis, this bony projection may be felt revolving on itself, as on a pivot, instead of describing, as in the natural state, the segment of a circle, of which the neck of the femur is the radius. This symptom, which was particularly noticed by Desault, is very manifest when the fracture is situated at the base of the neck, less so when at its middle; and it is not very perceptible when the breach is near the head of the bone. In the rotatory motions, the lower fragment, rubbing against the upper one, produces a distinct crepitus, which, however, is not an invariable symptom, as Larrey would lead one to suppose. In fact, as Sir A. Cooper has explained, it is not discoverable, while the patient is lying upon his back with the limb shortened; but, if the leg be drawn down, so as to bring the limbs to the same length, and rotation be then performed, especially inwards, the crepitus is sometimes observed, in consequence of the broken ends of the bone being thus brought into contact. (*On Dislocations, &c. p.* 121.)

The toes are usually turned outward; a position which Sabatier considers as the inevitable effect of the fracture, though Paré and Petit noticed, that it did not constantly occur. Two cases, adduced by these illustrious surgeons, were not credited by M. Louis; but the experience of Desault fully confirmed the possibility of the limb not being always rotated outwards: and, as Sir A. Cooper has remarked, three or four hours generally elapse before the turning of the limb outward is rendered most obvious by the fixed contraction of the muscles. (*Surgical Essays*, *Part* 2, *p.* 32.) Indeed, one case was shown to him by Mr. Langstaff, in which the foot was inverted. (*On Dislocations*, *Preface*.) Such an appearance is very uncommon, and the reason of it, in the case alluded to, has not been explained.

The position of the toes outward is commonly, and I believe correctly, imputed to the rotator muscles. Bichat conceived, however, that if this doctrine were true, such position ought always to exist; and he reminds us, that all the muscles, which proceed from the pelvis to the trochanter, are, with the exception of the quadratus, in a state of relaxation, by the approximation of the femur to their point of insertion; and that the contracted muscles would not allow the foot to be so easily turned inward again. Hence, Bichat thought it probable, that the weight of the foot itself might pull the limb into the position, in which it is commonly found. On the other hand, it is remarked by Sir A. Cooper, that any one may satisfy himself, that the rotation of the limb outwards is in part owing to the muscles, by feeling the resistance, which is made to rotation inwards, which resistance, however, he thinks, may in some measure depend upon the length of the portion of the neck of the femur, which remains attached to the trochanter major, and rests against the ilium. (*Surgical Essays, Part* 2, *p.* 32.)

In addition to the foregoing observations respecting the diagnosis, it is to be remembered, that a fracture within the capsular ligament seldom happens but at an advanced period of life, and is much more frequent in women than men. (*Sir A. Cooper on Dislocations, &c. p.* 123.)

A fracture of the neck of the thigh-bone, on the outside of the capsular ligament, is attended with but little shortening of the limb, and is frequently met with in persons under fifty, though it may and does occur in older subjects. Also while the fracture within the capsule takes place from very slight causes, this is generally the result of great violence, severe blows, falls, and the passage of heavy carriages over the pelvis. The crepitus can be easily felt, without previously drawing down the limb, and the case is characterized by greater suffering, than what is usually noticed when the fracture is within the capsule. But, the most important circumstance, in which a fracture on the outside of the capsule differs from one within it, is in its admitting of bony union, which the other case does not, as far as our present experience teaches us. (See *Sir A. Cooper on Dislocations, &c. p.* 185, *&c.*)

In an oblique fracture through the trochanter major, without injury of the neck of the bone, the leg is very little and sometimes not at all shortened; the foot is benumbed; the patient cannot turn in bed without great difficulty and pain; in some cases, the detached portion of the trochanter is drawn forwards towards the ilium; in others, it falls towards the tuberosity of the ilium; but, in general, it is widely separated from that portion which remains connected with the neck of the bone. The foot is considerably turned outwards; and a crepitus not readily detected. This accident may happen at any period of life: it unites readily: and the patient recovers with a very good use of the limb. (*Vol. cit. p.* 158.)

Many years ago, it was supposed, that fractures of the neck of the thigh-bone could not be cured, without some shortening of the limb, and lameness. Ludwig, Sabatier, and Louis, broached this doctrine, and imputed the circumstance to the destruction of the neck of the bone. That this sometimes happens has been well ascertained. A late surgical visiter to Paris informs us, that, in several specimens, which he examined in different museums, whether imperfect union, or no union at all, had followed the fracture, this absorption of the neck of the bone had taken place to a great extent, and in some to so great an extent, that the articulating surface of the bone, which plays in the acetabulum, rested between the trochanters, consolidated to the body of the bone by ligamentous union, and the thickening of the surrounding parts, whilst all the intervening neck of the bone was absorbed. (See *Sketches of the Medical School of Paris, by J. Cross, p.* 90.) M. Roux has also nearly always found the neck of the femur shortened and deformed after its reunion. (*Parallèle de la Chir. Angloise avec la Chir. Françoise, p.* 178.) Desault, however, in his practice, is said to have rarely met with instances of lameness from such a cause.

A question, that has lately been much agitated, (see *Earle's Practical Observations in Surgery, Lond.* 1823,) is, whether reunion by bone ever follows *cases, in which the fracture is entirely within the capsule*, and the head of the bone insulated, except at its attachment to the acetabulum by the round ligament? A few years ago the decision of the French surgeons used to be in the affirmative, and they pretended actually to demonstrate the fact by preparations in their museums. M. Roux, indeed, sent over a specimen to Sir A. Cooper, with the hope of producing conviction; but, this eminent surgeon still remains unconvinced, because the traces of reunion in the preparation appear to him to indicate a sort of fracture, where the internal fragment still retained some connexion with the capsular ligament. (*Roux, Parallèle de la Chirurgie Angloise, &c. p.* 179, 180.) In fact, it was a case, in which the fracture happened at the junction of the cervix with the trochanter. And Sir A. Cooper distinctly states, that, in all the examinations, which he has made of *transverse fractures of the cervix femoris, within the capsular ligament, he has never met with a bony union, or of any which did not admit of motion of one bone upon the other.* (*Surgical Essays, Part* 2, *p.* 39.) He imputes the want of bony union to the fragments not being in contact, and duly pressed against each other, and to the little action in the head of the bone separated from the cervix, "its life being supported solely by the ligamentum teres, which has some few vessels ramifying from it to the head of the bone." For the particular appearances found in the dissection of these cases, I must refer to the statements of Dr. Colles (*Dublin Hospital Reports, Vol.* 2.), and to Sir Astley Cooper's own account, from which it seems, that "no ossific union is produced; that nature makes slight attempts for its production upon the neck of the bone, and upon the trochanter major; but scarcely any upon the head of the bone; and that, if any union is produced, it is by ligament only." (*Vol. cit. p.* 46.) Mr. Wilson's observations are all in confirmation of the same explanation; (*On the Skeleton, p.* 247.) and he adverts to two preparations, in the museum of the College of Surgeons, which have been supposed to be proofs of a bony reunion of the neck of the femur, subsequently to a fracture within the capsular ligament; but (says Mr. Wilson) "I have very attentively examined these two preparations, and cannot perceive one decisive proof in either of the bone having been actually fractured." One of these cases is that, which was published by Mr. Liston in the Edinb. Med. and Surgical Journ. Lastly, Dr. Colles of Dublin dissected several cases, in which the neck of the femur had been broken: in one, where the injury was within the capsular ligament, "no effort of nature had been made to create a reunion between the two pieces of the fracture, and *the stability of the limb had depended upon the strength of those ligamentous bands, by which each piece was connected with the capsular ligament of the joint, aided, no doubt, by the extraordinary thickness, which the capsular ligament had acquired.*" (*Dublin Hospital Reports, Vol. 2, p.* 336.) In the two first instances, reported by this author, "The broken surfaces moved on each other, and were converted into a state approaching to ivory. No attempt had been made to reunite the fracture, and the pieces of bone were held in apposition only by new ligamentous productions from the capsular ligament, which were inserted into the external surfaces of each piece. In No. 3, there had been a slight attempt made at reunion. In Nos. 7, 8, and 9, we observed *a phenomenon, which,* I believe, *is now for the first time mentioned, a fracture of only part of the bone.* No. 6 presented us with that mode of reunion, which some have supposed the most perfect, of which this fracture is susceptible. While Nos. 10 and 11 exhibit a mode of reunion, very little inferior to callus in point of firmness, but very different in its nature, and which I conceive is peculiar to the fracture of the neck of the femur." Dr. Colles also found, that, in all these cases (except, perhaps, No. 5,) the *capsular ligament was not lacerated.* In every instance, however, there was an *increased thickness of the capsule,* and *a removal of all,* or *the greater part of the neck of the bone.* "Although the ligamentous bands seem, in a majority of instances, to have proceeded from the capsular ligament, yet, it is evident from No. 6, that these may arise merely from the broken surfaces of the bone; for, in this case not a single fibre was attached to the capsular ligament, the new bond of union being covered by the reflected portion of the synovial membrane or periosteum of the neck. We have an illustration of this in Ruysch. Tab. 1, Thes. 9." In Nos. 10 and 11, the fragments were united by a cartilaginous substance. In Nos. 7, 8, and 9, the unbroken portion of the neck was so softened, that it more resembled cartilage than bone, and, in this state, "it was laid down upon the fractured surface, and united to it." (*Dr. Colles in Dublin Hospital Reports, Vol. 2, p.* 353—355.) In the museum of the Ecole de Médecine, at Paris, there are some preparations, which the professors exhibit at their lectures, in order to prove, that bony union may succeed a fracture of the femur. These specimens were carefully examined by Mr. Cross; but, none of them proved to him, that bony union ever follows where the head of the bone becomes insulated, excepting its attachment to the pelvis by the ligamentum teres. (*Sketches of the Medical Schools at Paris, p.* 93.) On the other hand, Boyer observes, that experience fully proves the possibility of uniting such fractures of the neck of the thigh-bone, as are situated within the capsular ligament; but, he acknowledges, that there are certain circumstances, which may prevent this desirable event. "From all that has been hitherto said on the prognosis of a fracture of the neck of the femur, we may conclude (says Boyer) that this fracture is more serious, than that of any other part of the same bone, because the difficulty of keeping it reduced is greater. That it may in general be reunited, especially in young healthy subjects; but, more easily, when it is situated near the base of the neck, than near the head of the bone. That the languid vitality of one of the fragments, and the impossibility of ascertaining whether the coaptation be exact, make the cure slow, and the time necessary for their consolidation uncertain. That the neglect of means adapted to maintaining the limb in its proper length, and natural straightness, and the fragments sufficiently motionless, may cause them to unite by an intermediate substance. Lastly, that the situation of the fracture near the head of the femur; the complete laceration of the elongation of the capsule investing the neck of the bone; the great age of the patient; and, particularly, the constitution labouring under some diathesis, which affects the osseous system; may render the cure absolutely impossible; that, in this circumstance, one of the fragments is more or less destroyed by the friction of the other against it, and in the joint a disease is formed, which tends to carry off the patient." (*Boyer, Traité des Maladies Chirurgicales, T.* 3, *p.* 284.) This professor lays much stress on the complete laceration of the continuation of the capsule over the neck of the bone, as an occurrence preventive of union. But, he thinks, it does not frequently happen, because the capsular ligament hinders much displacement of the fragment; (*Op. cit. p.* 278,) a remark rather at variance with the shortened state of the limb. As for Baron Larrey, he appears to entertain no doubt of the possibility of uniting fractures of the neck of the femur within the capsular ligament, and concludes his tract on this subject with the case of General Fririon, who was perfectly cured, after a supposed injury of this description. (See *Journ. Complém. Tom.* 8, *p.* 118.) That some French surgeons, however, are now beginning to be less positive in their belief, is sufficiently manifest from the circumstance of a reward having been offered in France for the best explanation of the cause of such fractures not uniting by bone. (*Sir A. Cooper, Appendix, p.* 43.)

How is this discordance between the most experienced French and English surgeons to be reconciled and accounted for? After the very numerous and careful dissections, which have been performed by Sir A. Cooper and Dr. Colles, with the view of ascertaining the state of the joint, after fractures of the neck of the thigh-bone, little doubt can be entertained, that, where the fracture is *transverse,* and *within the capsular ligament, a bony reunion, if not absolutely impossible, is at least so rare an occurrence as not to be calculated upon.* The difference of the French surgeons upon this question is to be ascribed to their not having duly discriminated from the foregoing kind of case, either fractures extending more or less in the direction of the axis of the neck of the bone, or other fractures external to the capsular ligament. How much, however, the safety of the practitioner's reputation will depend upon the prognosis, which is given, must be quite evident; for in *the transverse fracture within the capsule, lameness is* *sure to follow, though its degree cannot at first be exactly estimated.* (*A. Cooper, Surgical Essays, Part* 2, *p.* 51.)

As far as I am able to judge of this subject, Sir Astley Cooper has been the means of introducing clear and discriminate views of it. and, without his able exertions, the important differences in the nature, symptoms, and curableness of the various kinds of fractures of the neck and upper part of the thigh-bone, depending upon their exact situation and direction, might yet have continued very imperfectly comprehended. This remark is made without any intention of deducting from the merits of Desault, Platner, and Mr. John Bell, all of whom seem to have noticed the fact, that a fracture within the capsular ligament will not admit of union by callus. (*C. Bell on Injuries of the Spine and Thigh-bone*, 4*to. Lond.* 1824. *p.* 52, *&c.*)

Having spoken of the nature of fractures of the neck of the thigh-bone, within and without the capsular ligament, I come next to the consideration of the proper practice to be adopted. In the first description of the injury, as no osseous union can be expected, ought we to endeavour to keep the fragments, as nearly in a state of apposition as possible, and subject the patient to rest and confinement, with the view of promoting the other modes of union, so well pointed out in Dr. Colles's paper? Or, should we, as Sir A. Cooper does, avoid confining the patient to any long, or continued extension, " as being likely to be productive of ill health, without the probability of producing union?" Yet, it appears both from this gentleman's own statements, and from those of Dr. Colles, that, though a bony union cannot be effected, other connecting means may be established, and the more perfect these are, the less will be the subsequent lameness. As long, therefore, as these facts are incontrovertible, I should be disposed to recommend surgeons to do every thing in their power to keep the limb quiet, and in a desirable posture, for a due length of time. Whether for this purpose, Boyer's apparatus, with the limb in the straight posture; or the apparatus with two inclined surfaces, with the limb in the bent position, and the patient on his back; or lastly, Hagedorn's ingenious and scientific treatment, as explained in the second vol. of the First Lines of Surgery, should be preferred, time and experience must determine. Sir A. Cooper merely places one pillow under the whole length of the limb, and puts another across under the patient's knee, so as to keep the limb in an easy bent position. In a fortnight, or three weeks, the patient is allowed to sit upon a high chair, and, in a few more days, he begins to take exercise upon crutches. After a time, these are laid aside, a stick substituted for them, and, in a few months, this assistance may be dispensed with. At the end of the treatment, a shoe must be worn with a sole of equal thickness to the diminished length of the limb. (*Surgical Essays, Part* 2, *p.* 50.)

In the treatment of such fractures of the neck of the femur, as are situated on the outside of the capsular ligament, Sir A. Cooper prefers the position in which the patient lies on his back, with the injured limb in a bent posture, supported on what is termed the double inclined plane, the kind of instrument already spoken of, as being sometimes employed by Mr. C. Bell. When the limb has been placed over this machine, in an easy bent position, a long splint, reaching above the trochanter major, is applied to the outer side of the thigh, and fastened to the pelvis with a strong leather strap, so as to press one portion of bone towards the other. The lower part of the splint is also fastened to the outside of the knee with a strap. The limb is to be kept as quiet as possible for eight weeks, at the end of which time, the patient may leave his bed, if the attempt should not cause too much pain; but, the splint is to be continued another fortnight. (*Surgical Essays, Part* 2. *p.* 59.) Desault's apparatus has been described in the foregoing columns, and those of Boyer and Hagedorn are explained and represented in the 2d Vol. of the First Lines of Surgery.

Larrey, who disapproves of the plan of continued extension, has lately proposed a particular apparatus for fractures of the neck of the femur: but, as it appears to me very inferior to other methods already mentioned, I shall here merely refer to the *Journ. Compl. T.* 8, *p.* 116, where a description of it may be found.

I am glad to find the number of advocates for Pott's method of treatment annually diminishing. Indeed, the bad effects and painful consequences of having the whole weight of the trunk operating upon the fractured ends of the bone, which are often not properly in contact, are too obvious to need any comment. Yet, this injudicious pressure is made in the bent position, which also forbids the use of long effective splints, and all assistance from moderate continued extension.

A fracture of the neck of the thigh-bone may be complicated with a dislocation of the head of the bone. (See *J. G. Haase, De Fractura colli Ossis Femoris, cum Luxatione Capitis ejusdem ossis conjuncta, Lips.* 1798.) For further information, relative to fractures of the neck of the femur, the following authors may be consulted. *C. G. Ludwig de Collo Femoris ejusque Fractura Programma, Lips.* 1755. *Bellocq, in Mém. l'Acad. de Chir. T.* 3. *Aitken's and Gooche's machines are described in B. Bell's Surgery, Vol.* 4. *Sabatier, in Mém. de l'Acad. de Chir. T.* 4. *Duverney, Traité des Mal. des Os., T.* 1. *Unger, in Richter's Bibl. B.* 6, *p.* 520. *Theden, Neue Bemerkungen, &c. Th.* 2. *Brunninghausen ueber den Bruch des Schenkelbeinhalses, &c. Wurzb.* 1789. *Van Gescher über die Entstellungen des Ruckgrats, und über der Verrenkungen und Bruche des Schenkelbeins. aus d. Holland. Hedenus, in Bernstein's Darstellung des Chir. Verbandes, Tab.* 42, *fig.* 82 *and* 83. *M. Hagedorn über der Bruch des Schenkelbeinhalses, &c. Leipz.* 1808. *J. N. Sauter, Anweisung die Beinbrüche der Gliedmassen, vorzuglich die complicierten, und den Schenkelbeinhalsbruch nach einer neuen, &c. Methode, ohne Schienen sicher zu heilen,* 8*vo. Konstanz.* 1812. *J. Wilson on the Structure and Physiology of the Skeleton, &c. p.* 243, *&c.* 8*vo. Lond.* 1820. *Dr. Colles, Dublin Hospital Reports, Vol.* 2. *Sir A. Cooper, Surgical Essays, Part* 2; *and Treatise on Dislocations, &c.* 4*to.*

1822, *with Appendix*, 1823. *H. Earle, Practical Observations on Surgery*, 1823. *Lancet, Nos. 5 and* 8, *Vol.* 1, *p.* 302. *Boyer, Traité des Mal. Chir. T.* 3. *John Bell, Principles of Surgery*, 4*to.* 1801, *p.* 549, *&c.*; *and C. Bell, on Injuries of the Spine and Thigh-bone*, 4*to*, 1824.

OBLIQUE FRACTURES OF THE EXTERNAL, OR INTERNAL CONDYLE OF THE FEMUR INTO THE JOINT.

In these cases, Sir A. Cooper prefers the straight position, because the tibia presses the extremity of the broken condyle into a line, with that which is not injured. The limb is to be put in the extended posture upon a pillow, and evaporating lotions and leeches are to be used for the removal of the swelling and inflammation. "When this object has been effected, a roller is to be applied around the knee, and a piece of stiff pasteboard, about sixteen inches long, and sufficiently wide to extend entirely under the joint, and to pass on each side of it, so as to reach to the edge of the patella, is to be dipped in warm water, and applied under the knee, and confined by a roller. When this is dry, it has exactly adapted itself to the form of the joint, and this form it afterwards retains, so as best to confine the bones. Splints of wood or tin may be used on each side of the joint; but they are apt to make uneasy pressure. In five weeks, passive motion of the limb may be gently begun, to prevent anchylosis." (*Surgical Essays, Part* 2, *p.* 101; *also Treatise, p.* 221.) This author afterwards describes a compound fracture of the external condyle, a portion of which was after a time extracted, and the case ended so favourably, that the patient, who was a boy, was able to bend and extend the leg without pain.

For fractures, just above the condyles, Sir A. Cooper recommends the bent position, without which, he says, deformity is sure to follow. He advises the limb to be placed over the double inclined plane, and a roller applied round the lower portion of the femur. (*p.* 103.)

FRACTURES OF THE PATELLA.

This bone is most frequently broken transversely, and the accident may be produced either by the action of external bodies, or by that of the extensor muscles. In the latter case, the fall is subsequent to the fracture, and, as Camper has remarked, it is mostly only an effect of it. For instance, the line of gravity of the body is, by some cause or another, inclined backward; the muscles in front contract to bring it forward again; the extensors act on the patella; this breaks, and the fall ensues. That it is the action of the muscles, and not the fall, which usually breaks the knee-pan, is well ascertained. Sometimes the fracture occurs, though the patient completely succeeds in preventing himself from falling backward, as we find exemplified in two cases reported by Sir A. Cooper. (*Surgical Essays, Part* 2, *p.* 85.) A soldier broke his patella in endeavouring to kick his serjeant; the olecranon has been broken in throwing a stone. In the operating theatre of the Hôtel Dieu, both the knee-pans of a patient were broken by the violent spasms of the muscles, which followed an operation for the stone. The force of the muscles occasionally ruptures the common tendon of the extensor muscles, or, what is more frequent, the ligament of the patella. Of these cases, Petit, Desault, and Sabatier, met with examples. When the patella is broken longitudinally, the cause is always outward violence. (*Œuvres Chir. de Desault, T.* 1, *p.* 252.)

A transverse fracture of the patella may also originate from a blow, or fall, on the part; but, in common cases, it is produced by the violent action of the extensor muscles of the leg. It is only of late years, however, that the true mode, in which the bone is usually broken, has been understood. As Boyer observes, for the production of a transverse fracture of the knee-pan, the extensor muscles of the leg need not act with a convulsive force, their ordinary action being strong enough to produce the effect in question, when the body is inclined backward, and the patient is in danger of falling upon his occiput. In this state, the thigh being bent, the extensor muscles of the leg contract powerfully, in order to bring the body forwards, and prevent the fall backwards; and the patella, whose posterior surface then rests only by a point against the forepart of the condyles of the femur, is placed between the resistance of the ligament binding it to the tibia, and the action of the extensor muscles. A fracture now happens the more easily, because, by the flexion of the knee, the line of the extensor muscles, and that of the ligament of the patella, are rendered oblique, with respect to the vertical axis of this bone, which is bent backwards at the point, where it rests upon the condyles. (*Traité des Mal. Chir. T.* 3, *p.* 322. *C. Bell's Operative Surgery, Vol.* 2, *p.* 201, 8*vo. Lond.* 1809. *A. Cooper's Surgical Essays, Part* 2, *p.* 86.) By violent spasmodic action of the extensor muscles, however, the patella may be broken transversely, while the limb is perfectly straight. A very singular case is mentioned by Sir A. Cooper, where a patella, which had been formerly broken, and united by ligament, was again divided into two portions, in consequence of the destruction of the uniting medium by ulceration. (*Vol. cit. p.* 100.) A case is also on record, where the ligamentous uniting substance was so incorporated with the skin, that when the latter happened to be lacerated, the knee-joint was laid open, and amputation became necessary. (*C. Bell, Op. Surgery, Vol.* 2, *p.* 204.)

In transverse fractures, there is a considerable separation between the two fragments of the bone, very perceptible to the finger, when the hand is placed on the knee. This separation is not occasioned equally by both portions; the upper one, embraced by the extensor muscles, is drawn upward very forcibly by these powers, which the patella no longer resists; while the inferior portion, being merely connected with the ligament below, is not moved by any muscle, and can only be displaced by the motions of the leg, to which it is attached. Hence, the separation is least when the limb is extended, being then only produced by the upper fragment; greatest, when the limb is bent, because both pieces contribute to it; and it may be increased or diminished, by bending the knee more or less.

As Boyer has particularly noticed, the laceration, or not, of the tendinous expansion, upon the front of the patella, makes a material difference in these cases, because it is a part of great importance in the cure. According to this author, a portion of it in simple fractures of the patella generally escapes laceration, and the separation of the fragments is then not very considerable; but, violent action of the extensor muscles, the fall subsequent to the fracture, or bending the knee too much, may separate the pieces of bone far from each other, and rupture the tendinous expansion. (*Traité des Mal. Chir. T.* 3, *p.* 328.) According to Sir A. Cooper, "when the ligament is but little torn, the separation will be but half an inch; but under great extent of injury, the bone is drawn five inches upwards, the capsular ligament, and tendinous aponeurosis covering it, being then greatly lacerated." (*Surgical Essays, Part* 2, *p.* 84.)

The upper portion of bone may be moved transversely, and pain is thus excited, but no crepitus can be felt, as the two pieces of bone are not sufficiently near each other. When the swelling of the knee, consequent to fractures of the patella, is very great, the symptoms of the injury may be more or less obscured. However, in consequence of the inability of the extensor muscles to move the leg, except in a few cases where the fracture is very low, the patient cannot stand without difficulty, and is nearly quite unable to walk.

In the treatment, the chief indications are to overcome the action of the extensor muscles of the leg, and to keep the fragments as near each other as possible, partly by a judicious position of the limb, and partly by mechanical means. The first indication is fulfilled by relaxing the above-mentioned muscles; 1st, by extending the leg; 2dly, by bending the thigh on the pelvis, or, in other words, raising the femur, so that the distance between the knee and anterior superior spinous process of the ilium may be as little as possible, which object, however, will also require the body to be raised, and the pelvis somewhat inclined forwards. In short, as Richter long ago advised, the patient should be almost in a sitting posture, the trunk forming a right angle with the thigh. (*Bibl. Chir. B.* 6, *p.* 611, *Göttingen*, 1782.) 3rdly, The muscles are to be compressed with a roller. The second indication, or that of placing and maintaining the fragments in contact, or as nearly so as circumstances will allow, is in a great measure already answered by the above recommended position of the limb, and trunk; but it is not perfectly fulfilled, unless the upper portion of the bone be also pressed towards the lower fragment, and mechanically held in this situation by the pressure of an apparatus, or bandage. And, in pushing the upper fragment towards the lower one, the surgeon should always be careful, that the skin be not depressed and pinched between them.

Having described the principles which ought to be observed, I do not know, that any great utility would result from a detail of the various methods of treating a broken patella preferred by different surgeons. In the 2d vol. of the First Lines of Surgery, may be found a description of the plan and apparatus employed by Baron Boyer. Desault's practice, which was related in the third edition of this Dictionary, I now omit, as not being exactly such as modern surgeons would adopt; not from any of his principles being erroneous, but because his apparatus is more complicated than necessary.

After putting the patient in bed upon a mattress, and in the desirable posture, with the limb confined, supported, and raised, as above directed, upon a well-padded hollow splint, Sir A. Cooper applies at first no bandage to the knee, but covers it with linen wet with a lotion, composed of liq. plumbi acet. dilut. ʒv. and spir. vin. ℥j. If, on the succeeding day, or two, there be much tension, or ecchymosis, leeches should be applied and the lotion continued; but the employment of a bandage is not to commence until the tension has subsided; for Sir A. Cooper assures us, that he has seen the greatest suffering, and such swelling as threatened gangrene, produced in these cases by the too early use of a roller. Instead of a circular bandage, placed above and below the broken bone, and drawn together with tape, &c. so as to bring the upper fragment towards the lower one, this experienced surgeon prefers the following method. A leather strap is buckled round the thigh, above the broken and elevated portion of bone, and from this circular piece of leather, another strap passes under the middle of the foot, the leg being extended, and the foot considerably raised This strap is brought up to each side of the patella, and buckled to the leather band already applied to the lower part of the thigh. It may also be fastened to the foot, or any part of the leg, with tapes. The limb is to be confined in this position five weeks, if the patient be an adult, and six if advanced in years. Then a slight passive motion is to be begun, and to be gently increased, from day to day, until the flexion of the knee is complete. (*Surgical Essays, Part* 2, *p.* 91.) But, although the impropriety of making any constriction of the knee with a bandage, while the skin is swelled and inflamed, must be obvious, the surgeon ought to be apprised, that such swelling and inflammation ought not to occasion the least delay in placing the limb in the right posture, and pressing the upper fragment towards the lower one. Mohrenheim ascribes the lameness formerly so frequent after this fracture, partly to the custom of not thinking of bringing the pieces of bone together until the swelling had subsided, and partly to the fashion of bending the joint too soon, with a view of preserving its motion. But, says he, nothing can be clearer, than that it is most advantageous to attend to the union of the fracture first, and to the flexibility of the joint afterwards. (*Beobachtungen*, 2 *B.* 8*vo.* 1783.) Boyer has likewise remarked, that the uniting substance is apt to yield, and become lengthened by bending the knee too early, and he therefore never allows this motion to be performed before the end of two months. When the ligamentous substance is long, and the patient very slow in regaining the use of the extensor muscles, he should sit every day on a table, and endeavour to bring them into action, and as this increases, a weight may be affixed to the foot, as Hunter, Sheldon, &c. recommend.

Nothing keeps the leg more surely extended, than a long, broad, excavated splint, with a suitable pad, applied to the posterior part of the thigh and leg, and fixed there with a roller, while the thigh itself is to be bent by raising the whole limb, from the heel to the top of the thigh, with pillows, which, of course, must form a gradual ascent from the tuberosity of the ischium to the foot.

The broken patella is almost always united by means of a ligamentous substance, instead of bone.

However, that an osseous union may follow a transverse fracture of the patella, and still more frequently a perpendicular one, is a fact of which there is not now the slightest doubt. Thus, Lallement has published an unequivocal specimen of a transverse fracture united by bone, with the history of the case, and the appearances after the death of the patient from some other affection. (*Boyer, Traité des Mal. Chir. T.* 3, *p.* 355, *&c.*) In the collection of Dr. William Hunter, there is one well marked instance of the bony union of a transverse fracture of the patella, and other examples have been seen in the dead subject by Mr. Wilson. (*On the Structure, Physiology, &c. of the Skeleton, p.* 240.) In Mr. Charles Bell's Museum, may also be seen similar specimens. (*On Injuries of the Spine and Thigh-bone, p.* 57, 58.) The reason why transverse fractures of the patella do not commonly unite by callus, is not owing to the want of power in this bone to produce an osseous connecting substance; for, as Larrey has several times noticed, if the fragments are kept in perfect contact by means of a suitable apparatus, their bony reunion becomes so complete, that scarcely any vestige of the injury can afterwards be traced. (*Journ. Complem. T.* 8, *p.* 114.) Indeed, it is a fact, on which Larrey dwells, as affording a proof that callus is produced not by the periosteum, but by the vessels of the bones themselves. And, what must add strength to the purport of the foregoing remarks is, the consideration, that perpendicular or longitudinal fractures of the patella, which are not liable to any displacement from the action of the extensor muscles of the leg, readily admit of bony union. (*Wilson on the Structure and Physiology, &c. of the Skeleton, p.* 239.) This is a statement which, I think, could not be rendered doubtful by any experiments made on animals, without the advantages of quietude and proper treatment. Yet, there are other facts related, which prove that both in longitudinal and transverse fractures a ligamentous union is generally produced, when the fragments are separated; but, if these are not drawn asunder, an osseous union takes place. Thus, in one case, reported by Sir A. Cooper, one third of the patella was separated from the rest of this bone, and had united by ligament, a free motion being left between the fragments. (*Surgical Essays, Part* 2, *p.* 94.) The same gentleman divided the patella longitudinally in a dog, without extending the division into the tendon above, or the ligament below, so that the fragments could not be separated. In three weeks, a close bony union was the result. (*P.* 95.) A case is also related, in which a gentleman fractured the patella transversely, and the lower portion likewise perpendicularly. The transverse fracture united, as usual, by ligament; the perpendicular one, by bone. (*P.* 96.) Mr. Charles Bell gives another explanation of the cause of union being by bone, or ligament. In the common case, says he, of fracture of the patella by the sudden action of the quadriceps extensor, the pieces are separated without that degree of violence, which is necessary to produce re-union by bone. But, when the patella is broken by a blow, or kick, there is not only less retraction, but "the injury, bloody effusion, tumefaction, and rigidity of the parts, resemble that which attends the fracture of any other bone, and the fragments unite by bone." (*On Injuries of the Spine, &c. p.* 58.)

The incorrect notions, formerly entertained, respecting the inconveniences of an exudation and projection of the callus into the joint after a fracture of the patella, and especially when the fragments are kept in contact, were long ago refuted by Pott and Sheldon. (*Pott's Chir. Works, Vol.* 1, *p.* 332, *Ed. of* 1808. *Sheldon's Essay on the Fracture of the Patella, &c. 8vo. Lond.* 1789.) On the contrary, as Sir A. Cooper particularly remarks, "the internal articular surface of the bone preserves its natural smoothness." (*Essays, Part* 2, *p.* 86.) How such doctrine of a superabundant callus could ever be reconciled with the doubts about a bony union being ever possible, appears difficult of explanation.

Pott, and some others, thought that there being commonly an interspace afterwards, between the two pieces of the patella, with a certain length of the connecting substance, might be advantageous in the motion of the joint; but Desault, Boyer, Sir A. Cooper, Sir J. Earle, and others, have always found, that the greater the distance between the two pieces of the bone, the greater is the difficulty afterwards in walking up a rising, or over an unequal ground.

In the treatment of a longitudinal, or perpendicular, fracture of the patella, the leg should be kept extended, leeches used, and a cold lotion applied. After a few days, a roller is to be put round the limb, and then a laced knee-cap, with straps buckled round the limb above and below the patella. (*A. Cooper, Vol. cit. p.* 96.) The experience of Dupuytren confirms the fact, that a longitudinal fracture of the patella is soon well consolidated. (*Annuaire Med. Chir. de Paris, p.* 94, *4to. Paris,* 1819.) Compound fractures of the patella frequently terminate in the death of the patient, unless amputation be done early. The injury, however, does not invariably lead either to the loss of life, or limb. I saw a case in St. Bartholomew's hospital in the year 1820, under Mr. Vincent, where the patella was broken to pieces, and the opening so extensive, that the fingers readily passed into the joint; yet, after a tedious confinement, the formation of abscesses, and the separation of several fragments of bone, the patient recovered with a stiff joint. In general, however, I believe with Sir A. Cooper, that in compound fractures of the patella, if the laceration be extensive, or the contusion very considerable, amputation will be required: but, if the wound be small, the patient not irritable, and no sloughing of the integuments, or ligament, likely to occur, it will be best to try to save the limb. (*Vol. cit. p.* 99.) The wound should be reunited as speedily as possible, and advantage taken of evaporating lotions, perfect rest in a desirable posture, a very low regimen, leeches, venesection, and saline opening medicines. Since writing the above remarks, I have seen another case of bad compound fracture of the patella in St. Bartholomew's hospital, where it has been about a month. No fragments of bone have yet been removed, but, a good deal of matter issues daily from the wound. The case must be regarded as in a very precarious state, though if hectic symptoms should not lower the patient too much, the limb will probably be saved.

In addition to the works already cited, consult *D. H. Meibomius de Patellæ Osse, ejusque Læsionibus, et Curatione, Franck.* 1697. *P. Camper, Diss. de Fracturâ Patellæ, et Olecrani,* 4to. *Hagæ Comit.* 1789. *Buirer in v. Siebold Chiron.* 3, 1, *p.* 64. *T. Alcock, in Trans. of the Associated Apothecaries, &c. Vol.* 1.

FRACTURES OF THE LEG

May be transverse or oblique. The first case is alleged to be most common in children. Experience proves, that the two bones of the leg are much more frequently broken together, than singly; a fact ascribed by Boyer to the strength of the knee and ankle joints. (*Traité des Mal. Chir. T.* 3, *p.* 360.) The direction of an oblique fracture of the tibia is found to be pretty constantly from below upwards, and from within outwards, the end of the upper fragment mostly presenting itself under the skin at the front and inner part of the leg. In these cases, the longitudinal displacement of the fracture is less constant, than the horizontal and angular. However, when it does happen, the inferior fragments are drawn outward and backward, whilst the superior project internally and forward. The angular displacement may be produced either by the action of the posterior muscles of the leg, or the weight of the body, and, in both cases, the angle projects forwards. But it may be directed posteriorly, if the heel be too much raised. A rotatory displacement, most commonly happening in the direction outwards, is produced by the inclination of the foot, and if this be turned too much inwards, the rotatory displacement will be in that direction. A longitudinal displacement cannot take place in transverse fractures, on account of the considerable extent of the surfaces of bone; but, in oblique fractures, the inferior fragments are almost always drawn upward by the action of the posterior muscles of the leg, in which position of the parts the lower ends of the superior fragments project forwards, and may be felt by the hand. Sometimes, however, when the solution of continuity is obliquely downward and outward, the anterior projection will be produced by the lower pieces. In both kinds of displacement, the pointed ends of the bones may tear and penetrate the integuments, and cause a compound fracture.

The usual symptoms, denoting a fracture of both bones of the leg, are a change in the direction and shape of the limb, pain, and incapability of walking or bearing upon the limb, mobility of the fractured pieces, and a distinct crepitus.

Fractures near the knee are not very subject to displacement, on account of the thickness of the tibia at that part; but they are more dangerous than those of the middle of the bone, because often followed by anchylosis of the knee-joint. Fractures, close to the ankle, are still more dangerous. Oblique fractures are very difficult of management, and when their displacement is upward and outward, the integuments are in danger of being torn by the projecting points of the superior portion of the tibia. (*Boyer.*) To bad compound fractures of the leg most of the observations are applicable, already delivered on compound fractures in general.

When the size of the tibia is compared with that of the fibula, and the close connexion of these bones to each other is remembered, an opinion might be formed, that the first could never be broken without the second. Experience, however, proves the contrary. And reasons for this fact, as Boyer remarks, may be deduced from the consideration, that the tibia is the bone which supports the weight of the body, and that it is situated at the forepart of the limb, simply covered by the skin, and much exposed to the effects of violence. (*Traité des Mal. Chir. T.* 3, *p.* 373.) When the tibia alone is broken, the fracture is said to be generally transverse.

If the injury happens near the knee, the great extent of the fractured surfaces prevents any considerable displacement of the fragments; and the fibula, acting as a support on the external side, contributes also to this effect. Boyer, however, has seen one instance, in which the tibia was broken by the kick of a horse, and the fragments displaced in the direction of the axis of the bone, which displacement could not be rectified, so that the bone remained permanently arched at the part.

The absence of displacement often renders the diagnosis of fractures of the tibia very difficult, and the difficulty is further increased by the little pain and inconvenience produced by such a fracture, with which persons have been known to walk.

Whenever there is reason to suspect the accident, in consequence of a blow or a fall on the leg, the part should be minutely examined. The fingers are to be moved along the anterior side of the tibia, the slightest inequality in which may be easily perceived, on account of its being covered only by the skin; and the motion of the pieces may be perceived, by grasping the opposite ends of the bone and pushing them in contrary directions. However, this motion, and the crepitus, are very indistinct, on account of the fibula not allowing the fractured portions to be sufficiently moved on one another.

In a review of the position and strength of the two bones of the leg, it will appear, that the tibia supports alone the whole weight of the body, every shock directed in the axis of the limb, and many kinds of force applied also in the transverse direction, without operating upon any particular point. Hence, the frequency of fractures of the tibia; and, if the fibula is generally broken at the same time, the latter injury is but subsequent to the other, and takes place because this slender bone is not capable of bearing the weight of the body, the impulse of external violence, and even the action of the muscles, after the tibia has given way. (*Dupuytren, Annuaire Med. Chir. des Hopitaux de Paris, p.* 15, 4*to. Paris,* 1819.) On the other hand, as the same distinguished surgeon remarks, the fibula being principally designed as a support for the outside of the foot, it is particularly when this function is to be executed, and its lower end has to make resistance to efforts made in that direction, that it is fractured; and, if the lower part of the tibia is also sometimes broken by the same force, it is almost always consecutively, and not by the effect of a direct and simultaneous action upon the two bones. (*P.* 17.) All fractures of the fibula, however, are not caused in the preceding manner; and Dupuytren concurs with Boyer, Mr. C. Bell, and all the best writers on this subject, in dividing these cases into two kinds; first, those in which the force is applied directly to the bone itself; secondly, the more important and serious cases, in which the force operates upon the fibula, through the medium of the foot. With respect to the first class of cases, the situation of the fibula on the outer side of the leg, a situation which would seem to expose it much to external violence; its slenderness; the interspace left between it and the tibia at the middle part of the leg; and the way in which each end of it rests upon the latter bone; would lead one to expect that its middle portion must often be broken; yet the case is less frequent than might be apprehended. And, as Dupuytren observes, there are two reasons for this fact; viz. the protection which the fibula receives from the peronæi muscles, and the rarity of circumstances capable of producing a fracture by a direct cause. These fractures, which are not usually attended with deformity, and, in some cases, even do not hinder the patient from bearing upon the foot, cannot for the most part be ascertained, unless attention be paid to the manner in which the accident was produced, and to the presence of ecchymosis, and of more or less pain in the part which has been struck, or pressed upon; together with a degree of irregularity of the fibula, perceptible by the fingers, and a more or less distinct moveableness and crepitus of the ends of the fracture.

The usual causes of this sort of fracture are blows on the fibula, gun-shot wounds, the fall of heavy bodies on the outside of the leg, or the passage of them over the same part. The foot is generally twisted, neither inwards nor outwards, and, in most instances, the accident is easily cured by means of rest, without being accompanied by any of the symptoms so often complicating other fractures of the fibula, produced by distortion of the foot. (*Dupuytren, Vol. cit. p.* 40.) A striking analogy may be remarked between fractures of the central part of the fibula and those of the corresponding portion of the ulna, and this in respect to causes, symptoms, treatment, and consequences. Fractures of the middle of the ulna, like those of the body of the fibula, are always occasioned by blows or falls on the fractured part, or by violence applied directly to the bone. Such fractures are scarcely ever attended with any deformity in the limb, incapacity of moving it, or displacement of the fragments; and just as some individuals are able to walk with a broken fibula, others, notwithstanding a fracture of the ulna, are found capable of using their fore-arm nearly as well as if it were free from injury. The latter case, like that of a fracture of the fibula, can only be known by the recollection of the way in which the hurt was received, the pain, ecchymosis, irregularities, motion, and crepitus, which last effects are also not very obvious so high up the bone. Like fractures of the body of the fibula, those of the body of the ulna only require rest and discutient applications, and very seldom the bandages, &c. necessary in the treatment of fractures of both bones of the fore-arm, or of those of the radius alone. (*Vol. cit. p.* 50.)

Fractures of the fibula from an *indirect* cause may happen from the foot being violently twisted either inwards, or outwards. In both instances, the cause of the fracture is a change in the direction of the line, in which the weight of the body is transmitted. In the first case, the said line, instead of following, as it commonly does, the axis of the tibia, and falling upon the astragalus, crosses the lower end of the tibia, and the ankle joint, obliquely from within outwards, and after passing across the malleolus externus, extends to the outside of the member. The parts, then supporting the weight of the body, are the malleolus externus, and the lower end of the tibia, besides which state of parts, the same malleolus is subjected to the traction of the external lateral ligaments, which operate with great force, in consequence of those ligaments being now nearly at a right angle with the lower end of the fibula, while this process itself is in contact with the astragalus, which is propelled from within outwards by the tibia. The latter bone, being thicker and stronger, than the fibula, generally resists, and, if the malleolus internus sometimes happens to break, it is secondarily, as an effect of the displacement of the foot outwards.

In the other example, where the foot is twisted outwards, the centre of gravity of the body, instead of following its usual course, obliquely crosses the lower end of the fibula, the ankle-joint, and the malleolus internus, and falls on the ground at a greater or lesser distance from the inner edge of the foot. On the one side, the internal lateral ligaments and malleolus, and on the other, the lower end of the fibula, are then the parts which have to bear the weight of the whole body, and the force of the muscles; and they are also the parts which are torn and fractured; first, the internal lateral ligaments, or the malleolus; and secondly, the lower portion of the fibula. (*Annuaire Méd. Chir. de Paris,* 1819, *p.* 66, 67.) Some of the symptoms of a fracture of the fibula, from an *indirect* cause, depend upon the fracture of that bone, and others upon the dislocation of the foot. They are divided by Dupuytren into two kinds; viz. *presumptive*, and *characteristic*. The first are, the way in which the patient received his hurt; a noise, or sort of crack heard by him at the instant of the injury; a fixed pain at the lower part of the fibula; a difficulty, or inability of walking; more or less swelling round the ankle, especially about the malleolus externus, and lower portion of the fibula. The *characteristic symptoms* are, an irregularity and unnatural moveableness of some point of the lower end of the fibula; a crepitus, which can be more or less distinctly felt by pressing upon and moving the part; mobility of the whole foot transversely, or horizontally; a facility of bringing the lower end of the fibula towards the tibia by pressure; a change in the point of incidence of the axis of the limb upon the foot; distortion of the foot outwards, and sometimes backwards; rotation of the same part upon its axis from within outwards; an angular depression, more or less manifest at the outer and lower part of the leg; projection of the internal malleolus; disappearance of almost all these symptoms, as soon as reduction is effected by a force applied to the foot; and their immediate recurrence when such force is discontinued, particularly if the limb be in the extended posture. (*Vol. cit. p.* 68.)

In considering the varieties of simple fracture of the fibula, the first, to which Dupuytren adverts, is that, in which the bone is broken *more than three inches above the extremity of the malleolus externus; a case, neither accompanied, nor followed by any displacement of the foot*, and almost always produced by the direct application of violence to the broken part of the bone.

A second variety of simple fractures of the fibula is when the bone has been broken, either by direct, or indirect force, within three inches from the end of the malleolus externus, and when the foot is not displaced, though much displacement is possible, and, indeed, often arises from the slightest effort, or movement made by the patient. The most frequent point of injury is about two inches and a half above the extremity of the outer malleolus. This is generally the place of a fracture, caused by a twist of the foot outwards; but, the accident may happen lower down, as is commonly seen, when the fracture is occasioned by a twist of the foot inwards.

These fractures of the fibula, abstractedly viewed, are not of much importance in themselves; but, with reference to the manner, in which they facilitate the dislocation of the foot, they are very serious.

Amongst the most frequent complications of fractures of the fibula, are the rupture of the internal lateral ligaments, the detachment of the point of the inner malleolus, and fracture of the lower part of the tibia. When these injuries originate from a violent twist of the foot outwards, they precede the fracture of the fibula; but, when they are caused by a twist inwards, they follow the breaking of that bone. (*Dupuytren, Vol. cit. p.* 96.)

Besides distortion of the foot outwards, or inwards, as attending certain fractures of the fibula, another complication may be dislocation of the foot backwards, produced by the action of the muscles of the calf, and not by the same causes, which broke the bone. However, whenever the malleolus internus has not given way, the dislocation is incomplete, and the foot is inclined outwards as well as backwards. In the complete luxation, as Dupuytren remarks, the bent posture is found exceedingly advantageous, though he admits, that, it will not always answer for maintaining the reduction.

TREATMENT OF FRACTURES OF THE LEG.

As in cases of fractured thighs, the practitioner may adopt either a bent or a straight position of the limb: in this country, surgeons mostly follow Mr. Pott's advice, and select the first one, of which alone I shall treat. That the bent position is, generally speaking, the most advantageous for a broken leg, I am well convinced. The strong muscles of the calf of the leg are the powers, which tend to displace the ends of the fracture, and their relaxation is a thing of the first-rate importance. It is quite different in the thigh, where the muscles are so numerous, that the attempt to relax by any position of the limb, all such as have the power of displacing the fragments would be in vain. I am ready to acknowledge, however, that in the bent posture, the apparatus is defective, inasmuch as it does not keep the knee-joint from moving; but yet it is certain that such motion has not so injurious an effect upon fractures of the leg, as it has upon those of the thigh. When the case is complicated with a wound, which cannot be dressed in the bent posture of the limb, without great disturbance of the fracture, the straight position ought unquestionably to be preferred. With respect to one of Mr. Pott's objections to this position, viz. that it makes the knee stiff for a long while afterwards, I suspect, that we should not lay much stress upon the circumstance; because, as Boyer has correctly observed, it is always the joint situated below the fracture, that is thus affected.

"In the fracture of the fibula only, (says Pott) the position is not of much consequence; because by the tibia remaining entire, the figure of the leg is preserved, and extension quite unnecessary; but, still, even here, the laying the leg on its side, instead of on the calf, is attended with one very good consequence, viz. that the confinement of the knee, in a moderately bent position, does not render it so incapable of flexion and use afterward, as the straight or extended position of it does, and consequently, that the patient will be much sooner able to walk, whose leg has been kept in the former posture, than he whose leg has been confined in the latter.

"In the fracture of both tibia and fibula, the knee should be moderately bent, the thigh, body, and leg, being in the same position as in the broken thigh. If common splints be used, one should be placed underneath the leg, extending from above the knee to below the ankle, the foot being properly supported by pillows, bolsters, &c. and another splint of the same length should be placed on the upper side, comprehending both joints in the same manner; which disposition of splints ought always to be observed, as to their length, if the leg be laid extended in the common way, only changing the nominal position of them, as the posture of the leg is changed, and calling what is inferior in one case, exterior in the other; and what is superior in one, in the other inferior.

"If Mr. Sharp's splints be made use of, there is in one of them a provision for the more easy support of the foot and ankle, by an excavation in, and a prolongation of, the lower or fibular splint, for the purpose of keeping the foot steady." (*Pott.*)

The strong muscles of the leg being relaxed by placing the limb in the bent position, as advised by Pott, the surgeon is to make such extension as seems requisite, for bringing the ends of the fracture into even apposition. Then he is carefully to raise the leg a little way from the surface of the bed, by taking firmly hold of the limb, above and below the fracture, and elevating the broken bones together, in such a way as shall keep both the upper and lower portions as nearly as possible on the same level. At this moment an assistant should put, exactly beneath the leg, the under splint, which has been previously made ready, by covering it with a soft pad, and laying over this an eighteen-tailed bandage. The limb is now to be gently depressed, till it rests on the apparatus. The surgeon, before proceeding further, must once more observe, that the ends of the bones are evenly in contact. Being assured of this important point, he is to apply a piece of soap plaster, and lay down the tails of the bandage. Another soft pad, well filled with tow, is next to be put over the upper surface of the leg, and over that the other splint, when the straps are to be tightened.

Mr. Pott's method of treating fractures of the fibula, complicated with luxation of the tibia, is described in the article *Dislocation*, and Dupuytren's practice in the 2d vol. of the First Lines of the Practice of Surgery.

In an oblique fracture of the head of the tibia, extending into the knee-joint, Sir A. Cooper recommends the straight position, in which the femur has the good effect of keeping the articular surfaces of the tibia even. A roller is to be used for pressing one fragment towards the other; a pasteboard splint is also to be applied with the same view; and early passive motion of the joint is to be practised, in order to prevent anchylosis.

When the fracture is oblique, but does not reach into the joint, the same author prefers placing the limb on the double inclined plane. (*Surgical Essays, Part* 1, *p.* 103, *and on Dislocations, &c. p.* 235.)

FRACTURES OF THE SCAPULA.

As Boyer correctly observes, fractures of the scapula are not very common, a circumstance explicable by the deep and covered position of the greater part of this bone, and its great mobility. Nor can these accidents arise without considerable direct violence. However, there are some parts of the scapula, which being more superficial, and of a form more likely to be acted upon by external bodies, are more frequently fractured: such are the acromion, and inferior angle of the bone. Fractures of the coracoid process, and even of the neck of the scapula, are also mentioned; but, the instances of such accidents are not common; and though these parts of the bone may appear in the skeleton likely to be often broken, their deep situation in the living subject generally saves them. Indeed, as Boyer says, they generally require great violence to break them, and then the contusion of the soft parts is a worse injury, than the fracture itself: thus, this author has seen the coracoid process broken by the blow of the pole of a carriage, and the patient lost his life from the violence at the same time inflicted upon all the soft parts about the shoulder. (*Traité des Mal. Chir. T.* 3, *p.* 161.)

When the acromion is broken, the weight of the arm, and the contraction of the deltoid muscle, draw it downward, while the trapezius and levator scapulæ draw the rest of the bone upward and backward. The roundness of the injured shoulder is lost, and part of the attachment of the deltoid being broken off, the head of the os humeri sinks towards the axilla, as far as the capsular ligament will permit. On tracing the acromion from the spine of the scapula to the clavicle, the surgeon will feel a depression just at their junction. The distance from the sternal end of the clavicle to the extremity of the shoulder is lessened. The natural form of the shoulder may be restored by raising the arm by the elbow; but, the deformity returns immediately the arm is suffered to fall again. The accident may be distinguished from a dislocation, by raising up the shoulder by pushing the humerus upwards by the elbow, when a crepitus will be perceptible to the surgeon's hand applied over the acromion, on the limb being rotated. (*A. Cooper, on Dislocations, &c. p.* 455.)

When the lower angle is broken, the serratus major anticus draws it forward, while the rest of the scapula remains in its natural situation; or, if the angular portion be considerable, the teres major, and some fibres of the latissimus dorsi, contribute to its displacement forward and upward.

When the coracoid process is fractured, the pectoralis minor, coraco-brachialis, and short head of the biceps, concur in drawing it forward and downward.

When the neck of the scapula is fractured, the weight of the arm makes it drop down so considerably, as to give the appearance of a dislocation; but, the facility of lifting the os brachii upward. the crepitus, and the falling of the limb downward again, immediately it is unsupported, are circumstances clearly marking, that the case is not a dislocation. According to Sir Astley Cooper, the crepitus is best perceived through the medium of the coracoid process. The degree in which the glenoid cavity and the head of the humerus descend, he observes, depends very much upon whether the ligament, between the under part of the spine of the scapula and the glenoid cavity, is lacerated or not. (*On Dislocations, &c. p.* 459.)

Sometimes great pains, and a crepitus are experienced, on moving the shoulder-joint, after an accident; and yet the spine, the neck of the scapula, and all the above parts, are not broken. In this circumstance, it is to be suspected, either that a small portion of the head of the os brachii, or a little piece of the glenoid cavity of the scapula, is broken off; which latter occurrence, I think, is not very uncommon.

When the inferior angle is broken, the part remains motionless, while the rest of the scapula is moved; and it is so separated, that no mistake can be made. (*Boyer.*)

Fractures of the spine and body of the bone, are all attended with a crepitus; and, in the first cases, an irregularity of the injured part may generally be felt.

The prognosis of fractures of the scapula varies according to the situation of the injury, and the attendant circumstances. Fractures of the body of the bone, whatever may be their direction, are generally very simple, and readily cured. Those of the acromion and lower angle are more troublesome to keep right; but the most serious cases are fractures of the coracoid process and neck of the bone, which cannot be kept right without great difficulty, and are said to be frequently followed by a considerable stiffness of the arm, inability to raise it, its atrophy, and even paralysis. In other respects, the danger of fractures of the scapula depends less upon the solution of continuity in the bone, than the contusion of the soft parts, or injury of the thoracic viscera. However, when the fracture is comminuted and the splinters are forced into the subscapularis muscle, abscesses may form under the bone, and, according to

Boyer, require a perforation to be made in it; (*Mal. Chir. T.* 3, *p.* 165.) a proceeding, which I cannot bring myself to think would ever be judicious, as making a depending opening in the soft parts must be far better practice. In military surgery, the scapula is often injured by sabre-cuts; but, as Dr. Hennen remarks, this bone, when preserved from motion, is found in these cases to unite with great readiness, and without future inconvenience. (*Principles of Military Surgery*, *p.* 48, *Ed.* 2.)

According to Boyer, when the scapula is fractured longitudinally, or transversely, it is merely necessary to fix the arm to the side by means of a bandage, which includes the arm and trunk, from the shoulder to the elbow. Thus, the motions of the shoulder, which are only concomitant with those of the arm, are prevented.

When the inferior angle is broken, and drawn downward and forward by the serratus major anticus, the scapula must be pushed toward the fragment, by pushing the arm itself inward, downward, and forward, where it is to be kept with a roller. The fragment is also to be kept backward as much as possible, with compresses and a roller, and the arm is to be supported in a sling.

The fractured acromion requires the arm to be so raised, that the head of the os brachii will push up the acromion, while an assistant pushes the scapula forward and downward, in a contrary direction to that of the arm. To maintain this position, a circular bandage is to be applied round the arm and body.

Desault used to apply also a small pillow under the axilla, before putting on the bandage, in order to make the head of the os brachii project more upward, on bringing the arm near the side; but, Sir Astley Cooper finds that a pillow, so placed, does harm, by throwing the head of the os humeri outward, and widely separating the acromion from the spine of the scapula. He approves of raising the elbow, and keeping the arm fixed. He also relaxes the deltoid muscle, by means of a cushion, put between the elbow and the side, the elbow inclining a little backwards: the limb is to be bound to the chest in this position with a roller. The union may take place by bone, but, owing to the difficulty of maintaining the coaptation, the uniting substance is generally ligamentous. (*A. Cooper on Dislocations*, *p.* 455.)

When the coracoid process is fractured, the muscles attached to it are to be relaxed, by bringing the arm forwards towards the breast, and confining it there in a sling; while the shoulder is kept downward and forward, and a compress confined just under the broken part, with a roller.

The treatment of a fracture of the neck of the scapula consists in keeping the head of the os humeri outwards, by means of a thick cushion in the axilla; in keeping the glenoid cavity and arm raised with a sling; and in preventing all motion of the arm by binding it to the trunk with a roller. In some of these cases, the apparatus proposed by Mr. Earle might be very useful. (*Pract. Obs. in Surg.* 1823.)

FRACTURES OF THE CLAVICLE.

This bone being long and slender, unsupported at its middle, and protected externally only by the integuments, is very often broken. Its serving to keep the scapula at a proper distance from the sternum, and as a *point d'appui* for the os brachii, every impulse of which it receives, makes its fractures still more common.

It may be broken at any part; but, its middle, where the curvature is greatest, is most frequently the situation of the injury. It is not very often fractured at its scapulary extremity. However, a direct force, falling on the shoulder, may break any part of the clavicle, on which it immediately acts. The soft parts, in this kind of case, will also be contused, or even lacerated.

A comminuted fracture may be thus occasioned, and, if the violence be very great, the subclavian vessels and nerves may be torn. The fall of a heavy body on the shoulder often gives rise to a paralysis of the arm.

When the fracturing force is applied to the ends of the bone, as in a fall on the point of the shoulder, or on the hands, while the arms are extended, the clavicle may be very much bent, and fractured so obliquely, that the broken portions protrude through the skin.

Fractures of this bone are usually attended with displacement, except when the injury takes place at the scapulary extremity, and within the ligament, tying the clavicle and coracoid process together.

The external portion of the clavicle is always that which is displaced. The internal part cannot be moved out of its natural situation, by reason of the costo-clavicular ligaments, and of its being drawn in opposite directions, by the sternocleidomastoideus, and pectoralis major, muscles. The external portion, drawn down both by the weight of the arm, and the action of the deltoid muscle, and forward and inward by the pectoralis major, is carried under the internal portion which projects over it. The broken clavicle no longer keeping the shoulder at a due distance from the sternum, the arm falls forward towards the breast. The patient finds it impossible to put his hand to his forehead, because this act makes a semicircular motion of the humerus necessary, which cannot be done while that bone has not a firm *point d'appui*. The shoulder and upper extremity may be observed to be nearer the breast, than those of the opposite side. The motion of the pieces of bone on one another may be felt, as well as the projection of the end of the internal portion. When the shoulder is moved a crepitus may also be perceived; but this is productive of great pain, and the diagnosis is so obvious, that it is quite unnecessary.

The ancients, and many moderns, have supposed, that, in order to set a fracture of the clavicle, the shoulder must be drawn back, and fixed in that position. The patient was placed on a low stool, so that an assistant might put his knee between the shoulders, which he drew back at the same time with both hands, while the surgeon applied the bandage, which was to keep the parts in this position. But, when the shoulders are thus drawn towards one another, the scapula is obviously pushed towards the sternum, and with it the external portion of the clavicle, which passes under the internal fragment.

The figure of 8 bandage has commonly been used for maintaining the parts in this position. While the assistant keeps back the shoulders, as above described, the surgeon is to apply one end of a roller to the arm-pit on the side affected, and then make it cross obliquely to the opposite shoulder, round which it is to pass, and from this to the other shoulder, about which it is to be applied in the same manner, and afterwards repeatedly crossed before and behind. The tightness, with which it is necessary to apply this bandage, produces a great deal of excoriation about the arm-pits, and the effect is to make the ends of the fracture overlap each other, the very thing which it is wished to avoid. Boyer remarks, that the iron cross proposed by Heister, the corselet described by Brasdor in the *Mem. de l'Acad. de Chir.* and the leather strap recommended by Brunninghaussen, are only modifications of the figure of 8 bandage, and are not at all better.

Desault advised extension to be made, by means of the limb, which is articulated with the fractured bone. This is done by converting the humerus into a lever, by carrying its lower end forward, inward, and upward, pushing the shoulder backward, upward, and outward, and putting a cushion in the arm-pit to serve as a fulcrum.

Desault used to put in the arm-pit a hair or flock cushion, five or six inches long, and three inches and a quarter thick at its base. Two strings are attached to the corners of the base, which is placed upward: they cross the back and breast, and are tied on the shoulder of the other arm. The cushion being thus placed in the arm-pit, and the fore-arm bent, Desault used to take hold of the patient's elbow, and carry it forward, up ward, and inward, pressing it forcibly against the breast. By this manœuvre, the humerus carries the shoulder outward, the ends of the fracture become situated opposite each other, and all deformity is removed.

An assistant is to support the arm in this position, while the surgeon, having a single-headed roller nine yards long, is to place one end of it in the arm-pit of the opposite side, and then apply the bandage over the upper part of the arm, and across the back to the same situation. The arm and trunk are to be covered with such circles of the roller, as far down as the elbow, drawing the bandage more tightly, the lower it descends.

Compresses, dipped in camphorated spirit, are next to be placed along the fractured bone. Desault then took a second roller, of the same length as the first, and put one end of it under the opposite arm-pit, whence it was carried across the breast over the compress and fracture, then down behind the shoulder and arm, and, after having passed under the elbow, upward on the breast. Desault next brought it across to the sound shoulder, under and round which he passed it, for the purpose of fixing the first turn. He then conveyed the roller across the back, brought it over the compresses, carried it down in front of the shoulder and arm, under the elbow, and obliquely behind the back to the arm-pit, where the application began. The same plan was repeated, until all the roller was spent. The apparatus was secured by pins, wherever they promised to be useful, and the patient's hand was kept in a sling.

Boyer has invented an apparatus for fractured clavicles, which is more simple, than that employed by Desault.

The cushion is to be applied under the arm. The apparatus consists of a girdle of linen cloth, which passes round the trunk on a level with the elbow. It is fixed on by means of three straps, and as many buckles. At an equal distance from its extremities are placed externally on each side two buckles, two before and two behind the arm. On the lower part of the arm, is to be laced a piece of quilted cloth, five or six fingers broad. Four straps are attached to it, which correspond to the buckles on the outside of the girdle, and serve both to keep the arm close to the trunk, and from moving either backward, or forward.

Certainly, the methods recommended by Desault and Boyer, are very judicious and scientific. They are not, however, much adopted in this country, perhaps in consequence of the general aversion among English surgeons to every apparatus which is not exceedingly simple. It is to be hoped, at the same time, that, in the treatment of fractured clavicles, they will always attend to the principles which Desault and Boyer have inculcated. If they understand why the position of the arm should be such as these eminent surgeons point out, they will have no difficulty in doing what is proper, and with a cushion, sling, and a couple of rollers, they will easily maintain the proper posture. A simple and good apparatus for fractures of the clavicle, and those of the neck of the scapula, has been recently proposed by Mr. Earle. (See *his Practical Observations on Surgery, p.* 187. *&c.*) It is also calculated for cases of dislocated clavicle, and other injuries of the shoulder.

I cannot quit this subject without cautioning surgeons never to fall into the error of supposing the rising end of a broken clavicle to be the end which is displaced. This is the one, which is truly in its right situation, and which has often been made, by injudicious pressure, to protrude through the integuments, one or two instances of which have fallen under my own observation.

FRACTURES OF THE OS BRACHII, OR HUMERUS.

This bone may be fractured at any point of its length: at its middle, either of its extremities, or above the insertion of the pectoralis major, latissimus dorsi, and teres major. The last case is termed fracture of the neck of the humerus; but that denomination has not the merit of being strictly anatomical. It is possible, however, that what is strictly called the neck of the humerus may be fractured, particularly by a gun-shot wound. By neck of the humerus, we understand that circular narrowing, which separates the tuberosities from the head.

The fractures of this bone may be transverse or oblique, simple or compound. Transverse fractures of its middle part, below the insertion of the deltoid muscle, are attended with but little displacement, for the brachialis internus and the triceps, being attached posteriorly and anteriorly to both fragments, counteract one another, and admit only a slight angular displacement. When the fracture takes place above the insertion of the deltoid muscle, the inferior portion is first drawn outward and then upward on the external side of the superior. Fractures of the humerus, near its lower end, such particularly as are transverse, are not subject to much displacement: a circumstance to be attributed to the breadth of the fractured surfaces; to their being covered posteriorly by the triceps muscle, and, anteriorly, by the brachialis internus, which admit only a slight angular displacement, by the inferior portion being drawn a little forward.

Oblique fractures are always attended with displacement, whatever be the part of the bone broken. The inferior portion being drawn upward by the action of the deltoides, biceps, coraco-brachialis, and long portion of the triceps, glides easily on the superior, and passes above its lower extremity. Finally, fractures of the neck of the humerus are always attended with displacement, produced by the action of the pectoralis major, latissimus dorsi, and teres major, which being attached to the lower portion near its superior extremity, draw it first inward and then upward, in which last direction it is powerfully urged by the biceps, coraco-brachialis, and long portion of the triceps. In this case, the superior portion itself is directed a little outward by the action of the infraspinatus, supraspinatus, and teres minor, which make the head of the humerus perform a rotatory motion in the glenoid cavity.

The shortening and change in the direction of the limb, the crepitus, which may be very distinctly perceived by moving the broken pieces in opposite directions, the pain and impossibility of moving the arm, &c. joined to the history of the case, render the diagnosis sufficiently plain.

Fractures of the neck of the humerus, however, are not so easily ascertained, and, from want of attention, have been frequently confounded with luxations of that bone. Yet, the diagnostic symptoms of these two affections are very different.

When the neck of the humerus is fractured, a depression is observed at the upper part and external side of the arm, very different from what accompanies the luxation of that bone downward and inward. In the latter case, a deep depression is found, just below the projection of the acromion, in the natural situation of the head of the humerus; whereas, in fracture of the neck of that bone, the shoulder retains its natural form, the acromion does not project, and the depression is found below the point of the shoulder. Besides, on examining the arm-pit, instead of finding there a round tumor, formed by the head of the humerus, the fractured and unequal extremity of that bone will be easily distinguished. The motion of the broken portions, and the crepitus, thus produced, serve still further to establish the diagnosis. (*Boyer.*)

In a simple fracture of the body of the humerus, the prognosis is generally favourable; but fractures near the elbow are liable to be followed by more or less stiffness of the joint, often very difficult of removal.

In ordinary fractures of the os brachii, it is usual to apply two pieces of soap-plaster, which together surround the limb, at the situation where the accident has happened. Extension, if necessary, being now made by an assistant, who at once draws the lower portion of the bone downward and bends the elbow, the surgeon is to apply a roller round the limb. The external splint is to extend from the acromion to the outer condyle, and being lined with a soft pad, the wood cannot hurt the limb by pressure. The internal splint is to reach from the margins of the axilla to a little below the inner condyle, and is to be well guarded with a pad, filled with tow, or any other soft materials.

Some surgeons are content with the application of two splints; but, though the two, above described, are these on which we are to place the greatest reliance, yet, as the cylindrical form of the arm conveniently allows us completely to incase this part of the limb in splints, I consider, the employment of four better; one on the outside, one on the inside, one on the front, and another on the back of the arm. These are to be carefully fixed in their respective situations by means of tape.

Throughout the treatment, the elbow and whole of the fore-arm, are to be quietly and effectually supported in a sling.

FRACTURE OF THE HEAD, OR NECK OF THE OS BRACHII.

Chirurgical language here differs from that adopted by anatomists, and, under the name of fracture of the neck of the humerus, is not meant, that of the circular, hardly perceptible depression, which separates the head from the tuberosities of this bone. By this expression, surgeons imply the fracture of that contracted part of the humerus, which is bounded above by these tuberosities; which below is continuous with the body of the bone, which has the tendons of the pectoralis major, latissimus dorsi, and teres major inserted below it; and which many practitioners extend even as low as the insertion of the deltoid muscle.

Indisputable facts, however, prove the possibility of the anatomical neck of the bone being fractured, and C. Larbaud showed Bichat the humerus of a young man, aged 17, the head of which bone was accurately detached from its body, by a division which had passed obliquely through the upper part of the tuberosities. Another example proved by dissection, has been very lately recorded by Delpech. (*Chirurgie Clinique.*) An instance of this kind, I think, was pointed out to me in the spring of 1821, in St. Bartholomew's hospital. The patient was a boy, whose elbow had been strongly kept up, on the supposition, that the case was a fracture of the neck of the scapula, and consequently, the irregular end of the humerus, formed a remarkable projection in front of the acromion, yet capable of being pushed back, where, however, it would not remain. When the accident is produced by a direct blow or fall on the fleshy part of the shoulder, the deltoid is sometimes contused and affected with ecchymosis. Even blood may be effused from some of the ruptured articular veins, or arteries, and form a collection, which Desault recommended to be speedily opened, though the reason of such practice, as a general thing, must be questionable, because large extravasations of blood about the shoulder are usually very soon absorbed.

Sir Astley Cooper has seen this accident both in old and in young persons; but, according to his observation, it rarely occurs in middle age. In the young, he says, it happens at the junction of the epiphysis, where the cartilage is situated; and, in the old, it arises from the greater softness of this part of the bone. (*On Dislocations, &c. p.* 459.)

An acute pain is experienced at the moment of the fall; sometimes the noise of something breaking is heard. There is always a sudden inability to move the limb, which, left to itself, remains motionless. But, on external force being applied, it readily yields, and admits of being moved, with the greatest ease, in every direction. Such motion is attended with severe pain, and, if carried too far, may cause ill consequences, as has been observed in patients in whom the fracture has been mistaken for a dislocation.

Below the acromion a depression is remarkable, always situated lower down than that which attends a dislocation. If we place one hand on the head, while the lower part of the bone is moved in various directions with the other hand; or, if, while extension is made, an assistant communicates to the bone a rotatory motion, the following circumstances are perceived. 1. The head of the humerus remains motionless. 2. A more or less distinct crepitus is felt, arising from the two ends of the fracture rubbing against each other. These two symptoms are characteristic of the accident; but the swelling of the joint may prevent us from detecting them.

Sometimes there is no displacement of the ends of the fracture, and then, as most of the symptoms are absent, the diagnosis is still more difficult. In general, however, the ends of the fracture are displaced, and, in this circumstance, it is the lower one, which is out of its proper position, and not the upper one, which is of little extent, and is not acted upon by many muscles.

The displacement is, generally, not very perceptible, in regard to length, unless the fracture be very oblique, and its pointed spiculæ irritate the muscles, and make them contract with increased power; or unless the blow, which was very violent, continued to operate after the bone had been broken, and forced the ends of the fracture from their state of apposition. In this way, the body of the humerus has been drawn or driven upward, so as to protrude through the deltoid muscle, and integuments, far above the height of the head of the bone.

But commonly, as Petit observes, the weight of the limb powerfully resists the action of the muscles, and the displacement of the fracture is more liable to be transverse. In this circumstance the lower end of the fracture is displaced outward or inward, and rarely in any other direction. In the most frequent case, the elbow is separated from the trunk, and cannot be brought near it without pain; and in the instance of the bone being displaced outward, the limb has a tendency to the opposite direction. According to Sir Astley Cooper, the upper end of the main portion of the humerus sinks into the axilla, where it can be felt, and the deltoid is drawn down by it, so that the roundness of the shoulder is diminished. (*On Dislocations, &c. p.* 459.)

The reduction takes place of itself, on employing a very little force, methodically directed, according as the fracture is displaced inward or outward. If the surgeon put his hands on the situation of the fracture, it is rather to examine the state of the ends of the broken bone, than to accomplish a thing seldom required, namely, what is implied by the term coaptation.

Every apparatus for the cure of fractures being only resistances, made by art to the powers causing the displacement of the broken part, it follows, that the whole should act in an inverse ratio to such powers. These consist; 1. Of the action of external bodies, favoured by the extreme mobility of the arm and shoulder; 2. Oi the action of the latissimus dorsi, pectoralis major, and teres major, which draw inward the lower end of the fracture, or of the deltoid, which pulls it outward; 3. Of the contractions of the muscles of the arm, which tend to draw the end of the fracture a little upwards.

Hence, in the treatment, the three indications are, 1. To render the arm and shoulder immoveable; 2. To bring either outward, or inward, the lower end of the fracture; 3. To draw downward the same. The last object merits less attention, than the two others, because the weight of the arm is alone almost sufficient for the purpose. Desault used to employ the following apparatus:

1. Two long rollers. 2. Three strong splints, of different lengths, and between two and three inches broad. 3. A cushion or pillow, three or four inches thick at one of its ends, terminating at the other in a narrow point, and long enough to reach from the axilla to the elbow. 4. A sling to support the fore-arm. 5. A towel to cover the whole of the apparatus.

The reduction having been effected, the assistants are to continue the extension. Then the surgeon is to take the first roller, which is to be wet with the liq. plumbi acet. dil. and he is to fix one of its heads by applying two circular turns to the upper part of the fore-arm. The bandage is now to be rolled moderately tight round the arm upward, making each turn overlap two-thirds of that which is immediately below it. When the roller has reached the upper part of the limb, it must be doubled back a few times to prevent the folds, which the inequality of the part would create. The bandage is afterwards to be carried twice under the opposite axilla, and the rest of it, rolled up, is to be brought up to the top of the shoulder, and committed to the care of an assistant.

The first splint is to be placed in front, reaching from the bend of the arm as high as the acromion. The second, on the outside, from the external condyle to the same height. The third, behind, from the olecranon to the margin of the axilla. The pillow, interposed between the arm and thorax, serves as a fourth splint, which becomes useless. An assistant applies these parts of the apparatus, and holds them on by applying his hands near the bend of the arm, in order not to obstruct the application of the remainder of the bandage.

The surgeon takes hold of the bandage again, and applies it over the splints with moderate tightness, and the bandage ends at the upper part of the fore-arm, where it began.

While the assistants still keep up the extension, the surgeon is to place the pillow between the arm and trunk, taking care to put the thick end upward, if the fracture be displaced inward; but downward, if this should be displaced outward, which Desault found most common. Then the pillow is to be fastened with two pins to the upper part of the roller.

The arm is to be brought near the trunk, and fixed upon the pillow, by means of the second roller, applied round the arm and thorax. The turns of this bandage should be rather tight below, and slack above, if the fracture be displaced inward; but, if outward, they should be slack below, and tight above.

The fore-arm is to be supported in a sling, and the whole of the apparatus is to be enveloped in a napkin, which will prevent the bandages from being pushed out of their places.

If the effect of the above apparatus in fulfilling the indications above specified is considered, we shall easily see, that they are very well accomplished. The arm, firmly fixed against the trunk, can only move with it, and then nothing displaces the lower end of the fracture, which is equally motionless. The shoulder cannot communicate any motion to the upper end of the fracture. The pillow, differently disposed, according to the direction, in which the lower extremity of the fracture is displaced, serves to keep this part in the opposite position.

Should this part of the bone project inward, the thick end of the pillow will remove it farther from the chest. The bone will be kept at this distance from the side by the turns of the bandage, which, being very tight downward, will act upon the limb as a lever, the fulcrum for which will be the pillow, and the resistance, the action of the pectoralis major, latissimus dorsi, and teres major. Thus the bandage will have the effect of bringing the elbow nearer the trunk, and move the lower end of the fracture in the opposite direction, so that it may be here considered as an artificial muscle, directly opposing the natural ones.

When the lower end of the fracture is drawn outward, the contrary effect will be produced, both from the pressure exercised by the bandage on the upper end of the displaced portion of the bone, and from the situation of the elbow; which is kept outward by the thick part of the pillow. The outer splint will also prevent the lower end of the fracture from being displaced outward, both by its mechanical resistance to the bone, and by compressing the deltoid muscle, which is the chief cause of such displacement. All displacement of the lower end of the fracture, forward, or backward, is prevented by the back splint; and as for the longitudinal displacement, which is already prevented by the weight of the limb, it is still more effectually hindered by the compression of the muscles of the arm, both by the splints and roller. (See *Œuvres Chir. de Desault, par Bichat, T.* 1.)

Sir Astley Cooper recommends a roller to be applied from the elbow to the shoulder joint; two splints to be bound on the inner and outer sides of the arm with a roller; a cushion to be placed in the axilla in order to throw out the head of the bone; and gently supporting the arm in a sling, for if the elbow be much raised, he says, the bones will overlap, and the union be attended with deformity. (*On Dislocations, &c. p.* 461.)

FRACTURES OF THE LOWER ENDS OF THE OS BRACHII, WITH SEPARATION OF THE CONDYLES.

Fractures of the os brachii, with detachment of its condyles, seem to have escaped the notice of most authors, who have written on the diseases of the bones. The accident, however, is not uncommon, and Desault, in particular, had frequent occasion to meet with it.

Whatever its causes may be, the two condyles are usually separated from each other by a longitudinal division, which, extending more or less upward, is bounded by another transverse, or oblique division, which occupies the whole thickness of the bone. Hence, there are three different pieces of bone, and two fractures.

Sometimes, the division is more simple; as, when taking a direction outward, or inward, it crosses obliquely down the lower end of the os brachii, terminates in the joint, and only detaches one of the condyles from the body of the bone.

In the first case, the deformity is greater, and the fractured part is more moveable. When pressure is made, either before, or behind, on the track of the longitudinal fracture, the two condyles becoming further separated from each other, leave a fissure between them, and the fractured part is widened. The fore-arm is almost always in a state of pronation. On taking hold of the condyles, and moving them in different directions, a distinct crepitus is perceived.

In the second case, the separation of the condyles from each other is not so easy; but, a crepitus can always be distinguished, on moving the detached condyle. In one case, in which only the external condyle was broken, Desault found the limb always supine: a position, which the muscles inserted into this part were, doubtless, concerned in producing.

In both cases, an acute pain, the almost inevitable effect of bending, or extending, the fore-arm; an habitual half-bent state of this part of the limb, and sometimes a subsequent swelling of it, together with more or less tumefaction round the joint, are observable. When the blow has been very violent, or a pointed piece of the bone protrudes through the flesh, the accident may be complicated with a wound, splinters of bone, &c.

When the condyles of the humerus are obliquely broken off, just above the joint, the appearances, as described by Sir Astley Cooper, are those of a dislocation of the radius and ulna backwards; but, the nature of the case is evinced by the circumstance of the displacement recurring, as soon as the extension is stopped, and also by the crepitus, generally perceptible, when the fore-arm is rotated upon the humerus. (*On Dislocations, &c. p.* 481.)

The old writers consider the communication of a fracture with a joint, a fatal kind of complication. Swelling and inflammation of the adjacent parts; continuance of pain after the reduction; large abscesses; even mortification of the soft parts, and caries of the bones, are, according to such authors, the almost inevitable consequences of these fractures, and anchylosis the most favourable termination. Paré, Petit, Heister, Duverney, all give this exaggerated picture. However, analogous fractures of the olecranon and patella prove, that this representation is magnified beyond truth. Modern observation has dispelled the ancient doctrine of the effusion of callus into the joint, and with it one of the principal causes, assigned by authors for the symptoms so much dreaded.

The detached condyles, being drawn in opposite directions by the muscles of the arm and fore-arm, commonly remain unmoved between these two powers, and are but little displaced. External force may, however, put them out of their proper situation, and they may then be displaced forward, or backward, or they may separate from each other sideways, leaving an interspace between them. Hence, the apparatus should resist them in these four directions, and this object is easily accomplished by means of four splints, kept on with a roller. The two lateral splints are particularly necessary, when the condyles are separated from the body of the bone, with an interspace between them. If one of them be still continuous with the humerus, no splint on this side will be requisite.

The apparatus need not extend as high as when the arm is fractured higher up; but, the roller should be continued over the fore-arm, in order that the joint may correspond to the middle of the bandage, which should here be firmer, than any where else. This method is also of use in producing a gentle compression of the muscles implanted into the condyles.

Desault recommends the front and back splints to be flexible at their middle part, which should be applied to the bend of the arm and elbow. (*Œuvres Chir. de Desault*, *par Bichat*, *T.* 1.)

The treatment, advised by Sir Astley Cooper, consists in bending the arm, drawing it forwards so as to reduce the parts, and then applying a roller. The best splint for this case, he says, is one formed at right angles, the upper portion of it being placed behind the upper arm, and the lower under the fore-arm. He also directs the application of a splint to the forepart of the upper arm. The splints are to be fixed with straps; evaporating lotions used; and the arm kept in a bent position in a sling. In a fortnight, if the patient be young, and, in three weeks, if he be an adult, passive motion may be gently employed for the purpose of hindering an anchylosis. (*On Dislocations, &c. p.* 482.) According to the same author, when the internal condyle is broken off obliquely, the ulna loses its natural support and projects backward.

FRACTURE OF THE FORE-ARM.

The fore-arm is more frequently broken, than the arm, because external force operates more directly upon it, than the latter part, especially, in falls on the hands, which are frequent accidents.—Bichat, in his account of Desault's practice, mentions, that fractures of the fore-arm often held the first place in the comparative table of such cases, kept at the Hôtel-Dieu.

We know, that the fore-arm is composed of two bones, the ulna and radius. The last is much more liable to fractures, than the first, because it is articulated with the hand by a large surface, and all the shocks, received by the latter part, are communicated to it. The situation of it also more immediately exposes it to such causes, as may break it. However, both the bones are frequently broken together.

FRACTURES OF BOTH BONES

May occur at the extremities, or middle of the fore-arm. They are frequent at the middle; very common below; but, seldom happen at the upper part of the fore-arm, where the numerous muscles, and the considerable thickness of the ulna, resist causes, which would otherwise occasion the accident. The bones are usually broken in the same line; but, sometimes, in two different directions. The fracture is almost always single; but, in a few instances, it is double, and Desault, in particular, was one day called to a patient, over whose fore-arm the wheels of a cart had passed, so as to break the bones, at their middle and lower part, into six distinct portions. The middle ones, notwithstanding they were quite detached, united very well, with hardly any deformity.

These accidents are most commonly occasioned by direct external violence; but, sometimes they are produced by a counter-stroke, which is generally the case, when the patient falls on his hand. But, in this instance, as the hand is principally connected with the lower broad articular surface of the radius, this bone alone has to sustain almost the whole shock of the blow, and hence, is usually the only one broken.

The symptoms, indicating fractures of the fore-arm, are not likely to lead the surgeon into any mistake: motion at a part of the limb, where it was previously inflexible; a crepitus, almost always easily felt; sometimes a distinct depression in the situation of the fracture; a projection of the ends of the fracture beneath the skin, but, a less common symptom; pain on moving the part; a noise sometimes audible to the patient at the moment of the accident; an inability to perform the motion of pronation and supination; and an almost constant half-bent state of the fore-arm.

There is one case, however, in which, the fracture being very near the wrist joint, similar appearances to those of a dislocation of this part may arise. But, attention to whether the styloid processes, are above, or below, the deformity, will discover whether the case be a fracture, or dislocation. In a fracture, the part is also more moveable, and there is a crepitus. (*Œuvres Chir. de Desault, par Bichat, T.* 1.) According to Boyer, the two cases may be distinguished by simply moving the hand, by which motion, if there be a luxation without fracture, the styloid processes of the radius and ulna, will not change their situation; but, if a fracture exist, they will follow the motion of the hand.

The connexion of the two bones of the fore-arm, by the interosseous ligament, which occupies the interspace by which they are separated, and the manner, in which the muscles attached to both, are inserted into them, render any displacement of the broken pieces in the longitudinal direction very difficult; and in reality, such displacement is seldom observed, and never in any considerable degree. When it does take place, it is to be ascribed to the cause of the fracture, rather than to muscular contraction. On the contrary, in the transverse displacement, the four pieces approach one another, and the interosseous space is diminished or entirely obliterated near the seat of the fracture; attended with evident deformity of the part. There is an angular displacement, which the fracturing cause always produces, either forward or backward, according to its direction.

Boyer gives the following account of the treatment of the fracture of both bones of the fore-arm.

The fore-arm is to be bent to a right angle with the arm, and the hand placed in a position between pronation and supination. The fore-arm and hand being thus placed, an assistant takes hold of the four fingers of the patient, and extends the fractured parts, while another assistant makes counter-extension by fixing the humerus with both his hands. By these means, the operator is enabled to restore the bones to their natural situation, and to push the soft parts into the interosseous space, by a gentle and graduated pressure on the anterior and posterior sides of the arm.

The bones are kept in their place by applying first on the anterior and posterior sides of the fore-arm two longitudinal and graduated compresses, the base of which is to be in contact with the arm. The depth of these compresses should be proportioned to the thickness of the arm, increasing as the diameter of the arm diminishes. In the next place, the surgeon takes a single-headed roller, about six yards long, and makes three turns of it on the fractured part; he then descends to the hand by circles partially placed over one another, and envelops the hand by passing the bandage between the thumb and index finger: the bandage is next carried upward in the same manner, and reflected wherever the inequality of the arm may render it necessary. The compresses and bandage being thus far applied, the surgeon lays on two splints, one anteriorly, the other posteriorly, and applies the remainder of the bandage over them. The compresses and splints should be of the same length as the fore-arm. It would be useless to employ lateral splints in this case, unless (what is scarcely ever to be expected or met with) a displacement should have taken place in that direction. Lateral splints would counteract the compresses and two other splints, by lessening the radio-cubital diameter of the arm, and with the action of the pronators tend to push the ends of the fracture into the interosseous space. The surgeon's attention should be particularly directed to preserve the interosseous space; for, if this be obliterated, the radius cannot rotate on the ulna, nor the motion of pronation or supination be executed; and this object may be obtained with certainty by applying the compresses and splints in such a manner, that the fleshy parts may be forced into, and confined in the interosseous space, and by renewing the bandage every seven or eight days.

If the fracture be simple, and the contusion inconsiderable, the patient need not be confined to bed; but may walk about with his arm in a sling.

FRACTURES OF THE RADIUS

Are the most frequent of those of the fore-arm. The radius being almost the sole support of the hand, and placed in the same line with the humerus, is for both these reasons more exposed to fractures, than the ulna.

Fractures of the radius, whether transverse or oblique, near its middle part or extremities, may be caused by a fall or blow on the fore-arm, or, as happens in most cases, by a fall on the palm of the hand. When likely to fall, we extend our arms, and let the hands come first to the ground; in which case, the radius, pressed between the hand on the ground, and the humerus, from which it receives the whole momentum of the body, is bent, and, if the fall be sufficiently violent, broken more or less near its middle part. When, after an accident of this kind, pain, and difficulty of performing the motions of pronation and supination, supervene, the probability of a fracture of the radius is very strong. The truth is fully ascertained by pressing with the fingers along the external side of the fore-arm. Also, in endeavouring to perform supination or pronation of the hand, a crepitus and a motion of the broken portions will be perceived. When the fracture takes place near the head of the radius, the diagnosis is more difficult, on account of the depth of soft parts over that part of the bone. In this case, the thumb is to be placed under the external condyle of the os humeri, and on the superior extremity of the radius, and at the same time the hand is to be brought into the prone and supine positions. If, in these trials, which are always painful, the head of the radius rests motionless, there can be no doubt of the bone being fractured. Here the causes of displacement are the same as in fractures of the fore-arm; it can never take place, except in the direction of the diameter of the bone, and is effected principally by the action of the pronating muscles. The ulna serves as a splint in fractures of the radius; and the more effectually, as these two bones are connected with one another throughout their whole length.

In general, when only the radius is fractured, no extension is requisite. During the treatment, the elbow is to be bent, and the hand put in the mid-state, between pronation and supination; that is to say, the palm of the hand is to face the patient's breast. Having reduced the ends of the fracture, when they appear to be displaced, the soap plaster is to be applied, and over this a slack roller. This bandage is, indeed, of no utility; but, it makes the limb seem to the unknowing by-standers more comfortable, than if it were omitted, and, as it does no harm, the surgeon may honestly apply it. However, no one can doubt, that tight bandages may act very perniciously, by pressing the radius and ulna together, causing them to grow to each other, or, at all events, making the fracture unite in an uneven manner. Only two splints are necessary; one is to be placed along the inside, the other along the outside, of the fore-arm. Soft pads must always be placed between the skin and the splints, in order to obviate the pressure of the hard materials, of which the latter are formed. The inner splint should extend to about the last joint of the fingers: but, not completely to the end of the nails; for, many patients, after having had their fingers kept, for several weeks, in a state of perfect extension, have been a very long time in becoming able to bend them again.

Sometimes, it may be proper to apply a compress just under the ends of the fracture, to prevent their being depressed towards the ulna too much, the consequence of which has occasionally been the loss of the prone and supine motions of the hand.

In setting a fractured radius, the hand should be inclined to the ulnar side of the fore-arm.

FRACTURES OF THE ULNA.

Fractures of this bone are less frequent, than those of the radius, and take place generally at its lower extremity, which is most slender, and least covered. A fracture of this bone is almost always the result of a force acting immediately on the part fractured; as, for instance, when, in a fall, the internal side of the fore-arm strikes against a hard resisting body. On applying the hand judiciously to the inside of the fore-arm, this fracture is easily ascertained by the depression at that part, in consequence of the inferior portion being drawn toward the radius by the action of the pronator radii quadratus. This displacement, however, is less considerable than what takes place in fractures of the radius. The superior portion of the ulna remains unmoved. (*J. L. Petit.*)

In this case, the assistant, who makes whatever little extension may be necessary, should incline the hand to the radial side of the fore-arm, while the surgeon pushes the flesh between the two bones, and applies the apparatus, as in the preceding case. In all fractures of the bones of the fore-arm, and, particularly in those which are near the head of the radius, a false anchylosis is to be apprehended, and should be guarded against by moving the elbow gently and frequently, when the consolidation is in a certain degree advanced.

Fractures of the fore-arm always require the part to be kept quietly in a sling.

FRACTURES OF THE OLECRANON.

The olecranon may be fractured either at its base, its centre, or its extremity; but, the second case is the most frequent. The division is almost always transverse, though occasionally oblique. The accident is very rarely produced by the action of the muscles, but, almost always, by external violence, directly applied to the part in a blow, or fall upon the elbow.

With regard to symptoms, the contraction of the triceps, being no longer resisted, by any connexion with the ulna, draws upward the short fragment, to which it adheres, so as to produce, between it and the lower one, a more, or less evident interspace. This interspace is situated at the back part of the joint, and may be increased or diminished at will, by augmenting the flexion of the fore arm, and putting the triceps into action, or extending the limb. Another symptom, is the impossibility of spontaneously extending the fore-arm, the necessary effect of the detachment of the triceps from the ulna. It appears from the dissections made by Sir Astley Cooper, that the extent of the separation depends upon the degree of laceration of the capsular ligament, and of that portion of ligament, which proceeds from the side of the coronoid process to that of the olecranon. (*On Dislocations, &c. p.* 487.) It must be owing to the untorn state either of the latter part, or of the aponeurosis covering the olecranon, that patients occasionally retain the power of extending the fore-arm, as is exemplified in the case reported by Mr. Earle, where, on the sixth day after the accident, (and not before) this power was destroyed by a sudden flexion of the fore-arm. (*Practical Obs. p.* 147.) The fore-arm is constantly half-bent, the biceps, and brachialis having no antagonists. The olecranon is more or less drawn up higher, than the condyles of the os brachii, which latter parts, on the contrary, are naturally situated higher, than the olecranon, when the fore-arm is half-bent. The upper piece of bone may be moved in every direction, without the ulna participating in the motion. Besides these symptoms, we must take into the account, the considerable pain experienced, and the crepitus perceptible, when the fragment is approximated to the surface from which it is detached.

The indications are to push the retracted portion of the olecranon downwards, and to keep it in this position, at the same time, that the ulna is made to meet it, as it were, by extending the fore arm. According to Desault, however, the fore-arm should not be completely extended, as when the pieces of bone touch at their back part, they leave a vacancy in front, which is apt to be followed by an irregular callus, prejudicial to the free motion of the elbow. Hence, it was his practice to put the arm between the half-bent and the completely extended state, and to maintain this posture by means of a splint along the fore-part of the arm. But, as position operates only on the lower part of the olecranon, the upper one requires to be brought near the former, and fixed there, which is, doubtless, the most difficult object to effect, because the triceps is continually resisting.

Desault used to adopt the following method: the fore-arm being held in the above position, the surgeon is to begin applying a roller round the wrist, and to continue it as high as the elbow. The skin, covering this part, being wrinkled in consequence of the extension of the limb, might insinuate itself between the ends of the fracture, and consequently it must now be pulled upward by an assistant. The surgeon is then to push the olecranon towards the ulna, and confine it in this situation with a turn of the roller, with which the joint is then to be covered, by applying it in the form of a figure of 8.

A strong splint, a little bent, just before the elbow, is next laid along the arm and fore-arm, and fixed by means of a roller. The limb is then to be evenly supported on a pillow.

The cure of the fractured olecranon is seldom effected by the immediate reunion of its fragments: there generally remains a greater or lesser interspace between them, which is filled up by a substance, not of a bony consistence. Indeed, the tenor of the remarks and experiments, lately published by Sir Astley Cooper on this subject, is to represent the broken olecranon as similarly circumstanced with respect to bony union, as the fractured neck of the femur. He has seen union by bone effected in the living subject; but, this was when the fracture had taken place very near the shaft of the ulna. The ligamentous substance, he says, which generally forms the bond of union, often has one, or even several apertures in it, when it is of considerable length. The arm is observed to be weakened, in proportion to the length of the ligament. (*On Dislocations, &c. p.* 489.)

Camper laid great stress upon the inutility of keeping the arm perfectly extended: he found patients recover sooner and better, when the elbow was kept half bent, and the joint gently exercised at as early a period as possible. "Agglutinationem scilicet motiri non debet chirurgus, sed sublatis tumore ac inflammatione quiete et remediis aptis, cubitum quotidie prudenter movere, ut unio per tricipitis tendinem, seu per concretionem membranosam formetur, et os ossi non admoveatur. Verbo quemadmodum C. Celsus in *Med. Lib.* 8, *c.* 10, § 4, *p.* 537, de cubito fracto præcepit. Quod si ex summo cubito quid fractum sit, glutinare id vinciendo alienum est, fit enim brachium immobile, ac, si nihil aliud quam dolori occurrendum est, idem qui fuit ejus usus est." (*Camper de Fractura Patellæ, p.* 66, *Hagæ,* 1789.) Mr. Earle is also an advocate for placing the limb in a slightly bent position. (*Pract. Obs. p.* 165.) The late Mr. Sheldon, however, does not concur with Desault and Camper, respecting the position of the limb during the treatment, but insists upon the utility of keeping the fore-arm perfectly extended.

When there is much swelling, Sir A. Cooper employs leeches and evaporating lotions for two or three days; but, when not much violence has been done to the limb, he applies a bandage at once. He places the arm in a straight position, presses down the fragment until it touches the ulna, and after putting a slip of linen along each side of the joint, puts a roller round the limb above and below the olecranon. By tying the slips of linen, which pass under the rollers, these are drawn nearer together, and the fragment of the olecranon is thus kept as near as possible to the ulna. Lastly, a splint, well padded, is applied along the front of the arm, and secured with a bandage, which is frequently wetted with spirits of wine and water. (*On Dislocations, &c. p.* 490.)

On an average, the olecranon becomes firmly united about the twenty-sixth day. (*Desault.*) In a month, the splint is to be removed, and passive motion begun. (*A. Cooper.*)

FRACTURE OF THE CORONOID PROCESS.

Two examples of this accident are noticed by Sir Astley Cooper: in one case, seen by him several months after its occurrence, the same appearances presented themselves as were remarked by the surgeon who first attended the patient: namely, the ulna projected backwards whilst the arm was extended, but, it could be drawn forwards, and the elbow bent, without much difficulty, when the deformity disappeared. In the other instance, which presented itself in the dissection-room, the coronoid process which had been broken off, was united by ligament, and so moveable, that, when the fore-arm was extended, the ulna glided backwards upon the condyles of the humerus. Sir Astley Cooper is of opinion that the case admits of no other mode of union: he recommends keeping the arm steadily in the bent position for three weeks. (*On Dislocations, &c. p.* 484.)

FRACTURES OF THE CARPAL AND METACARPAL BONES, AND PHALANGES OF THE FINGERS.

The bones of the carpus, when broken, are usually crushed, as it were, between very heavy bodies, or the limb has been entangled in powerful machinery, or suffered gun-shot violence. It must be obvious, therefore, that, as the soft parts are also seriously injured, these cases are generally followed by severe and troublesome symptoms, and sometimes require the performance of amputation, either immediately, or subsequently. When an attempt is to be made to save the part, the chief indications are to extract splinters of bone, and prevent inflammation, abscesses, and mortification. The parts may at first be kept wet with a cold evaporating lotion, any wound present being lightly and superficially dressed, but, afterwards, as soon as all tendency to bleeding is over, emollient poultices may be applied over the dressings, instead of the lotion. The dressings, themselves, however, should not be removed for the first three, or four days, all unnecessary disturbance of the crushed parts being highly injurious. Should abscesses form, early openings should be practised, so as to prevent the matter from extending up the fore-arm. Duly supporting the hand and fore-arm in a sling is of the greatest importance. The metacarpal bones of the little finger and thumb are more frequently broken, than the other three. A fracture of a metacarpal bone is generally produced by violence applied directly to the part, as no force, capable of causing the accident, can well act upon the two ends of the bone so as to break it. The fracture may be simple, but, more commonly, it is compound, the soft parts being wounded, and lacerated by the same violence, which has injured the bone. In most cases, also, unless the force has operated by a very limited surface, more than one metacarpal bone is fractured. At first, the same kind of treatment is requisite, as in the preceding cases, and, after the inflammation has subsided, a hand-board, or splint may be employed. When the hand is very badly crushed, amputation is indicated.

In fractures of the finger bones, the treatment consists in applying a piece of soap-plaster, rolling the part with tape, incasing it in pasteboard, sometimes placing the hand on a flat splint, or finger-board, and always keeping the hand, fore-arm, and elbow, well supported in a sling.

For Fractures of the Cranium, see Head, Injuries of.

For information on fractures consult particularly, *J. L. Petit, Traité des Maladies des Os. Duverney, Traité des Maladies des Os. Jonathan Wathen, the Conductor and Containing Splints; or a Description of Two New-invented Instruments, for the more safe Conveyance, as well as the more easy and perfect Cure of Fractures of the Leg. 2d Ed. 8vo. Lond.* 1767. *W. Sharp in Vol.* 57 *of the Philosophical Trans. part* 2, 1767. *An Account of a new Method of treating Fractured Legs. Pott's Remarks on Fractures and Dislocations. T. Kirkland, Obs. upon Mr. Pott's general Remarks on Fractures, &c. 8vo. Lond.* 1770; also *Appendix to the same, 8vo. Lond.* 1771. *Cases in Surgery, by C. White, Edit.* 1770. *J. Aitken, Essays on several Important Subjects in Surgery, chiefly on the Nature of Fractures of the Long Bones of the Extremities, particularly those of the Thigh and Leg, 8vo.* 1771. *Boyer, Traité des Mal. Chir. T.* 3. *Encyclopédie Méthodique, Partie Chir. Art. Fracture, Cuisse, Omoplate, Ilium, &c. &c. Œuvres Chir. de Desault, par Bichat, T.* 1. *Parts of the Parisian Chirurgical Journal. Sir J. Earle, A Letter containing some Observations on the Fractures of the lower Limbs; to which is added, an Account of a Contrivance to administer Cleanliness and Comfort to the bed ridden, or persons confined to bed by age,*

accident, sickness, or other infirmity, 8*vo. Lond.* 1807. *Levéillé, Nouvelle Doctrine Chir. T.* 2, 1812. *Assalini, Manuale di Chirurgia, Parte Prima, Milano,* 1812. *Dupuytren, des Fractures ou Courbures des os des Enfans, in Bulletin de la Faculté de Med. Paris,* 1811. *Idem, sur la Fracture de l'Extrémité inférieure du péroné, les luxations, et les accidens qui en sont la suite, in Annuaire Méd. Chir. de Paris,* 4*to. Paris,* 1819. *Roux, Rélation, d'un Voyage fait à Londres en* 1814, *ou Parallèle de la Chirurgie Angloise avec la Chirurgie Françoise, p.* 173, *&c. Paris,* 1815. *Med. Chir. Trans. Vol.* 2, *p.* 47, *&c.; Vol.* 5, *p.* 358, *&c.; Vol.* 7, *p.* 103. *Sketches of the Medical Schools of Paris, by J. Cross, p.* 87, *&c. Sir A. Cooper, A Treatise on Dislocations and Fractures of the Joints,* 4*to. Lond.* 1822, and *Obs. on Fractures of the Neck of the Thigh-bone,* 1823. *H. Earle, Practical Observations in Surgery,* 8*vo.* 1823. *W. Gibson's Institutes and Practice of Surgery,* 8*vo. Vol.* I. *Philadelphia,* 1824.

FRÆNUM LINGUÆ. In infants, the tongue is sometimes too closely tied down, by reason of the frænum being extremely short, or continued too far forwards. In the latter case, the child will not be able to use its tongue, with sufficient ease in the actions of sucking, swallowing, &c. in consequence of its point being confined at the bottom of the mouth. Though this affection is not unfrequent, it is less common, than is generally supposed by parents and nurses. When the child is small, and the nurse's nipple large, it is common for her to suppose the child to be tongue-tied, when, in fact, it is only the smallness of the child's tongue, that prevents it from surrounding the nipple, so as to enable it to suck with facility. Mothers also commonly suspect the existence of such an erroneous formation whenever the child is long in beginning to talk.

The reality of the case may always be easily ascertained by examining the child's mouth. In the natural state, the point of the tongue is always capable of being turned upward, towards the palate, as the frænum does not reach along above a quarter of an inch of the lower part of the tongue from the apex. But, in tongue-tied children, by looking upon one side, we may see the frænum extending from the back part to the very point, so that the whole length of the tongue is tied down, and unnaturally confined.

The plan of cure is to divide as much of the frænum as seems proper for setting the tongue at liberty. The incision, however, should not be carried more extensively backward, than is necessary, lest the ranimal arteries be cut; an accident, that has been known to prove fatal. For the same reason, the scissars used for this operation, should have no points. I think the following piece of advice, offered by a modern author, may be of service to practitioners, who ever find it necessary to divide the frænum linguæ: "It is not the relations of the trunk of the lingual artery alone, which the student ought to make himself acquainted with. He will do well to study the position of the arteria ranina in respect to the frænum linguæ. This information will teach him the impropriety of pointing the scissars upward and backward, when snipping the frænum, an operation, by the by, oftener performed, than needed. He will learn, that the ranular artery lies just above the attachment of the frænum; so that if he would avoid it, he must turn the points of the scissars rather downward; if he do not, the artery will probably suffer." (*A. Burns, Surgical Anatomy of the Head and Neck, p.* 239.)

When an infant has the power of sucking, this proceeding should never be resorted to, even though the frænum may have the appearance of being too short, or extending too far forwards. (*Fab. Hildanus, centur.* 3. *Obs.* 28; *Petit, Traité des Mal. Chir. T.* 3, *p.* 265, *Edit.* 1774.)

Although the operation of dividing the frænum linguæ is for the most part done, without any bad consequences, surgeons should remember well, that it is liable to dangers, especially, when performed either unnecessarily, or unskilfully.

Besides the fatal events, which have occasionally resulted from wounding the raninal arteries, the records of surgery furnish us with proofs, that the mere bleeding from the raninal veins, and the small vessels of the frænum, may continue so long, in consequence of the infant's incessantly sucking, as to produce death. In such cases, the child swallows the blood, as fast as it issues from the vessels, so that the cause of death may even escape observation. But, if the body be opened, the stomach and intestines will be found to contain large quantities of blood. (See *Dionis, Cours d'Opérations de Chirurgie,* 7*e Démonstration*; *Petit, Traité des Maladies Chir. T.* 3, *p.* 282, *&c.*)

Another accident, sometimes following an unnecessary, or too extensive a division of the frænum, consists in the tongue becoming thrown backward over the glottis into the pharynx, where it lies fixed, and causes suffocation. The observations of Petit on this subject are highly interesting. (See *Op. cit. T.* 3, *p.* 267, *&c.*)

Lastly, it should be known, that an infant's inability to move its tongue, or suck, is not always owing to a malformation of the frænum. Sometimes the tongue is applied and glued, as it were, to the roof of the mouth, by a kind of mucous substance, and in this case, it should be separated with the handle of a spatula. By this means, infants have been saved, which were unable to suck during several days, and were in imminent danger of perishing from want of nourishment. (See *Mémoires de l'Acad. de Chirurgie, T.* 3, *p.* 16, *Edit.* 4*to.*)

See particularly *Petit, Traité des Maladies Chir. T.* 3, *p.* 260, *&c. Dionis Cours d'Opérations,* 7*e Démonstr. Sabatier, Médecine Opératoire, T.* 3, *p.* 132, *&c. Lassus, Pathologie Chir. T.* 2, *p.* 454. *Richerand, Nosogr. Chir. T.* 3, *p.* 284, *Ed.* 2. *Richter, Anfangsgr. der Wundarzn. B.* 4, *Kap.* 2, *p.* 11, *Ed.* 1800.

FRAGILITAS OSSIUM. A morbid brittleness of the bones.

Boyer imputes *mollities ossium* to a deficiency of lime in their structure; *fragilitas ossium* to a deficiency of the soft matter naturally entering into their texture. He states, that a certain degree of fragilitas ossium necessarily occurs in old age, because the proportion of lime in the bones naturally increases as we grow old, while that of the organized part diminishes. Hence, the bones of old persons more easily break, than those of young subjects, and are longer in uniting again. As Mr. Wilson observes, however, they never are found so friable and fragile, as to crumble like a calcined bone, but, on the contrary, they contain a large quantity of oil, a fact particularly noticed by Saillant (see *Hist. de la Société de Méd.* 1776, *p.* 316), and after death dry so greasy, that they are unfit to be preserved as preparations. Their organized vascular part is diminished, but their oily animal matter is increased. (*On the Skeleton and Diseases of Bones*, *p.* 258.)

In persons, who have been long afflicted with cancerous diseases, the bones are said to become sometimes as brittle, as if they had been calcined. Saviard and Louis relate cases of this description. (*Obs. Chir. et Journ. de Savans*, 1691. *Obs. et Remarques sur les Effets du Virus Cancreux, Paris*, 1750. *Pouteau Œuvres Posthumes, T.* 1.) Louis mentions a nun who broke her arm by merely leaning on a servant; and in the London Medical Journal an account is given of a person, who could not even turn in bed, without breaking some of his bones.

In the latter stages of syphilis, the bones are alleged to be sometimes remarkably brittle. (*Ephem. Nat. Cur. Dec.* 1. *Ann.* 3, *Obs.* 112. *Walther, Museum Anat. T.* 2, *p.* 29.)

In bad cases of scurvy, the bones occasionally become so brittle, that they are broken by the slightest causes, and do not grow together again. (*Boetticher von den Krankh. der Knochen, p.* 68.)

The fragilitas ossium of old age is incurable: that which depends on some other constitutional disease, can only be relieved by a removal of the latter. (See *Boyer on Diseases of the Bones, Vol.* 2.)

This author, in one of his last works, expresses his opinion, that the doctrine of mollities and fragilitas ossium being distinct different diseases, is by no means sufficiently proved by a due number of accurate observations. (*Traité des Mal. Chir. T.* 3, *p.* 607, 608.) Consult also *Waldschmidt, Dis. de Fractura Ossium sine Causâ violentâ externâ. Kilon*, 1721. *Acrel, Chir. Vorfälle* 2, *p.* 136. *Courtial, Nouvelles Obs. Anat. sur les Os, p.* 64, 12*mo. Paris*, 1705. *Marcellus Donatus, Lib.* 5, *c.* 1, *p.* 528. *Walther, Museum Anat. Vol.* 2, *p.* 29. *Schmucker, Vermischte Schriften*, 1 *B. p.* 385. *Kentish, in Edinb. Med. Comment. Vol.* 1. *Hist. de l'Acad. des Sciences*, 1765, *p.* 65. *Hist. de la Soc. Royale de Médecine*, 1777 *and* 1778, *p.* 224. *Journ. de Méd. T.* 77, *p.* 267, *T.* 84, *p.* 216. *Isenflamm. Pract. Bemerk. über Knochen. p.* 368, 415, 466. *Fabricius Hildanus Cent.* 2. *Obs.* 66, 67, 68, *Cent.* 5, *Obs.* 89. *D'Aubenton, Description du Cabinet du Roi, T.* 3, *Ossa Veneorum sponte fracta. Meekren, Obs. Med. Chir. p.* 341, *Amst.* 1682. *Weidmann de Necrosi Ossium, p.* 2, *Francofurti*, 1793; *and the writings of Duverney, Petit, and Pringle. J. Wilson on the Skeleton, &c. p.* 258, 8*vo. Lond.* 1820.

FUNGUS. Any sponge-like excrescence. Granulations are often called *fungous* when they are too high, large, flabby, and unhealthy.

FUNGUS HÆMATODES. (from *fungus*, and αιμα, blood.) *The Bleeding Fungus. Spongoid Inflammation. Soft Cancer. Carcinôme Sanglante. Medullary Sarcoma.*

This disease, which has been accurately described only of late years, was formerly generally confounded with cancer. The public are indebted to Mr. J. Burns, of Glasgow, for the first good account of it; and the subsequent writings of Mr. Hey, of Leeds, Mr. Freer, of Birmingham, Mr. J. Wardrop, Mr. Langstaff, and others, have made us still better acquainted with the subject.

It is unquestionably one of the most alarming diseases, incidental to the human body, because we know of no specific remedy for it; and an operation can only be useful at a time, when it is very difficult to persuade a patient to submit to it.

Indeed, when the diseased part is extirpated at an early period, a recovery hardly ever follows; for, experience proves, that it is not a disease of a local nature, but almost always extends to a variety of organs and structures at the same time, either to the brain, the liver, or lungs, &c. It is of the utmost consequence to be aware of this fact, since we should otherwise be induced to attempt many hopeless operations, and deliver a prognosis that might cause disappointment and censure. In a large proportion of patients, afflicted with fungus hæmatodes, the general disorder of the system is indicated by a peculiarly unhealthy aspect; a sallow, greenish yellow colour of the skin, which is frequently covered with clammy perspiration; constant troublesome cough; difficulty of breathing, &c.

Fungus Hæmatodes, is the name used by Mr. Hey. Mr. J. Burns has called the disease *spongoid inflammation*, from the spongy elastic feel, which peculiarly characterizes it, and which continues even after ulceration takes place. Fungus hæmatodes has most frequently been seen to attack the eyeball, the upper and lower extremities, the testicle, and the mamma. But, the uterus, ovary, liver, spleen, brain, lungs, thyroid gland, hip, and shoulder joints, have also been the seat of the disease. A distemper, which presents itself in so many parts, must be subject to variety in its appearances.

FUNGUS HÆMATODES OF THE EYE.

1. When it attacks the eye, the first symptoms are observable in the posterior chamber, an appearance like that of polished iron, presenting itself at the bottom of the eye. (*Scarpa on Diseases of the Eye, p.* 505, *Ed.* 2.) The pupil becomes dilated and immoveable, and, instead of having its natural deep black colour, it is of a dark amber, and sometimes of a greenish hue. The change of colour becomes gradually more and more remarkable, and, at length is discovered to be occasioned by a solid substance, which proceeds from the bottom of the eye towards the cornea. The surface of this substance is generally rugged and unequal, and ramifications of the central artery of the retina may sometimes be seen running across it. The front surface of the new mass, at length advances as far forwards as the iris, and the amber, or brown appearance of the pupil, has, in this stage, been known to mislead surgeons into the supposition of there being a cataract, and make them actually attempt couching. The disease continuing to increase, the eyeball loses its natural figure, and assumes an irregular knobby appear-

ance. The sclerotica also loses its white colour, and becomes of a dark blue, or livid hue. Sometimes, matter now collects between the tumor and the cornea. The latter membrane in time ulcerates, and the fungus shoots out. In a few instances, it makes its way through the sclerotica, and is then covered by the conjunctiva. The surface of the excrescence is irregular, often covered with coagulated blood, and bleeds profusely from slight causes. When the fungus is very large, the most prominent parts slough away, attended with a fetid sanious discharge. In the course of the disease, the absorbent glands, under the jaw, and about the parotid gland, become contaminated. On dissection, a diseased mass is found extending forwards from the entrance of the optic nerve, the vitreous, crystalline, and aqueous humours being absorbed. The retina is annihilated, and the choroid coat propelled forwards, or quite destroyed. The tumor seems to consist of a sort of medullary matter, resembling brain. The optic nerve is thicker and harder than natural, of a brownish ash-colour, and destitute of its usual tubular appearance. In other cases, the nerve is split into two or more pieces, the interspaces being filled up with the morbid growth. (*Wardrop.*) Nay, as Mr. Travers has stated, the optic ganglion, tractus opticus, and thalamus, have been repeatedly found diseased, and the surrounding adipose substance in the orbit affected to a considerable extent in places also where there was no direct communication with the diseased contents of the globe. (*Synopsis of the Diseases of the Eye, p.* 221.) Even the brain has been observed to share in the disease, sometimes dark-red spots appearing on the dura mater; sometimes small spots, containing a fluid like cream, being found between the pia mater and tunica arachnoides. Mr. Travers has a preparation, exhibiting a genuine example of the disease affecting the anterior right lobe of the cerebrum, and protruding the eye from its socket, while the eye itself was perfectly free from disease. (*Op. cit. p.* 223.) When the lymphatic glands at the angle of the jaw are enlarged, as they frequently are, they are also found converted into a kind of medullary matter, similar to that which composes the diseased mass in the eye-ball. When the skin bursts over a diseased absorbent gland, a sloughy ulcer is produced; but, no fungus is emitted, unless the affection of the gland with fungus hæmatodes be primary. Fungus hæmatodes of the eye has been erroneously regarded as cancer by the best writers. We learn from Bichat, that more than one third of the patients on whom Desault operated for *supposed* carcinoma of the eye, were under twelve years of age. Twenty out of twenty four cases of fungus hæmatodes of the eye, with which Mr. Wardrop has been acquainted, happened to children under twelve years of age. Now, as cancer is rather a disease of aged, than young persons, and we find, from Mr. Wardrop, that fungus hæmatodes of the eye mostly affects persons under twelve years of age, it is tolerably certain, that most of Desault's cases, reported to be cancers of the eye, were in fact the equally terrible disease now engaging our consideration. According to Mr. Travers, the only parts of the eye and its appendages, subject to be primarily attacked by cancer, are the lachrymal gland, conjunctiva, and eyelids; while the evidence of many cases has assured him, that fungus hæmatodes may originate in any texture of the eye, with the exception of the lens and cornea. (*Synopsis of the Diseases of the Eye, p.* 216, 222, and 421.) This account, however, differs from that delivered by Mr. Wardrop and Professor Scarpa, who describe the disease as first commencing in the retina, and particularly at the point, where the optic nerve enters the eye. "For (says the latter author), on the first appearance of the yellowish, or greenish spot, the retina on examination is found to be entirely deficient, or in other words, to have degenerated into the malignant fungus. It is also found, that the choroid membrane, while the fungus hæmatodes is in its incipient state, does not appear to have suffered any remarkable alteration in its texture, and that it is only at a more advanced period of the disease, that this membrane becomes thickened, and separated from its connexion with the sclerotica. The choroid membrane, even in the most advanced stage of the disorder, preserves more than all others, its natural texture." (*On the Principal Diseases of the Eyes, p.* 507, *Ed.* 2.) In cases of fungus hæmatodes, the sight of young subjects is generally destroyed, before the attention of parents is excited to the distemper. Frequently, however, a blow, followed by ophthalmy, precedes the growth of the diseased mass. When no external violence has occurred, the first symptom is a trivial fulness of the vessels of the conjunctiva, the iris becoming, at the same time, extremely vascular, and altered in colour, and the pupil dilated and immoveable. There is seldom much complaint made of pain; but, the child is sometimes observed to be languid and feverish. In adults, fungus hæmatodes of the eye generally comes on without any apparent cause, though sometimes in consequence of a blow. At first, the tunica conjunctiva is slightly reddened, and vision indistinct. The redness and obscurity of sight increases slowly, and an agonizing nocturnal headach is experienced, the eye bursts, and the humours are discharged.

With regard to the cure of the fungus hæmatodes of the eye, the only chance of effecting this desirable object depends upon the early extirpation of the diseased organ. It must be acknowledged, however, that most of the operations, in which the morbid eye has been removed, have hitherto proved unsuccessful, owing to a recurrence of the disease. The reason of such ill success may be imputed to the optic nerve and other parts being almost always in a morbid state, before an attempt is made to remove the eye. One case, however, described by Mr. Travers, as having its seat in the cellular texture connecting the conjunctiva to the cornea, was operated upon, and no recurrence of the disease had occurred a twelvemonth afterwards. No other texture was affected more, than the contiguity and extent of the disease explained. (*Synopsis of the Diseases of the Eye, p.* 413.) The most successful extirpation of an eye, in an advanced stage of this disease, and, perhaps, the only satisfactory one at present on record, is that which was performed by Mr. Wishart, the cure continuing complete eighteen months after the operation. (See *Edinb. Med. Journ. Vol.* 19. *p.* 51.) The operation has nearly always been found to fail, when the disease is advanced so far, that the posterior chamber is filled by the fungous mass. With the very few exceptions, which there are to this statement, it may be correctly said, that as no internal medicines, nor external applications, afford the least hope of checking any form of the fungus hæmatodes, it is manifest, that when the distemper of the eye exceeds certain bounds, the miserable patient is placed beyond the reach of any effectual aid from surgery. In a case, which I saw in April, 1821, in the London Eye Infirmary, the disease formed a diseased mass, as large as an orange, accompanied with enlarged lymphatic glands over the parotid. The patient was an infant. In this instance, Mr. Lawrence used as a local application, the liquor opii sedativus, prepared by Mr. Battley, which was found to lessen considerably the child's sufferings. (See particularly *Wardrop's Obs. on Fungus Hæmatodes. Scarpa on the Principal Diseases of the Eye, chap.* 21. *Some Cases in Saunders's Treatise on Diseases of the Eye; and B. Travers's Synopsis of the Diseases of the Eye, 8vo. Lond.* 1820.)

FUNGUS HÆMATODES OF THE LIMBS.

2. In the extremities, the disease begins with a small colourless tumor, which is soft and elastic, if there be no thick covering over it, such as a fascia: but otherwise it is tense. At first, it is free from uneasiness; but, by degrees, a severe acute pain darts occasionally through it, more and more frequently, and, at length, becomes incessant. For a considerable time, the tumor is smooth and even; but, afterwards, it projects irregularly at one, or more points; and the skin at these places becomes of a livid red colour, and feels thinner. In this situation, it easily yields to pressure, but instantly bounds up again. Small openings now form in these projections, through which is discharged a thin bloody matter. Almost immediately after these tumors burst, a small fungus protrudes, like a papilla, and this rapidly increases, both in breadth and height, and has exactly the appearance of a carcinomatous fungus, and frequently bleeds profusely. The matter is thin, and exceedingly fetid, and the pain becomes of the smarting kind. The integuments, for a little way round these ulcers, are red, and tender. After ulceration takes place, the neighbouring glands swell, and assume exactly the spongy qualities of the primary tumor. If the patient still survive the disease in its present advanced progress, similar tumors form in other parts of the body, and the patient dies hectic.

After death, or amputation, the tumor is found to consist of a soft substance, somewhat like the brain, of a greyish colour, and greasy appearance, with thin membrane-like divisions running through it, and cells, or abscesses, in different places, containing a thin bloody matter, occasionally in very considerable quantity. There does not seem uniformly to be any entire cyst, surrounding the tumor; for, it very frequently dives down betwixt the muscles, or down to the bone, to which it often appears to adhere. The neighbouring muscles are of a pale colour, and lose their fibrous appearance, becoming more like liver than muscle. The bones are always carious in the vicinity of the disease.

The distemper is sometimes caused by external violence, though in general there is no evident cause whatever. (*Dissertations on Inflammation by J. Burns, Vol.* 2.)

Mr. Hey has given several cases of the fungus hæmatodes. If I notice the most particular circumstances, relative to one of these, it will suffice to inform the reader of the form, in which this terrible affliction has presented itself in this gentleman's practice.

A young man, aged twenty-one, two years before applying to Mr. Hey, perceived a small swelling on the inside of the right knee, not far from the patella. This tumor was moveable, and did not impede the motion of the joint: it was not discoloured, but was painful, when moved or pressed upon. It continued in this state half a year, and then, the man having hurt his knee against a stone, it gradually increased in bulk, but did not exceed the size of an egg. The skin was now discoloured with blue specks, which were taken to be veins. He could still walk with ease, and follow his business.

Two months before his admission into the Leeds Infirmary, he met with a fall, and violently bent his knee, but did not strike it against any thing. The tumor began immediately to enlarge; and, within a few hours, it extended half way up the inside of his thigh. About a fortnight after this accident, the skin burst at the lowest part of the tumor, and discharged some blood. A dark-coloured fungus, about the size of a pigeon's egg, here made its appearance, and, a few weeks afterwards, the skin burst at another part of the large tumor, and some blood was again discharged. From the fissure arose another fungus, which had increased, in the course of the last week, to the size of a small melon, and now measured eight inches from one side of its base to the other. The base of the fungus frequently bled, especially, when the man allowed his limb to hang down.

The whole tumor was now of an enormous size, being nineteen inches across, when the measure was carried over the last-mentioned fungus. From its highest part in the thigh to the lowest part, just below the knee, it measured seventeen inches, without including the fungus. The base of the tumor at the knee, exclusive of that part which ran up the thigh, measured twenty-four inches in circumference. The tumor was situated on the inner side of the limb, and was distinctly defined. The skin, covering the disease, was in some places livid, and had several fissures and small ulcerations upon it; but, had not burst asunder, except in the two places above described. The tumor was soft, and gave a sensation of some contained fluid, when gently pressed with the hands alternately in opposite directions. The patient said he had walked without pain in his knee, a week before his admission into the Infirmary; and he had lost very little blood in his journey to Leeds. He complained of the greatest uneasiness in the highest part of the tumor. It had become hot and painful in the night-time, for some days past. His pulse was 114 in a minute; his tongue was clean; and his appetite had been good, till the last few days. He had never felt any pulsation in the tumor.

In a consultation it was determined, that the tumor should be laid open, by cutting off a portion of the distended integuments; and that after removing the contents, if the sac should be found in a sound state, the disease should be treated as a simple wound; but, if in a morbid state, amputation of the limb should be immediately performed.

A large oval piece of the integuments being removed, the tumor was found to contain a very large quantity of a substance, not much unlike coagulated blood; but more nearly resembling the medullary part of the brain in its consistence and oily nature. It was of a variegated reddish colour, in some parts approaching to white, and, as blood issued from it, Mr. Hey conceived it was organized. This mass was partly diffused through the circumjacent parts in innumerable pouches, to which it adhered, and was partly contained in a large sac of an aponeurotic texture, which was connected with the capsule of the knee-joint. There was a great and universal effusion of blood from the internal surface of the sac, and from the pouches, containing this morbid mass.

Amputation of the limb was immediately performed, on finding such to be the nature of the case. Mr. Hey, unfortunately, however, left a portion of the diseased surface behind on the inner part of the thigh, and hoping that a small narrow portion of the upper part of the sac would soon become a clean sore, and not impede the cure, he made the circular incision two inches below its higher part.

On examining the amputated limb, the vastus internus was found to be brown, and much softer than the other muscles, which were healthy. There were many small portions of blood extravasated in the substance of this muscle. The sac was formed on the aponeurotic covering of the muscle, and ended below where this aponeurosis begins to cover the capsular ligament of the knee. The two fungous substances, above described, appeared to have been only extensions of the morbid mass, where this had made its way through the sac and the integuments. The joint of the knee, and muscles of the leg, were perfectly sound.

I need not detail all the particulars after the operation. Suffice it to say, the man suffered a great deal of constitutional disorder. After a few weeks the granulations upon the stump became good, and the cicatrization was nearly completed at the end of the sixth week, after the amputation. At this period, the small and superficial portion of the upper part of the great sac, which Mr. Hey had unfortunately left, was now healed; but, a tumor, now about four inches in length, and between two and three in breadth, had gradually risen at the lower and under part of the thigh, beneath the cicatrix. This contained a soft substance, exactly similar, as far as the touch could discover, to that which had filled the large sac. This tumor became painful, and sometimes discharged a bloody serum, sometimes dark-coloured blood, through four or five small openings in the cicatrix.

Mr. Hey laid open the tumor, and removed its contents; but no advantage was gained by this proceeding. The interior surface was found to be too much diseased to produce good granulations. Blood continued to ooze out of the wound for a few days. Then the inner surface became covered with a blackish substance, which gradually extended itself, and formed a new fungus. A variety of escharotics were applied to destroy the fungus and morbid surface of the wound; but, to no purpose, the growth of the fungus always exceeded the quantity destroyed. Undiluted oil of vitriol, applied freely, had very little effect.

An attempt was once more made to cut away the disease; but, on examining the wound carefully, after the contained substance was removed, the muscular substance was found degenerated into a hard mass, which felt somewhat like cartilage. The adipose membrane was also diseased, and formed into large cells, which had contained the fungous substance. Hence, another amputation seemed the only resource.

After this operation, the whole surface of the stump seemed sound, except the principal artery, which was filled with a somewhat stiff matter, resembling coagulated blood, which prevented its bleeding. The inside of the vessel, on being touched with the scalpel, felt hard, and communicated a sensation, like that of scraping bone.

The man was sent home, as soon as his state would admit of it; but, he died consumptive about six months afterwards. Besides this instance, in the thigh, Mr. Hey relates cases of fungus hæmatodes, situated in the female breast, in the leg, in the neck (extending from the jaw to the clavicle, and producing suffocation), on the back part of the neck, on the back part of the shoulder, and at the extremity of the fore-arm, near the wrist.

"If I do not mistake, (says Mr. Hey,) this disease not unfrequently affects the globe of the eye, causing an enlargement of it, with the destruction of its internal organization. If the eye is not extirpated, the sclerotis bursts at the last, a bloody sanious matter is discharged, and the patient sinks under the complaint." (*P.* 283.)

Besides some cases, in similar situations, to those mentioned by Mr. Hey, one is related by Mr. Burns, in which the hip-joint was the seat of this terrible affection. After detailing the progress of the case to the poor man's death, this author states, that he found, on dissection, the hip joint completely surrounded with a soft matter, resembling the brain, enclosed in thin cells, and here and there cells full of thin bloody water; the head of the thigh-bone was quite carious, as was also the acetabulum. The muscles were quite pale, and almost like boiled liver, having completely lost their fibrous appearance, and muscular properties. The same sort of morbid mischief was also found within the pelvis, most of the inside of the bones, on the affected side, being quite carious. An attempt had been made, before the patient died, to tap the bladder; but, the trocar had only entered a cell, filled with bloody water, and situated in a mass of the soft brain-like substance.

I have already said enough, to render the description of the dreadful nature of the fungus hæmatodes tolerably complete. Little can be said of the treatment; for, we know not of one medicine, that seems to have the least power of putting a stop to the disease, and, with the exception of a case under Mr. Cline, where the breast healed up after the diseased mass had been thrown off by sloughing, (*Lancet*, *Vol. II. p.* 401,) we have no reason to believe, that there is ever the smallest chance, even of any spontaneous amendment, much less of such a cure. Also, in the case just now cited, it is not known whether any relapse followed.

We have seen, that when the chief part of a fungus hæmatodes is cut away, and only a small portion of its cyst left behind, the fungus is reproduced from this part, and soon becomes as formidable, nay more formidable, than it was before, and this, notwithstanding the application of the most powerful escharotics. Neither the hydrargyrus nitratus ruber, the hydrargyrus muriatus, the antimonium muriatum, nor the undiluted vitriolic acid, have always been able to repress the growth of such fungus. *(Hey.)*

There is no remedy, that has the power of checking or removing the complaint. Friction, with anodyne balsams, sometimes gives relief in the early stages; but it does not retard the progress of the disease.

In short, the only chance of cure consists in extirpating the whole of the distempered parts, removing not only the soft, brain-like, fungous substance, but every particle of the cysts, sacs, or pouches, in which it may be contained. An operation of this kind, however, is only advisable in the early stages, while the disease is entirely local, if it ever be so, a circumstance much to be doubted; for, after the neighbouring glands have become affected, the chance of recovery is almost destroyed. It is sometimes difficult, however, to persuade patients at an early period to submit to amputation, or extirpation, because the pain and inconveniences are inconsiderable; but, the operation ought to be urged with all the force, which a conviction of its absolute necessity, and the fatal peril of delay, ought to inspire.

The attempts to cure the disease, by cutting it away, have been attended with such ill success, that some surgeons deem it advisable not to follow this method. but amputate the limb at once. The annexed views of the matter appear to me to be most judicious and rational. First, that if an attempt be made to cut away the tumor, and save the limb, the surgeon must be careful to remove, at the same time, a considerable quantity of the soft parts in the circumference of the swelling. Secondly, that the earlier this is done, the more likely is it to succeed. Thirdly, that, after the tumor is taken out, an attentive examination of the surface of the wound should be made, and every suspicious part, or fibre, be cut away. Fourthly, that, should the disease still recur, amputation ought to be instantly performed. Fifthly, that caustics should never be applied to this disease. Sixthly, that, even when one of these operations effectually extirpates the distemper of the limb, the patient's entire recovery is always rendered exceedingly uncertain, by reason of the viscera, and other invisible parts, being frequently affected, at the time of the operation, with the same sort of disease.

FUNGUS HÆMATODES OF THE TESTICLE.

3. Fungus hæmatodes of the testicle sometimes begins in its glandular part, sometimes in the epididymis. Its progress is slow, and the pain generally not severe. Nor is there, at first, any inequality or hardness of the diseased part, nor change in the scrotum. When the testicle has become exceedingly large, it feels remarkably soft and elastic, as if it contained a fluid. Hence, the case has often been mistakén for a hydrocele, and punctured with a trocar. (*Wardrop; Earle in Med. Chir. Trans. Vol.* 3, *p.* 60.) Occasionally when the tumor is large, it is in some places hard, in others soft. The hydrocele may be known by the water beginning to collect at the bottom of the scrotum, and then ascending towards the spermatic cord, and by the swelling being circumscribed towards the abdominal ring; whereas the fungus hæmatodes begins with a gradual enlargement of the testicle itself, followed by a fulness, which extends up the spermatic cord. It is not in the slightest degree diaphanous, and is much heavier, than a similar bulk of water. *(Earle, op. cit.)* As the disease advances, abscesses form, and the scrotum ulcerates, but no fungus shoots out. When the inguinal glands become contaminated, they often acquire an immense size; and, when the skin over them bursts, large portions of them slough away. Fungus hæmatodes of the testicle is said to afflict young, more frequently, than old subjects. On dissection, the substance of the diseased testicle is found to present a medullary, or pulpy appearance, generally of a pale brownish colour, though sometimes red. In most cases, the tunica vaginalis and tunica albuginea are adherent together; occasionally there is fluid between them.

In an example, dissected by Mr. Lawrence, the swelling of the testicle consisted of cellular septa, filled with pulpy matter. Numerous tubercles of the disease were found in the omentum, and about the pelvis, intermixed with recently effused coagula. A mass of soft matter, equal in size to a man's head, lay on the spine, behind the aorta and vena cava, *which last vessel was closed for some extent.* The spermatic vessels could not be found. (*See Med. Chir. Trans. Vol.* 8, *Part* 1, *art.* 13.)

The only chance of a cure must be derived from a very early performance of castration, before the disease has extended to the inguinal glands, or far up the spermatic cord. Indeed, very little hope should be placed in the removal of the testicle; for, fungus hæmatodes appears to be rather a constitutional, than a local disease. Nearly every case on record has terminated fatally, and upon dissection, either the liver, the lungs, the brain, the mesenteric glands, or other internal parts, have been found affected with the same disease. In one case, dissected by Mr. Lawrence, tubercles of a similar structure to the disease in the axilla, were found in the lungs, heart, and in short, in nearly all the thoracic and abdominal viscera, though the contents of the skull were free from disease. (*See Cases recorded by Wardrop, Earle, Lawrence, and Langstaff, in Med. Chir. Trans. Vol.* 3 *and* 8.)

We shall quit this subject with stating some of the principal differences between two diseases, which have been commonly confounded. A scirrhous tumour is, from its commencement, hard, firm, and incompressible, and is composed of two substances; one hardened and fibrous, the other soft and inorganic. The fibrous matter is the most abundant, consisting of septa, which are paler than the soft substance between them. A scirrhous tumor, situated in a gland, is not capable of being separated from the latter part, so much are the two structures blended. A scirrhus, in another situation, sometimes condenses the surrounding cellular substance, so as to form a kind of capsule, and assume a circumscribed appearance. When a scirrhous swelling ulcerates, a thin ichor is discharged, and a good deal of the hard fibrous substance is destroyed by the ulceration; other parts become affected, and the patient dies from the increased ravages of the disease, and its irritation on the constitution. Sometimes, though not always, after a scirrhus has ulcerated, it emits a fungus of a very hard texture. Such excrescence, however, is itself, at last destroyed by the ulceration. Cancerous sores, also, frequently put on for a short time, in some places, an appearance of cicatrization. On the other hand, the fungus hæmatodes, while of moderate size, is a soft elastic swelling, with an equal surface, and a deceitful feel of fluctuation. It is, in general, quite circumscribed, being included within a capsule. The substance of the tumor, instead of being for the most part hard, consists of a soft, pulpy, medullary matter, which readily mixes with water. When ulceration occurs, the tumor is not lessened by this process, as in scirrhus; but a fungus is emitted, and the whole swelling grows with increased rapidity. Cancerous diseases are mostly met with in persons of advanced age, while fungus hæmatodes generally afflicts young subjects. (*Wardrop.*) Many dissections have now proved, that the substance of fungus hæmatodes may contain cellular septa, which include the pulpy, medullary matter.

Fungus hæmatodes, in its early stage, is generally attended with less acute pain, than what is experienced in cases of scirrhus. The tumor also has a less definite boundary than a scirrhus, and it is more difficult to say, where the diseased structure terminates, and where the healthy commences. When the disease is in the breast, there is less tendency, than in scirrhous cases, to disease in the axillary glands, which may remain sound, though the disorder in the breast may have advanced to suppuration and ulceration. In the breast, the disease is also much quicker in its progress, than scirrhus. (*A. Cooper, Lancet, Vol.* 2, *p.* 399.)

In cases of external cancer, the viscera are not in general affected at the same time with cancerous disease; but in the majority of examples of fungus hæmatodes, this distemper is found affecting in the same subject a variety of parts. In addition to the outward tumor, we find swellings of a similar nature, perhaps, in the liver, the lungs, the mesenteric glands, or even in the brain. Yet, M. Roux will have it, that cancer and fungus hæmatodes are the same disease; or, at least, that the latter is only a species of the former, and, that, in both cases, the same peculiar diathesis prevails. (*Roux, Parallèle de Chirurgie Angloise avec la Chirurgie Françoise, p.*216,217.)

See *Dissertations on Inflammation, by J. Burns. Vol.* 2. *Hey's Practical Observations in Surgery, ed.* 3. *Freer on Aneurism. Observations on Fungus Hæmatodes, or Soft Cancer, by James Wardrop,* 8vo. *Edin.* 1809. *This last publication is highly deserving of the attention of the surgical practitioner, the disease in different organs being well described, and its character discriminated from that of cancer.*

A case of this disease is related in Vol. 5, *of the London Medical Journal. It was the consequence of an attempt to cure a ganglion by means of a seton, and it proved fatal. A case is also related by Mr. Abernethy, in Surgical Observations,* 1804, *p.* 99. *See also a Case of diseased Testicle, accompanied with Disease of the Lungs and Brain, by H. Earle, in Medico-Chirug. Trans. Vol.* 3, *p.* 59, *&c. in which vol. four other cases are recorded by Mr. Lawrence, p.* 71, *et seq. and one by Mr. Langstaff, p.* 277, *which last I remember visiting in company with this gentleman and Mr. Lawrence, a short time before the patient died. See also Langstaff's Cases and Observations in the* 8*th and* 9*th Vols. of the same work. Voyage fait à Londres, en* 1814, *ou Parallèle de la Chirurgie Angloise avec; la Chirurgie Françoise, p.* 211, *&c. On Fungus Hæmatodes of the Eye, there are some valuable observations in the last edition of Scarpa's Treatise on the Diseases of that organ. See also Saunders on Diseases of the Eye, and B. Travers's Synopsis of Diseases of the Eye,* 8vo. *Lond.* 1820.

Respecting medullary sarcoma, which is generally considered as the same affection as fungus hæmatodes, some further observations will be delivered in the article, *Tumors.*

FURUNCULUS. (from *furo,* to rage.) A boil, so named from the violence of the heat and inflammation attending it.

A boil is a circumscribed, very prominent, hard, deep-red, inflammatory swelling, which is exceedingly painful, and commonly terminates in a slow and imperfect suppuration. The figure of the tumor is generally that of a cone, the base of which is considerably below the surface. Upon the most elevated point of the boil, there is usually a whitish, or livid pustule, which is exquisitely sensible, and immediately beneath this is the seat of the abscess. The matter is mostly slow in forming, is seldom very abundant, and never healthy, at first, being always blended with blood. The complaint is seldom attended with fever, except, when the tumor is very large, situated on a sensible part, or when several of these swellings occur at the same time in different places. In the last circumstance, they often occasion in children, and even in irritable adults, restlessness, loss of appetite, spasms, &c. They rarely exceed a pigeon's egg in size, and they may originate on any part of the body.

Boils commonly arise from constitutional causes. Young persons, and, especially subjects of full plethoric habits, are most subject to them. The disease is also observed to occur with most frequency in the spring. (*Lassus, Pathologie Chir. T.* 1. *p.* 16.) According to Richerand, the origin of boils depends upon a disordered state of the gastric organs. (*Nosographie Chir. T.* 1. *p.* 124, *edit.* 2.) Frequently, they arise without any evident cause, and apparently in healthy constitutions. At other times, they follow eruptive diseases and typhus. (*W. Gibson, Institutes, &c. of Surgery, p.* 48, *vol.* 1.)

The suppuration attending a boil, is never perfect, and the matter, which forms, is not only tinged with blood, but surrounded with a sloughy substance, which must generally be discharged, before the part affected will suppurate kindly, and the disease end. Richter compares the slough to a kind of bag, or cyst, and the whole boil to an inflamed encysted tumor.

The best plan is mostly to endeavour to make boils suppurate, as freely as possible, by applying external emollient remedies. This seems to be the natural course of the disease in its progress to a cure, and, indeed, all endeavours to discuss furunculous tumors commonly fail, or succeed very imperfectly; only removing the inflammation, and leaving behind an indolent hardness, which occasions various inconveniences, according to its situation, every now and then inflames anew, and never entirely disappears, until a free suppuration has been established.

In a very few cases, perhaps, it may be proper to try to discuss boils. For this purpose, besides bleeding, gentle evacuations, and a low diet, which are requisite in this, as well as other local inflammations, some prescribe as external applications honey strongly acidulated with sulphuric acid; alkohol; or camphorated oil.

But, in the generality of instances, suppuration must be promoted, by the use of emollient poultices. The tumor, when allowed to burst, generally does so at its apex. However, as the opening is generally long in forming, and too small to allow the sloughy cellular substance to be discharged, it is always best, as soon as matter is known to exist in the tumor, to make a free opening with a lancet, and immediately afterwards to press out as much of the matter and sloughs as can be prudently done. This having been accomplished, and the rest of the sloughs pressed out, as soon as it is practicable, healthy pus will be secreted, and the part will granulate and heal. Until the suppuration becomes of the healthy kind, and the sloughy substances are entirely discharged, an emollient linseed poultice is the best application; and when granulations begin to fill up the cavity, plain lint, and a simple pledget, are the only dressings necessary.

For the purpose of stimulating the cavity, and causing it to fill up, Professor Gibson, of Philadelphia, has sometimes employed with success an injection of the nitrate of silver.

Where there is reason to suppose the gastric organs to be in a disordered state, an emetic should be given in the early part of the treatment, and afterwards small repeated doses of any of the mild purging salts.

When an indolent hardness continues, after the inflammatory and suppurative state of boils has been cured, the part should be rubbed with camphorated mercurial ointment.

Besides the above *acute* boil, authors describe a *chronic* one, which is said frequently to occur, in subjects, who have suffered severely from the small-pox, measles, lues venerea, scrofula, and in constitutions, which have been injured by the use of mercury.

The *chronic* boil is commonly situated upon the extremities, is of the same size as the acute one, has a hard base, is not attended with much pain nor any considerable discoloration of the skin, until suppuration is far advanced, and the matter is seldom quite formed before three or four weeks. This, like the former, sometimes appears in a considerable number at a time. The discharge is always thinner, than good pus, and when the boil is large, and has been long in suppurating, a great deal of sloughy cellular membrane must be cast off, before the sore will heal.

The principal thing requisite in the local treatment of all furunculous, and carbuncular tumors, is to make an early free opening into them, and to press out the matter and sloughs, employing emollient poultices, till all the mortified parts are detached and removed, and afterwards simple dressings. (See *Pearson's Principles of Surgery. Richter, Anfansgründe der Wundarzn. B.* 1. *Lassus, Pathologie Chir. T.* 1, *p.* 15. *Richerand, Nosographie Chir. T.* 1, *p.* 123, *edit.* 2. *W. Gibson's Institutes of Surgery, vol.* 1. *Philadelphia,* 1824.)

G.

GANGLION, (γαγγλιον.) In surgery, a tumor on a tendon, or aponeurosis.

A ganglion is an encysted, circumscribed, moveable swelling, commonly free from pain, causing no alteration in the colour of the skin, and formed upon tendons in different parts of the body, but most frequently, upon the back of the hand, and over the wrist. A French gentleman consulted me, who had one upon the upper part of his foot, which created a great sensation of weakness in the motion of the foot, and I have taken notice, that ganglions occur particularly often just below the kneepan, in housemaids, who are in the habit of kneeling a great deal in order to scour rooms. A curious example has been lately recorded, in which a ganglion, situated exactly over the arteria radialis and the arteria superficialis volæ, was at first supposed to be an aneurism. (See *Edinb. Med. and Surg. Journ. for April,* 1821.)

These tumors, when compressed, seem to possess considerable elasticity. They often occur unpreceded by any accident; frequently, they are the consequence of bruises and violent sprains. They seldom attain a considerable size, and ordinarily are not painful, though every now and then there are instances to the contrary. When opened, they are found to be filled with a viscid transparent fluid, resembling white-of-egg. If they do not disappear of themselves, or are not cured, while recent, by surgical means, they, in some cases, become so large, that they cause great inconvenience, by obstructing the motion of the part, and rendering it painful.

Discutient applications sometimes succeed in curing ganglions, and, in this country, friction with the oleum origani is a very common method. I have often seen such tumors very much lessened by this plan of treatment, but seldom cured, and, no sooner has the friction been discontinued, than the fluid in the cyst has in general accumulated again.

Compression is usually more effectual, than discutient liniments. Persons with ganglions have been recommended to rub them strongly with their thumb, several times a day. After this has been repeated very often, the tumor has sometimes disappeared. But, the best method is to make continual pressure on ganglions, by means of a piece of sheet-lead, bound upon the part with a bandage. There is no objection, however, to using once, or twice a day, in conjunction with this treatment, frictions with the oleum origani, or camphorated mercurial ointment, provided these measures together do not seem likely to make the tumor inflame, an event, which should always be carefully avoided. Ganglions, when irritated too much, have been known to become most malignant fungous diseases.

Setons have been recommended to be introduced through ganglions, with a view of curing them. This method, however, is not an eligible one; for, it is by no means free from danger, as the records of surgery fully prove. Cancerous diseases, and even a malignant fatal fungus, (*Med. Jour. Vol. 5.*) have arisen from the irritation of a seton passed through a ganglion.

Frequently, when a ganglion inflames, and ulcerates, the cyst throws out a fungus, which is of a very malignant nature. Hence, the practitioner should avoid making an opening into the swelling, or doing any thing, which is likely to occasion sloughing or ulceration of the disease. Ganglions may be cured by pressure sufficient to rupture the cyst, and some authors have recommended putting the hand affected upon a table, and then striking the ganglion several times with the fist, or a mallet. The cyst of a recent ganglion may also be burst, by compressing it strongly with the thumbs, with or without the intervention of a piece of money; the fluid is effused into the adjacent cellular membrane; and, pressure being now employed, the opposite sides of the cavity become united by the adhesive inflammation, and the recurrence of the disease is prevented. On this principle, Sir Astley Cooper cures the disease. (See *L'Encyclopédie Méthodique, Partie Chir. art. Ganglion; Lassus, Pathologie Chir. T.* 1, *p.* 400, *&c.*; *Levéillé, Nouvelle Doctrine Chir. T.* 3, *p.* 7.)

In almost every instance, a ganglion may be cured by pressure and friction, and, if not actually cured, the disease may be rendered so bearable by these means, that few patients would choose to have the tumor cut out. Under this plan, the swelling becomes very much diminished, and, should it enlarge again, the mode of relief is so simple, and the case so little troublesome, that patients generally content themselves with occasionally wearing a piece of lead on the part.

But when ganglions resist all attempts to disperse, or palliate them; when they become extremely inconvenient, either by obstructing the functions of a joint, or causing pain; they should be carefully dissected out, by first making a longitudinal incision in the skin covering them, then separating the cyst on every side from the contiguous parts, and lastly cutting every particle of it off the subjacent tendon or fascia. The greatest care must be taken, not to make any opening in the cyst, so as to let out its contents, and make it collapse; a circumstance, which would render the dissection of it entirely out much more difficult.

The operation being accomplished, the skin is to be brought together with sticking plaster, and a compress placed over the situation of the tumor, with a view of healing the wound and the cavity by adhesion.

When the ganglion has burst, or is ulcerated, it is best to remove the diseased skin, together with the cyst, and of course the incision must be oval, or circular, as may seem most convenient. The grand object is not to allow any particle of the cyst to remain behind, as it would be very likely to throw out a fungus, and prevent a cure. In Warner's Cases of Surgery is an account of two considerable ganglions, which this gentleman, in imitation of Celsus and Paulus Ægineta, thought it right to extirpate. These had become adherent to the tendons of the fingers. In the operation, he was obliged to cut the transverse ligament of the wrist, and the patients, who before could not shut their hands, nor close their fingers, perfectly regained the use of these parts. Mr. Gooch relates a case of the same kind, which had been occasioned by a violent bruise, three, or four, years before. The tumor reached from the wrist to the middle of the hand, and created a great deal of pain. Mr. Gooch extirpated it, and then restored the position of the hand, and free motion of the joint, by the use of emollient applications, and suitable pressure, made with a machine constructed for the purpose. Other cases confirming the safety of cutting out ganglions, are recorded in the *London Medical Journal for* 1787, *p.* 154; by Eller, in *Mém. de l'Acad. des Sciences de Berlin, T.* 2, *ann.* 1746; *Schmucker, in Chir. Wahrnehmungen,* 1 *B. p.* 332; *Girard, Lupiologie.*

The ganglions, which occur just below the knee, I have seen cured by a little blister, applied over them, and kept open with the savin cerate. Camphorated blisters, indeed, have been proposed as a means of dispersing other ganglions. (*Jaeger, Chir. Cautelen,* 2 *B.*)

For information, relative to ganglions, consult *Warner's Cases in Surgery. Chirurgical Works of B. Gooch, Vol.* 2, *p.* 376. *Heister's Surgery. B. Bell's Surgery. Latta's System of Surgery. L'Encyclopédie Méthodique, Partie Chir. art. Ganglion. Richter, Anfangsgr. der Wundarzn. B.* 1. *Lassus, Pathologie Chir. T.* 1. *p.* 399; *Dict. des Sciences Méd. T.* 17, *p.* 311.

GANGRENE. (from γαινω, to feed upon.) An incipient mortification, so named from its eating away the flesh.

Authors have generally distinguished mortification into two stages; the first, or incipient one, they name *gangrene*, which is attended with a sudden diminution of pain in the place affected; a livid discoloration of the part, which, after being yellowish, becomes of a greenish hue; a detachment of the cuticle, under which a turbid fluid is effused; lastly, the swelling, tension, and hardness, of the previous inflammation, subside, and, on touching the part, a crepitus is perceptible, owing to the generation of air in the gangrenous parts.

When the part has become quite cold, black, fibrous, incapable of moving, and destitute of all feeling, circulation, and life; this is the second stage of mortification, termed *sphacelus*. Gangrene, however, is frequently used synonymously with the word mortification. (See *Mortification.*)

GASTROCELE. (from γαϛηρ, the stomach, and κηλη, a tumor.) A hernia of the stomach.

GASTRORAPHIA, or GASTRORAPHE.

(from γαςηρ, the belly, and ϱαφη, a suture.) A suture of the belly, or some of its contents.

Although the term *gastroraphe*, in strictness of etymology, signifies the sewing up of any wound of the belly, yet Mr. S. Sharp informs us, that, in his time, the word implied, that the wound of the abdomen was complicated with another of the bowels.

The moderns, I think, seem to limit the meaning of the word to the operation of sewing up a wound in the parietes of the abdomen.

What was formerly meant by gastroraphe could scarcely ever be practised, because the symptoms laid down for distinguishing when an intestine is wounded, do not with any certainty determine in what particular part it is wounded; which want of information makes it absurd to open the abdomen in order to get at it. Hence, the operation of stitching the bowels can only take place, when they fall out of the abdomen, and when we can see where the wound is situated. And, indeed, even in these circumstances, the employment of sutures is a practice, the propriety of which is questionable, as will be further considered in the article *Wounds.*

The circumstances, making the practice of sewing up a wounded intestine proper, are so rare, that Du Verney, who was the most eminent surgeon in the French army a great many years during the wars, and fashion of duelling, declared, that he had never had a single opportunity of practising gastroraphe, according to the former acceptation of that word.

Gastroraphe, or merely sewing up a wound of the parietes of the abdomen, may be done, as Mr. Sharp explains, with the common interrupted suture, (see *Suture*) or with the quilled one, which is better, as follows:

A ligature, capable of splitting into two, has a needle attached to each end of it. The lip of the wound is to be pierced, from within outward, about an inch from its edge. The other needle is to be passed in the same way through the opposite lip. Then the two needles are to be cut off. As many such sutures must be made, as the extent of the wound may require.

The sides of the wound are next to be brought together, and the ligatures tied, not in a bow, in the way of the interrupted suture, because the continual action of the abdominal muscles might make the ligatures cut their way through the parts. On the contrary, it is better to divide each end of the ligatures into two portions, and to tie these over a piece of bougie laid along the line at which the ligatures emerge from the flesh. This is to be done to all the ligatures on one side first. Then the wound being closed, another piece of bougie is to be placed along the other lip of the wound, and the opposite ligatures tied over it, with sufficient tightness, to keep the sides of the wound in contact. This suture is certainly preferable to the interrupted one, because a great deal of its pressure is made on the two pieces of bougie, and of course it is less likely to cut its way out. Its operation is to be assisted with compresses laid over each side of the wound, and the uniting bandage.

In four or five days, the sutures may generally be removed, and sticking plaster alone employed. (See *Wounds of the Abdomen.*)

It is generally allowed, that sutures are violent means, to which we should only resort, when it is impossible to keep the lips of a wound in contact by the observance of a proper posture, and the aid of a methodical bandage. M. Pibrac believes such circumstances exceedingly uncommon, and in his excellent production, in the third volume of the Memoirs of the Royal Academy of Surgery, relative to the abuse of sutures, cases are related, which fully prove, that wounds of the belly readily unite by means of a suitable posture and a proper bandage, without the practice of gastroraphe. These cases, however, are less decisive and convincing, (if possible to be so) than the relations of the Cæsarean operation, the extensive wound of which has often been healed by simple means, after the failure of sutures. In fact, it is not only possible to dispense with gastroraphe, it is even mostly advisable to do so, for experience has proved, that this operation has sometimes occasioned very bad symptoms.

Under certain circumstances, however, it may be essentially necessary to practise gastroraphe. For instance, were a large wound to be made across the parietes of the abdomen, a suture might become indispensably requisite to prevent the protrusion of the bowels. Yet, even in this case, the sutures should be as few in number as possible. In a longitudinal wound of the abdomen, a bandage of the eighteen-tailed kind, might prove very useful, and do away all occasion for gastroraphe. (See *Sutures.*)

I shall conclude this article with a fact, perhaps, more curious, than instructive, related by M. Bordier, of Pondicherry, in the *Journal de Médecine*, vol. 26, 538. An Indian soldier, angry with his wife, killed her, and attempted to destroy himself by giving himself a wound with a broad kind of dagger in the abdomen, so as to cause a protrusion of the bowels. A doctor of the country, being sent for, dissected between the muscles and skin, and introduced a thin piece of lead, which kept up the bowels. The wound soon healed up, the lead having produced no inconvenience. The man was afterwards hung, and M. Bordier, when the body was opened, assured himself more particularly of the fact. Indeed, numerous cases prove, that lead may lodge in the living body, without occasioning the inconvenience, which results from the presence of many other kinds of extraneous bodies.

See *Le Dran, Opérations de Chirurgie. Sharp's Treatise on the Operations of Surgery. L'Encyclopédie Méthodique, Partie Chirurgicale, art. Gastroraphe; Sabatier, Médecine Opératoire, T.* 1.

GLAUCOMA. (from γλαυκος, bluish green,) is now defined by modern surgeons to be a greenish, or grey opacity of the vitreous humor, attended with the loss, or a considerable impairment, of sight. (*Weller on Diseases of the Eye, Transl. by Monteith, Vol.* 2, *p.* 27.) In the words of Mr. Guthrie, the disease essentially consists in an alteration of the component parts of the vitreous humor, accompanied with derangement of the structure of the hyaloid membrane, retina, and tunica choroidea, the vessels of which are always more or less varicose. (*Operative Surgery of the Eye, p.* 214.) Professor Beer considers the subjects of glaucoma and the cataracta viridis, or glaucomatosa, together in the same chapter. He observes, that these diseases occur rather frequently, not only as true effects of inflammation of the eye, but sometimes quite unpreceded by this affection. Although glaucoma may continue for a long time as the only disorder, without the crystalline lens being changed in the slightest degree, yet Beer has never seen the case reversed, and the lens become altered as it does in glaucoma first, and the vitreous humor afterwards. In what this author describes as gouty ophthalmy, glaucoma is said to come on with the following symptoms. The iris is not observed to expand, but rather to become contracted; the pupil is not equally dilated, but extends more towards the canthi, the iris at length becoming scarcely perceptible towards each angle of the eye, especially the outer one, and the pupil of course assuming something of the appearance which is seen in the eye of a ruminating animal. In a case, however, which I once saw in the London Eye Infirmary under Mr. Lawrence, it was particularly remarked, that the diameter of the pupil was not greatest in the transverse direction; a circumstance, which Beer's account would lead us to expect as constant. And, it particularly merits notice, that as the iris shrinks towards the margin of the cornea, its pupillary edge is inverted towards the lens, so that its smaller circle completely disappears. In this very dilated state of the pupil, a grey greenish opacity is perceived, seeming to be very deep, and arising from a real loss of transparency in the vitreous humor. At this period, the lens evidently becomes opaque, acquiring a sea-green hue, and the cataracta viridis, or glaucomatosa, now swells and appears to project forwards into the anterior chamber. The pain then becomes more incessant and violent; the varicose affection of the eyeball seriously increases; and the eyesight, which began hourly to diminish from the moment when the pupil was first observed to be in any degree expanded and opaque, and the iris motionless, is now so entirely destroyed, that not the slightest perception of *external* light remains, though the patient may vainly congratulate himself on discerning luminous appearances produced within the eye itself, in the form of a fiery, shining circle, especially when the organ is gently pressed upon. An eye in this condition (says Beer) has really a look, as if it were dead, the cornea being as flaccid, and void of lustre, as in a corpse. Finally, when these symptoms have attained their utmost pitch, an atrophy of the eyeball follows, and the painful sensations about the organ cease. In corpulent individuals, however, they still continue with greater violence. Sooner, or later, the other eye is also either attacked with arthritic iritis, or ophthalmy, or becomes affected with glaucoma, which is ushered in by violent and incessant headach. (*Beer, Lehre von den Augenkrankheiten, B.* 1, *p.* 581, *&c.* 8*vo. Wien.* 1813.) According to this author, glaucoma and the green cataract, are never the consequences of any description of ophthalmy, but what he terms *arthritic*. (B. 2, *p.* 255, *Wien.* 1817.) I believe, however, with Mr. Guthrie, that the inflammation is really an unhealthy disorganizing inflammation, not necessarily dependent upon, or connected with gout, (*Operative Surgery of the Eye, p.* 216,) of the effects of which disorder the German practitioners entertain the most vague notions. Both these affections, after they are conjoined with a general varicose disease of the eyeball, are set down by Beer as generally incurable. According to Weller, when the vitreous humor first begins to be muddy, the disease may sometimes be checked. (*On Diseases of the Eye, Vol.* 2, *p.* 29.) The means of relief, depended upon in Germany, are frictions on the eyebrow with tinct. opii croc., or liniment. ammon.; the avoidance of cold; camphorated bags of aromatic herbs applied over the eye, but the effect of which must be rather insignificant; issues; setons; rubbing the antimonial ointment over the spine, or behind the ears, &c. (*Vol. cit. p.* 228.)

Other authors recommend applying blisters, and giving internally the extract of cicuta, calomel, and soap. (*Encyclopédie Méthodique, Partie Chir.*) The topical use of æther might be tried; but, from the history of the disease, the chances of cure must evidently be nearly hopeless. (See also *Tr. G. Benedict de Morbis Humoris Vitrei, 4to. Lips.* 1809.)

GLEET. By the term *gleet*, is commonly understood a continued running, or discharge, after the inflammatory symptoms of a clap have for some time ceased, unattended with pain, scalding in making water, &c. Mr. Hunter remarks, that it differs from a gonorrhœa in being uninfectious, and in the discharge consisting of globular bodies, contained in a slimy mucus, instead of serum. He says, that a gleet seems to take its rise from a habit of action, which the parts have contracted. The disease, however, sometimes stops of itself, even after every method has been ineffectually tried. This probably depends upon accidental changes in the constitution, and not at all upon the nature of the disease itself. Mr. Hunter had a suspicion, that some gleets were connected with scrophula. Certain it is, the sea bath cures more gleets, than the common cold bath, or any other mode of bathing; and a cure may sometimes, but not always, be accomplished by an injection of diluted sea-water.

Gleets are often attended with a relaxed constitution. They also sometimes arise from other affections of the urethra, besides gonorrhœa. A stricture is almost always accompanied with a gleet; and so sometimes is disease of the prostate gland.

It is remarked by Mr. Hunter, that if a gleet does not arise from any evident cause, and cannot be supposed to be a return of a former gleet, in consequence of a gonorrhœa, either a stricture or diseased prostate gland is to be suspected: an inquiry should be made whether the stream of urine is smaller than common, whether there is any difficulty in voiding it, and whether the calls to make it are frequent. If there should be such symptom, a bougie, rather under the common size, should be introduced; and, if it passes into the bladder with tolerable ease, the disease is probably in the prostate gland, which should next be examined. (See *Urethra, Strictures of; and Prostate Gland.*)

Balsams, turpentines, and the tinctura canth. given internally, are of service, especially in slight cases; and when they are useful, they prove so almost immediately. Hence, if they had neither lessened nor removed the gleet in five or six days, Mr. Hunter never continued them longer. The same observation applies to cubebs, so celebrated of late as a remedy for gonorrhœa and gleet, and the common dose of which is ʒij in any convenient fluid three times a-day. As the discharge, when removed, is also apt to recur, such medicines should be continued for some time after the symptoms have disappeared.

When the whole constitution is weak, the cold bath, sea bath, bark and steel, may be given. The astringent gums, and salt of steel, given as internal astringents, have little power.

With regard to local applications, the astringents, commonly used, are, the decoction of bark, sulphat of zinc, alum, and preparations of lead. The aqua vitriolica cærulea, of the old London Dispensatory, diluted with eight times its quantity of water, makes a very good injection.

Irritating applications consist either of injections, or bougies, simple or medicated with irritating medicines. Violent exercise may be considered as having the same effect. Such applications should never be used till the other methods have been fully tried, and found unsuccessful. They at first increase the discharge, and, on this account, are sometimes abandoned too early. Two grains of the oxymuriate of mercury dissolved in eight ounces of distilled water, make a very good irritating injection. In irritable habits, such an application may do great harm, and therefore, if possible, the capability of the parts to bear its employment, should first be made out.

Bougies sometimes act violently, but Mr. Hunter thought them more efficacious, than injections. A simple unmedicated one is generally sufficient, and must be used a month or six weeks, before the cure can be depended upon. Bougies medicated with camphor, or turpentine, were formerly employed for the cure of gleet: they did not require so long a trial as common bougies: at present, I believe, they are not used at all by any surgeon of eminence. Whatever bougies are employed should be under the common size.

Mr. Hunter knew a gleet disappear on the breaking out of two chancres on the glans. Gleets have also been cured by a blister on the under-side of the urethra; and; by electricity.

In every plan of treatment, rest, or quietness, is generally of great consequence; but, after the failure of the usual modes, riding on horseback will sometimes immediately effect a cure.

Regularity and moderation in diet are to be observed.

Intercourse with women often causes a return, or increase of gleet; and, in such cases, it gives suspicion of a fresh infection; but, the difference, between this and a fresh infection, is, that here the return is almost immediately after the connexion.

Gleets in women, are cured nearly in the same manner as those of men. Turpentines, however, have no specific effect on the vagina; and the astringent injections used may also be stronger, than those intended for male patients.

See *A Treatise on the Venereal Disease, by John Hunter, Ed.* 2. Also, *Swediaur's Practical Observations on Venereal Complaints.*

GLOSSOCATOCHUS. (from γλωσσα, the tongue; and κατεχω, to depress.) The ancient glossocatochus was a sort of forceps, one of the blades of which served to depress the tongue, while the other was applied under the chin.

GOITRE. See *Bronchocele.*

GONORRHŒA. (from γονη, the semen; and ϱεω, to flow.) Etymologically, an involuntary discharge of the semen; but always, according to modern surgery, a discharge of purulent infectious matter, from the urethra in the male, and from the vagina and surfaces of the labia, nymphæ, clitoris, &c. in the female subject.

Dr. Swediaur, after censuring the etymological import, as conveying an erroneous idea, says, if a Greek name is to be retained, he would call it blennorrhagia, from βλεννα, mucus, and ϱεω, to flow. However, as most of the moderns consider the discharge as pus, not mucus, the etymological import of blennorhæa is as objectionable as that of gonorrhœa. Mr. Howship has repeatedly examined the discharge with a microscope, but without perceiving any essential difference between such discharge, and the pus effused from an ulcer. (*On Complaints affecting the Secretion and Excretion of the Urine, p.* 260.) In English, the disease is commonly called a *clap*, from the old French word *clapises*, which were public shops, kept and inhabited by single prostitutes, and generally confined to a particular quarter of the town, as is even now the case in several of the great towns in Italy. In German, the disorder is named a *tripper*, from dripping; and in French, a *chaudepisse*, from the heat and scalding in making water. (*Swediaur.*)

We shall first present the reader with some of Mr. Hunter's opinions, concerning the nature of gonorrhœa, its symptoms, and treatment; and, lastly, take notice of the observations of some other writers.

When an irritating matter of any kind is applied to a secreting surface, it increases that secretion, and changes it from its natural state to some other. In the present instance, it is changed from mucus to pus.

Till about the year 1753, it was generally supposed, that the matter from the urethra, in cases of gonorrhœa, arose from ulcers in the passage; but, about that time, it was ascertained, that pus could be secreted without a breach of substance. It was first accidentally proved, by dissection, that pus could be formed in the bag of the pleura, without ulceration; and Mr. Hunter afterwards examined the urethra of malefactors and others, who were executed, or died, while known to be affected with gonorrhœa, and demonstrated, that the canal was entirely free from every appearance of ulcer.

The time, when a gonorrhœa first appears, after infection, is extremely various. It generally comes on sooner, than a chancre. Mr. Hunter had reason to believe, that, in some instances, the disease began in a few hours; while in others, six weeks previously elapsed; but he had known it begin at all the intermediate periods. However, it was his opinion, that about six, eight, ten, or twelve days after infection, is the most common period.

The surface of the urethra is subject to inflammation and suppuration, from various other causes besides the venereal poison; and sometimes discharges happen spontaneously, when no immediate cause can be assigned. Such may be called *simple* gonorrhœa, having nothing of the venereal infection in them.

Mr. Hunter knew of cases, in which the urethra sympathized with the cutting of a tooth, and all the symptoms of a gonorrhœa were produced. This happened several times to the same patient. The urethra is known to be sometimes the seat of the gout; and Mr. Hunter was acquainted with instances of its being the seat of rheumatism.

When a secreting surface has once received the inflammatory action, its secretions are increased and visibly altered. Also, when irritation has produced inflammation, and an ulcer in the solid parts, a secretion of matter takes place, the intention of which, in both, seems to be to wash away the irritating matter. But, in inflammations, arising from specific, or morbid poisons, the irritation cannot be thus got rid of; for, although the first irritating matter be washed away, yet, the new matter has the same quality as the original had; and, therefore, upon the same principle, it would produce a perpetual source of irritations, even if the venereal inflammation, like many other specific diseases, were not what it really is, kept up by the specific quality of the inflammation itself. This inflammation seems, however, to be only capable of lasting a limited time, the symptoms, peculiar to it, vanishing of themselves, by the parts becoming less and less susceptible of irritation; and the subsequent venereal matter can have no power of continuing the original irritation; for otherwise there would be no end to the disease. The time, which the susceptibility of the irritation lasts, must depend upon the difference in the constitution, and not upon any difference in the poison itself.

Mr. Hunter believed, that the venereal disease only ceased spontaneously, when it attacked a secreting surface, and produced a mere secretion of pus, without ulceration. Such were some of the sentiments of this great man, who was a firm believer in the identity of the poisons of syphilis and gonorrhœa; but, this idea and the hypothesis, about the impossibility of any spontaneous cure of venereal sores, are now very generally relinquished.

The first symptom of gonorrhœa is generally an itching at the orifice of the urethra, sometimes extending over the whole glans. A little fulness of the lips of the urethra, the effect of inflammation, is next observable, and soon afterwards a running appears.

The itching changes into pain, more particularly at the time of voiding the urine. There is often no pain till some time after the appearance of the discharge, and other symptoms; and in many gonorrhœas, there is hardly any pain at all, even when the discharge is very considerable. At other times, a great degree of soreness occurs long before any discharge appears. There is generally a particular fulness in the penis, and more especially in the glans. The glans has also a kind of transparency, especially near the beginning of the urethra, where the skin being distended, smooth, and red, resembles a ripe cherry. The mouth of the urethra is, in many instances, evidently excoriated. The surface of the glans itself is often in a half excoriated state, consequently very tender; and it secretes a sort of discharge. The canal of the urethra becomes narrower, which is known by the stream of urine being smaller than common. This proceeds from the fulness of the penis in general, and either from the lining of the urethra being swollen, or in a spasmodic state. The fear of the patient, while voiding his urine, also disposes the urethra to contract; and the stream of urine is generally much scattered and broken, as soon as it leaves the passage. There is frequently some degree of hemorrhage from the urethra, perhaps, from the distention of the vessels, more especially when there is a chordee, or a tendency to it. Small swellings often occur, along the lower surface of the penis, in the course of the urethra. These, Mr. Hunter suspected to be enlarged glands of the passage. They occasionally suppurate, and burst outwardly, but now and then in the urethra itself. Mr. Hunter has also suspected such tumors to be ducts, or lacunæ of the glands of the urethra distended with mucus, in consequence of the mouth of the duct being closed, in a manner similar to what happens to the duct leading from the lachrymal sac to the nose, and so as to induce inflammation, suppuration, and ulceration. Hardness and swelling may also occur in the situation of Cowper's glands, and end in considerable abscesses in the perineum. The latter tumors break either internally or externally, and sometimes in both ways, so as to produce fistulæ in perinæo.

A soreness is often felt all along the under side of the penis, frequently extending as far as the anus. The pain is particularly great in erections; but the case differs from chordee by the penis remaining straight. In most cases of gonorrhœa, erections are frequent, and even sometimes threaten to bring on mortification: as opium is of great service, Mr. Hunter thought, that there was reason to suppose them of a spasmodic nature.

The natural slimy discharge from the glands of the urethra is first changed, from a fine transparent ropy secretion, to a watery whitish fluid; and the lubricating fluid, which the passage naturally exhales, becomes less transparent: both these secretions becoming gradually thicker, assume more and more the qualities of common pus.

The matter of gonorrhœa often changes its colour and consistence, sometimes from a white to a yellow, and often to a greenish colour. These changes depend on the increase and decrease of the inflammation, and not on the poisonous quality of the matter itself; for an irritation of these parts, equal to that produced in a gonorrhœa, will produce the same appearances.

The discharge is produced from the membrane lining the urethra, and from the lacunæ, but, in general, only for about two or three inches from the external orifice. Mr. Hunter says, seldom further, than an inch and a half, or two inches at most. This he terms the specific extent of the inflammation. Whenever he had an opportunity of examining the urethra affected with gonorrhœa, he always found the lacunæ loaded with matter, and more visible, than in the natural state. Before the time of this celebrated man, it was commonly supposed, that the discharge arose from the whole surface of the urethra, and even from Cowper's glands, the prostate, and vesiculæ seminales.

But, if the matter were secreted from all these parts, the pus would collect in the bulb, as the semen does, and thence be emitted in jerks; for, nothing can be in the bulbous part of the urethra, without stimulating it to action, especially, when in a state of irritation and inflammation.

When the inflammation is violent, some of the vessels of the urethra often burst, and a discharge of blood ensues. Sometimes such blood is only just enough to give the matter a tinge. In other instances, erections cause an extravasation, by stretching the part.

When the inflammation goes more deeply, than the membranous lining, and affects the reticular membrane of the urethra, it produces in it an extravasation of coagulable lymph, the consequence of which is a chordee. (See *Chordee.*)

Mr. Hunter suspected, that the disease is communicated or creeps along from the glans to the urethra, or, at least, from the lips of the urethra to its inner surface, as it is impossible, that the infectious matter can, during coition, get as far as the disease extends. He mentions an instance, in which a gentleman, who had not cohabited with any woman for many weeks, to all appearance caught a gonorrhœa from a piece of plaster, which had adhered to his glans penis, in a necessary abroad: the infection is accounted for by supposing, that some person, with a clap, had previously been to this place, and had left behind some of the discharge, and that the above gentleman had allowed his penis to remain in contact with the matter, till it had dried.

Many symptoms, depending on the sympathy of other parts with the urethra, sometimes accompany a gonorrhœa. An uneasiness, partaking of soreness and pain, and a kind of weariness, are felt about every part of the pelvis. The scrotum, testicles, perinæum, anus, and hips, become disagreeably sensible, and the testicles often require to be suspended. So irritable, indeed, are they in such cases, that the least accident, or even exercise, which would have no effect of this kind at another time, will make them swell. The glands of the groin are often affected sympathetically, and even swell a little, but, they do not suppurate, as they generally do when they inflame from the absorption of matter. Mr. Hunter has seen the irritation of a gonorrhœa so extensive as to affect with real pain the thighs, buttocks, and abdominal muscles. He knew one gentleman, who never had a gonorrhœa without being immediately seized with universal rheumatic pains.

When the disorder, exclusive of the affections from sympathy, is not more violent, than has been described, Mr. Hunter termed it a *common, or simple venereal gonorrhœa*; but, if the patient is very susceptible of such irritation, or of any other mode of action, which may accompany the venereal, then the symptoms are in proportion more violent. In such circumstances, we sometimes find the irritation and inflammation exceed the specific distance, and extend through the whole urethra. There is often a considerable degree of pain in the perinæum; and a frequent, though not a constant, symptom, is a spasmodic contraction of the acceleratores urinæ, and erectores muscles. In these cases, the inflammation is sometimes considerable, and goes deeply into the cellular membrane, but, without producing any effect, except swelling. In other instances, it goes on to suppuration, often becoming one of the causes of fistulæ in perinæo. Thus, Cowper's glands may suppurate, and the irritation often extends even to the bladder itself.

When the bladder is affected, it becomes more susceptible of every kind of irritation. It will not bear the usual distention, and, therefore, the patient cannot retain his water the ordinary time; and, the moment the desire of making water takes place, he is obliged instantly to make it, with violent pain in the bladder, and still more in the glans penis, exactly similar to what happens in a fit of the stone. If the bladder be not allowed to discharge its contents immediately, the pain becomes almost intolerable; and even when the water is evacuated, there remains, for some time, a considerable pain, both in the bladder and glans.

Sometimes, though rarely, when the bladder is much affected, the ureters, and even the kidneys sympathize; and Mr. Hunter had reason to suspect, that the irritation might be communicated to the peritonæum, by means of the vas deferens.

Mr. Hunter mentions a case, in which, while the inflammatory symptoms of a gonorrhœa were abating, an incontinence of urine came on; but, in time, got spontaneously well.

A very common symptom, attending a gonorrhœa, is a swelling of the testicle. (See *Hernia Humoralis.*)

Another occasional consequence is a sympathetic swelling of the inguinal glands. (See *Bubo.*)

A hard chord is sometimes observed, leading from the prepuce along the back of the penis, and often directing its course to one of the groins, and affecting the glands. At the part of the prepuce, where the chord takes its rise, there is most commonly a swelling. This sometimes happens when an excoriation and a discharge from the prepuce, or glans penis exist. In one case, Mr. Howship thought the large vein on the dorsum of the penis was inflamed and thickened. (*On Complaints affecting the Secretion and Excretion of the Urine, &c. p.* 266.)

From the above account, the symptoms of gonorrhœa, in different cases, seem to be subject to infinite variety. The discharge often appears without any pain; and the coming on of the pain is not at any stated time after the appearance of the discharge. There is often no pain at all, although the discharge is in considerable quantity, and of a bad appearance. The pain often goes off, while the discharge continues, and will return again. In some cases, an itching is felt for a considerable time, which is sometimes succeeded by pain; though, in many cases, it continues to the end of the disease. On the other hand, the pain is often troublesome, and considerable, even when there is little or no discharge. The neighbouring parts sympathize, as the glands of the groin, the testicle, the loins, and pubes, the upper parts of the thighs, and the abdominal muscles. Sometimes the disease appears a few hours after the application of the poison; sometimes not till six weeks have elapsed. Lastly, it is often impossible to determine, whether the case is a venereal discharge, or rather one produced by the application of infectious matter, or only an accidental, discharge, arising from some unknown cause.

GONORRHŒA IN WOMEN.

The disorder is not so easily ascertained in them as in men, because they are subject to a disorder called *fluor albus*, which resembles gonorrhœa. A mere discharge in women, is less a proof of the existence of a gonorrhœa, than even a discharge without pain in men. The kind of matter does not enable us to distinguish a gonorrhœa from a fluor albus; for in the latter affection, the discharge often puts on all the appearance of venereal matter. Pain is not necessarily present, and therefore forms no line of distinction. The appearance of the parts often gives us but little information; "for," says Mr. Hunter, "I have frequently examined the parts of those who confessed all the symptoms, such as increase of discharge, pain in making water, soreness in walking, or when the parts were touched, yet I could see no difference between these and sound parts. I know of no other way of judging, in cases where there are no symptoms sensible to the person herself, or where the patient has a mind to deny any uncommon symptoms, but from the circumstances preceding the discharge; such as her having been connected with men supposed to be unsound, or her being able to give the disorder to others; which last circumstance, being derived from the testimony of another person, is not always to be trusted to, for obvious reasons." But, though there may sometimes be great difficulty in forming a judgment of some of these cases, the surgeon may frequently come to a right conclusion by recollecting, as Mr. Dunn has reminded me, that, besides the difference depending on the suddenly severe symptoms of gonorrhœa, fluor albus may be known by the great debility; the sinking of the stomach; the weariness of the limbs; the pain of the back always increased by the erect posture; the severe headachs; the painful menstruation, together with the very gradual increase of the disease.

From the manner, in which the disease is contracted, it must principally attack the vagina, a part not endowed with much sensation. In many cases, however, it produces a considerable soreness on the inside of the labia, nymphæ, clitoris, carunculæ myrtiformes, and meatus urinarius. In certain cases, these parts are so sore, that they will not bear to be touched; the person can hardly walk; the urine gives pain in its passage through the urethra; and when it comes into contact with the above-mentioned parts.

The bladder, and even the kidneys, occasionally sympathize. The mucous glands on the inside of the labia, often swell, and sometimes suppurate, forming small abscesses, which open near the orifice of the vagina.

According to Mr. Hunter, the venereal matter from the vagina sometimes runs down the perinæum to the anus, and produces a gonorrhœa, or chancre, in that situation. The disease in women may probably wear itself out, as in men; but it may exist in the vagina for years, if the testimony of patients can be relied on.

TREATMENT OF GONORRHŒA.

As every form of the venereal disease is supposed to arise from the same cause, and as we have a specific for some forms, we might expect, that this would be a certain cure for every one; and, therefore, that it must be no difficult task to cure the disease, when in the form of inflammation and suppuration in the urethra. Experience teaches us, however, that the gonorrhœa is the most variable in its symptoms, while under a cure; and the most uncertain, with respect to its cure, of any forms of the venereal disease, (if it ever be a form of this disease at all,) many cases terminating in a week, while others continue for months, under the same treatment.

The only curative object is, to destroy the disposition and specific mode of action in the solids of the parts, and as they become changed, the poisonous quality of the matter produced will also be destroyed. This effects the cure of the disease, but does not always remove the consequence.

Gonorrhœa is incapable of being continued beyond a certain time in any constitution; and, when it is violent, or of long duration, it is owing to the part being very susceptible of such irritation, and readily retaining it. As no specific remedy for gonorrhœa is known, it is fortunate, that time alone will effect a cure. It is worthy of consideration, however, whether medicine can be of any service. Mr. Hunter is inclined to think it not of the least use, in nine cases out of ten. But, even this would be of some consequence, if the cases, capable of being benefited, could be distinguished.

The means of cure, generally adopted, are of two kinds, internal remedies, and local applications; but, whatever plan is pursued, we are always to attend more to the nature of the constitution, or to any accompanying disease in the parts themselves, or parts connected with them, than to the gonorrhœa itself.

When the symptoms are violent, but of the common inflammatory kind, known by the extent of the inflammation not exceeding the specific distance, the local treatment may be either irritating or soothing.

According to Mr. Hunter, irritating applications are less dangerous in these cases, than when irritable inflammation is present, and they may alter the specific action; but to produce this effect, their irritation must be greater, than that of the original injury. The parts will afterwards recover of themselves, as from any other common inflammation.

Mr. Hunter believes, however, that in the beginning, the soothing plan is the best. If the inflammation be great, and of the irritable kind, no violence is to be used, for it would only increase the symptoms; and nothing should be done, that can tend to stop the discharge, as it would not put a stop to the inflammation. The constitution is to be altered, if possible, by remedies adapted to each disposition, and reducing the disease to its simple form. If the constitution cannot be altered, nothing is to be done, and the action is to be allowed to wear itself out.

When the inflammation has abated, the cure may be attempted by internal remedies, or local applications, which do not operate violently, whereby the irritation might be reproduced. Gentle astringents may be applied.

But, if the disease has begun mildly, an irritating injection may be used, in order quickly to get rid of the specific mode of action. This application will increase the symptoms for a time; but, when it is left off, they will often abate, or wholly disappear; and, after such abatement, astringents may be used, the discharge being the only thing to be removed.

When itching, pain, and other uncommon sensations are felt for some time before the discharge appears, Mr. Hunter diffidently expresses his inclination to recommend the soothing plan, instead of the irritating one, in order to bring on the discharge, which is a step towards the resolution of the irritation; and he adds, that to use astringents would be bad practice, as, by retarding the discharge, they would only protract the cure. When there are strictures or swelled testicles, astringents should not be used; for, while there is a discharge, such complaints are relieved.

Mr. Hunter thus expresses himself in regard to the effect of mercury in gonorrhœa: "I doubt very much of mercury having any specific virtue in this species of the disease; for I find that it is as soon cured without mercury as with it, &c. So little effect, indeed, has this medicine upon a gonorrhœa, that I have known a gonorrhœa take place (while the patient was) under a course of mercury, sufficient for the cure of a chancre. Men have also been known to contract a gonorrhœa when loaded with mercury for the cure of a lues venerea; the gonorrhœa, nevertheless, has been as difficult of cure as in ordinary cases."

Mr. Hunter does not say much in favour of evacuants, diuretics, and astringents, given internally. He allows, however, that astringents, which act specifically on the parts, as the balsams, conjoined with any other medicine, which may be thought right, may help to lessen the discharge, in proportion as the inflammation abates.

Local applications may be either internal to the urethra; external to the penis; or both. Those which are applied to the urethra seem to promise most efficacy, because they come into immediate contact with the diseased parts. They may be either in a solid or fluid form. A fluid is only a very temporary application. The solid ones or bougies, may remain a long while, but in general irritate immediately, from their solidity alone; and Mr. Hunter says, the less bougies are used, when the parts are in an inflamed state, the better, though he never saw any bad effects from them, when applied with caution.

At present, bougies are rarely used in cases of gonorrhœa, in consequence of the irritation which they produce, and their tendency to bring on swelling of the testis.

The fluid applications, or injections, in use, are innumerable; and as gonorrhœa frequently gets well with so many of various kinds, we may infer, that the complaint would, in time, get well of itself. However, there cannot be a doubt, that injections often have an immediate effect on the symptoms, and hence, must have power; though the injection which possesses the greatest power, is unknown. As injections are only temporary applications, they must be used often, especially when found useful, and not of an irritating kind.

Mr. Hunter divides injections into four kinds, the *irritating*, *sedative*, *emollient*, and *astringent*. According to his doctrines, irritating injections, of every kind, act in this disease upon the same principle; that is, by producing an irritation of another kind, which ought to be greater than the venereal; by which means the venereal is destroyed and lost, and the disease cured, although the pain and discharge may still be kept up by the injection; effects, however, which will soon go off, when the injection is laid aside. In this way bougies also perform a cure. Most of the irritating injections have an astringent effect, and prove simply astringent when mild.

Irritating injections should never be used when there is already much inflammation; especially in constitutions which are known to be incapable of bearing much irritation; nor should they be used when the inflammation has spread beyond the specific distance; nor when the testicles are tender; nor when, upon the discharge ceasing quickly, these parts have become sore; nor when the perinæum is very susceptible of inflammation, and especially if it formerly should have suppurated; nor when there is a tendency in the bladder to irritation, known by the frequency of making water.

In mild cases, and in constitutions which are not irritable, such injections often succeed, and remove the disease almost immediately. The practice, however, ought to be attempted with caution, and not, perhaps, till milder methods have failed. Two grains of the hydrargyrus muriatus, dissolved in eight ounces of distilled water, form a very good irritating injection; but an injection of only half this strength may be used, when it is not intended to attempt a cure so quickly. If, however, the injection, even in that proportion, gives considerable pain in its application, or occasions a great increase of pain in making water, it should be further diluted.

Sedative injections will always be of service, when the inflammation is considerable, and they are very useful in relieving the pain. Perhaps, the best sedative is opium, as well when given by the mouth, or anus, as when applied to the part affected, in the form of an injection. But, even opium will not act as a sedative in all constitutions and parts; but, on the contrary, often has opposite effects, producing great irritability. Lead may be reckoned a sedative, so far as it abates inflammation, while, at the same time, it may act as a gentle astringent. Fourteen grains of acetate of lead, in ℥viij. of distilled water, make a good sedative astringent injection.

Drinking freely of diluting liquors may, perhaps, have a sedative effect, as it in part removes some of the causes of irritation, by rendering the urine less stimulating to the bladder, when the irritation is there, and to the urethra in its passage through it. Diluting drinks may possibly lessen the susceptibility of irritation. The vegetable mucilages of certain seeds and plants, and the emollient gums, are recommended. Mr. Hunter does not entertain much opinion of their efficacy, though some of his patients told him, that they experienced less uneasiness in making water, when their drink was impregnated with mucilaginous substances.

Emollient injections are the most proper, when the inflammation is very great; and they probably act by first simply washing away the matter, and then leaving a soft application to the part, so as to be singularly serviceable, by lessening the irritating effects of the urine. Indeed, practice proves this; for a solution of gum arabic, milk and water, or sweet oil, will often lessen the pain, and other symptoms, when the more active injections have done nothing, or seemed to do harm.

The irritation at the orifice of the urethra, is frequently so great, that the point of the syringe cannot be suffered to enter. In this case, no injection should be used till the inflammation has abated; but in the meanwhile, fomentations may be employed.

Astringent injections act by lessening the discharge. They should only be used towards the latter end of the disease, when it has become mild. But, if the disease should begin mildly, they may be used at the very beginning; for, by gradually lessening the discharge, without increasing the inflammation, we complete the cure, and prevent a continuance of the discharge called *gleet*. They will have an irritating quality, if used strong, and hence increase the discharge, instead of lessening it. Mr. Hunter's experience did not teach him, that one astringent was much better than another. The astringent gums, as dragon's blood, the balsams, and the turpentines, dissolved in water; the juices of many vegetables, as oak bark, Peruvian bark, tormentil root, and, perhaps, all the metallic salts, as green, blue, and white vitriols; the salts of mercury, and also alum: probably all act much in the same way; though the mere changing of an injection is often efficacious. The local use of the nitric acid, properly diluted, has been commended by Vigaroux, Toepelmann, and others, as a safe remedy for the stoppage of gonorrhœa. (See *Pearson on the Effects of various Articles in the Cure of Lues Venerea, p. 205, Ed. 2; and Neuere Erfahr. über zweckm. Behdl. venerisch. Schleimausflüsse, &c. Leipz.* 1809.)

The external applications are poultices, and fomentations, which can only be useful when the prepuce, glans, and orifice of the urethra, are inflamed.

Since Mr. Hunter's time, many surgeons have been in the habit of keeping the penis, in the incipient inflammatory stage of gonorrhœa, covered with linen, continually wet with the liquor plumbi acetatis dilutus; a practice which is certainly both rational and beneficial. Mr. Abernethy, in his Lectures on Surgery, speaks in favour of this method. And some surgeons, amongst whom is my intelligent correspondent, Mr. Dunn, of Scarborough, have seen great relief derived from the use of a suspensor scroti, or double handkerchief, which, combined with rest and the elevation of the penis, the last-mentioned practitioner has frequently found, indeed, of more service than any thing else.

In the treatment of gonorrhœa the liquor potassæ is a favourite internal medicine with many practitioners, who begin with prescribing it, and continue its use until the inflammatory stage has subsided. However, according to Mr. Howship, its effects are very uncertain, and sometimes it excites uneasiness and irritation about the neck of the bladder, and difficulty of voiding the urine. Hence, whenever he now directs this medicine, it is in combination with some aperient, so that it may not remain long in the bowels. (*On Complaints affecting the Secretion and Excretion of the Urine, p.* 269.)

The latter gentleman, and a great many other modern surgeons, have relinquished the use of all injections in the treatment of gonorrhœa, and manage the disease on common antiphlogistic principles. Mr. Howship states, that when injections are used, they are not unfrequently followed by a most distressing and permanent irritability of the bladder. (*On Complaints affecting the Secretion and Excretion of the Urine, p.* 268.) But, the common objection to them is founded upon the suspicion, that they increase the frequency of hernia humoralis and strictures.

When the glands of the urethra are enlarged, mercurial ointment may be rubbed on the part; but this will probably be of most service after the inflammation has subsided.

TREATMENT OF GONORRHŒA IN WOMEN.

This is nearly the same as that of the disease in men, but is more simple. When the disorder is in the vagina, injections are best; and after their use, the external parts should be well washed. It is almost impossible for the patient to throw an injection into the urethra, when it is affected. The same injections are proper as for men; but they may be made doubly strong. When the glands of the vagina suppurate, and form abscesses, these should be opened, and dressed; but, the practice of smearing the parts with mercurial ointment, as advised by Mr. Hunter, is now entirely abandoned.

CONSTITUTIONAL TREATMENT OF GONORRHŒA.

In many strong plethoric constitutions, the symptoms are violent, and there is a great tendency to inflammatory fever. In such instances, opiate clysters, though at first productive of relief, sometimes occasion in the end fever, and consequently aggravate all the symptoms. In these cases, the balsam of capivi, also, sometimes increases the inflammatory symptoms. In a constitution of this kind, the treatment consists chiefly in evacuations, the best of which are bleeding, and gentle purging. The patient must live sparingly, and, above all, use little exercise.

In a weak and irritable constitution, the symptoms are frequently violent, the inflammation extending beyond the specific distance, running along the urethra, and even affecting the bladder. Here the indication is to strengthen; and, according to Mr. Hunter, bark alone has been known to effect a cure. All evacuations are hurtful.

A fever has been known to stop the discharge, relieve the pain in making water, and finally cure the disease. On other occasions, Mr. Hunter has seen all the symptoms of gonorrhœa cease on the accession of a fever, and return when the fever was subdued. In other examples, a gonorrhœa mild at first, has been rendered severe by the coming on of a fever, and, upon its subsidence, the gonorrhœa has ceased. Although a fever does not always cure a gonorrhœa, yet, as it may do so, nothing should be done while it lasts. If the local complaint should continue after the fever is gone, it is to be treated according to symptoms.

A gonorrhœa may be considerably affected by the patient's manner of living, and by other diseases attacking the constitution. Most things which hurry or increase the circulation, aggravate the symptoms; such as violent exercise, drinking strong liquors, eating strong indigestible food, some kinds of which act specifically on the urethra, so as to increase the symptoms more than simply heating the body would do; such as pepper, spices in general, and spirits.

In cases which have begun mildly, in which the inflammation is only slight, or in others, in which the violent symptoms have subsided, such medicines as have a tendency to lessen the discharge, may be given, together with the local remedies before-mentioned. Turpentines are the most efficacious, particularly the balsam of capivi, and cubebs. (See *Edin. Med. and Surgical Journ. for January* 1818, *and for the same month*, 1819; *also H. Jeffrey's Pract. Obs. on Cubebs; 8vo. Lond.* 1821.) Of the latter medicine ʒij. may be given thrice in the 24 hours; but with respect to these and all other medicines, which act upon the disease through the medium of the urine, if they succeed at all, it is always within a week, or ten days, from the beginning of their use; and, therefore, if no amendment take place in this time, they should not be continued. Cantharides, the salts of lead and copper, and alum, have also been recommended.

The opinions, entertained by Mr. Hunter, respecting the identity of the infection of gonorrhœa, and that of the venereal disease, led him to prescribe small doses of mercury, in consequence of the possibility of absorption, and with the view of preventing lues venerea.

TREATMENT OF SOME OCCASIONAL EFFECTS OF GONORRHŒA.

Bleeding from the Urethra is sometimes relieved by the balsam capivi. Mr. Hunter did not find astringent injections of use.

Painful erections are greatly prevented by taking twenty drops of tinctura opii at bedtime. Cicuta has also some power in this way; and many surgeons, among whom is Mr. Dunn, of Scarborough, have a favourable opinion of camphorated poultices, and of the internal exhibition of camphor; a medicine, which I ought to have mentioned in former editions, as a common means of lessening the pain and inconvenience of erections in the inflammatory stage of gonorrhœa.

Chordee. See this word.

Bladder affected. Opiate clysters, the warm bath, and bleeding, if the patient is of full habit, are proper. Leeches may be applied to the perinæum. When this affection lasts a considerable time, and is not mitigated by common methods, Mr. Hunter advises trying an opiate plaster on the pubes, or the loins, where the nerves of the bladder originate; or a small blister on the perinæum. In another place, he mentions bark, cicuta, sea air, and sea bathing, among the proper means.

Swelled Testicles. See *Hernia Humoralis.*

For a more full account of Gonorrhœa, according to the above doctrines, see a *Treatise on the Venereal Disease, by John Hunter*, from page 29 to 90.

ON THE QUESTION, WHETHER GONORRHŒA IS REALLY A FORM OF THE VENEREAL DISEASE?

The foregoing remarks, and others in Mr. Hunter's work, would lead one to believe, that the poison of gonorrhœa and the venereal virus are the same. Here it is my duty impartially to state the arguments, which have been urged for, and against, this important doctrine.

Mr. Hunter assures us, that he has seen all the symptoms of lues venerea originating from gonorrhœa only; that he had even produced venereal chancres by inoculating with the matter of gonorrhœa; and that he afterwards repeated these experiments in a manner in which he could not be deceived. (*P.* 293, *et seq.*)

Mr. Hunter's experiments, it is true, have been repeated with a different result; but, as a late writer has remarked, can we wonder at this, when we consider from how many causes gonorrhœa may arise, and how impossible it is to distinguish the venereal from any other? (*Obs. on Morbid Poisons, by J. Adams, M. D. p.* 91, *Ed.* 2.)

Another argument, adduced by Hunter, in favour of the poisons of gonorrhœa and chancre being the same, is the probability, that the Otaheiteans had the venereal disease propagated to them by European sailors, who were affected with gonorrhœa; for these can hardly be supposed to have had a chancre, during a voyage of five months, without the penis being destroyed.

It is impossible, however, to say what time may elapse, between the application of the venereal poison to the penis, and the commencement of the ulceration. Therefore, Bougainville's sailors, alluded to by Mr. Hunter, might have contracted the infection at Rio-de-la-Plata; but actual ulcers on the penis might not have formed till about five months afterwards, when the ship arrived at Otaheite.

In attempting to explain, why a gonorrhœa and a chancre do not equally produce lues venerea, and why the medicine which almost universally cures chancre, has less effect on gonorrhœa, a modern advocate for Mr. Hunter's doctrine says, that we must take into consideration, that the seat of the two diseases is different; that the same cause may produce different effects upon different parts; that the same poison, when mixed with different fluids, may be more or less violent in its operation; and that there may be greater or less attraction of certain fluids to a part, according to its nature and composition. (*Inquiry into some Effects of the Venereal Poison by S. Sawrey*, 1802, *p.* 4.) Mr. Sawrey very truly remarks, p. 6, that if the gonorrhœal matter has clearly and decidedly produced chancre, or contaminated the system *in any one instance*, the question is determined. It could in no instance produce these effects, unless it had the power of doing so. This writer brings forward some cases to prove, that the poison of gonorrhœa may produce gonorrhœa, or chancre; but, the limits of this work only afford room to observe, that these instances are by no means decisive of the point, because some objections may be urged against them, as indeed, Mr. Sawrey himself allows. That Mr. Hunter's cases are inconclusive, I have particularly endeavoured to explain in the *First Lines of the Practice of Surgery, Vol.* 1, *Ed.* 4.

Why does not gonorrhœa commonly produce ulceration in the urethra? Mr. Sawrey tries to solve this question, by saying, that the product of the venereal inflammation, the diseased contents of the small arteries of the urethra, are thrown out of these open-mouthed vessels into this canal, without any breach of their texture, which otherwise would be a necessary consequence.

Why does not gonorrhœa equally contaminate the system as chancre? In gonorrhœa, says Mr. Sawrey, the discharge is very plentiful; it is not, in general, attended with ulceration; the poison is much more diluted, and mixed with a mucous and puriform fluid. It is deposited in the urethra, and its lacunæ, where little or no pressure is applied, and it finds easy egress out of the canal. In chancre there is breach of substance, the poison is not much diluted, &c.

Why does not chancre generally, in the same person, produce gonorrhœa, and gonorrhœa chancre? Mr. Sawrey, in answer, expresses his belief, that these incidents are not very unfrequent. He says, he has known persons having a chancre, which continued for months, become affected, after that time, with a clap, without any further exposure. His opinion is, that the matter of the chancre had insinuated itself into the urethra, and produced the disease; though, he confesses, many would explain the circumstance, by supposing that the chancre and gonorrhœa were both communicated at the same time by two different poisons.

Mr. Hunter remarks, that the presence of one disease renders the adjacent parts less susceptible of the influence of the other.

Mr. Sawrey concludes his second chapter with inclining to the idea, that the matter of gonorrhœa is not strictly pus, but of a more mucous nature than that of a chancre. However, when he mentions chemical attractions, as drawing the poison from mucus to the urethra, and from pus to the dry parts, in order to explain the last of the above questions, every sober reader must feel sorry, that a work, which contains some really sensible observations, should comprehend this most unfortunate one.

Mr. Whately also supported the opinion, that the matter of gonorrhœa and that of chancre, are the same. (*On Gonorrhœa Virulenta.*)

Another defender of this side of the question is Dr. Swediaur, who endeavours to prove the fallacy of the following positions:—1. *That the poison which produces the clap, does never, like that of chancres, produce any venereal symptoms in the mass or lues itself.* 2. *That the poison of the clap never produces chancres, and that the poison of chancres never produces a clap.* 3. *That mercury never contributes to, nor accelerates the cure of a clap; but that, on the contrary, every blenorrhagia may be certainly cured without mercury, and without any danger of leaving a lues behind.*

His arguments run thus:—the reason why claps do not, like chancres, constantly produce the lues, is, that most of them excite only a superficial inflammation in the membrane of the urethra, without any ulceration. Hence, absorption cannot easily take place, the poison being out of the course of the circulation. But he has seen claps, with an ulcer in the urethra, followed by the most unequivocal symptoms of lues itself. He mentions the urethra being defended with a large quantity of mucus, as the thing impeding the common formation of ulcers, which do occasionally occur when the mucus is not secreted as usual, or is washed away. He asserts, that in many cases, where he had occasion to examine both parties, he was convinced that the chancres were communicated by a person affected with a simple gonorrhœa; and, *vice versa*, that a virulent clap had been the consequence of an infection from a person having merely chancres. He says, that if a patient, with a venereal running, does not take care to keep the prepuce and glans perfectly clean, chancres will very often be produced. He owns a great many claps are cured without mercury; yet, repeated experience has shown him, a cure cannot always be thus accomplished. Mild cases, without ulcer or excoriation in the urethra, may certainly be radically cured without a grain of mercury; and though mercury should be given, it would not have the least effect: not because the disease does not proceed from the venereal poison, but because out of the course of the circulation. He contends, that the topical use of mercury in injections, acts usefully even in these cases. But, when a clap is joined with ulceration in the urethra, it is always cured more safely and expeditiously with mercury, and is frequently incurable without it. A lues also follows cases attended with ulcers in the urethra. He allows that all claps are not venereal. (See *Pract. Obs. on Venereal Complaints, by J. Swediaur.*)

One argument urged against the identity of gonorrhœal and chancrous virus, is, that gonorrhœa was not described as a symptom, till nearly half a century after the other symptoms of the venereal disease were known. Fallopius is among the first who observed gonorrhœa, as a symptom of the venereal disease. "If however," says Dr. Adams, "venereal gonorrhœa was unnoticed till about fifty years after the other forms of the disease were described, what does this prove, but that contagious gonorrhœa was so common, as to be disregarded as a symptom of the new complaint? Can there be a doubt, from the caution given by Moses, that gonorrhœa was considered as contagious in his days? During the classical age, we find inconveniences of the urinary passages were imputed to incontinence; and the police of several states, before the siege of Naples, made laws for preserving the health of such as would content themselves with public stews, instead of disturbing the peace of families.

"This is enough to lessen our surprise, that gonorrhœa should be unnoticed for some time after the appearance of the venereal disease. But, so far is it from proving, that the two contagions are different, that the fairest inference we can draw is in favour of their identity. For, if by this time the venereal disease began to be so far understood, that secondary symptoms were found the consequence of primary ones in the genitals, it is most probable, that the first suspicion of venereal gonorrhœa arose from the occurrence of such secondary appearances, where no other primary symptoms could be traced." (*Adams on Morbid Poisons, p.* 95, *Ed.* 2.)

In relating the arguments, maintained by the best modern writers, to repel the attacks made on the doctrine, that gonorrhœa and chancre arise from the same poison, we have been compelled to disclose the chief grounds, on which the assailants venture to entertain a contrary theory.

The sentiments of Mr. B. Bell are quite at variance with those of Hunter, Sawrey, Swediaur, Adams, Howship, &c.; but, my limits will only allow me just to enumerate a few of his leading arguments.

If the matter of gonorrhœa, and that of chancre, were of the same nature, we must admit, that a person with a chancre only, can communicate to another, not only every symptom of pox, but of gonorrhœa; and that another, with gonorrhœa only, can give to all, with whom he may have connexion, chancres, with their various consequences. This ought indeed to be a very frequent occurrence; whereas, all allow that it is even in appearance very rare.

On the supposition of the matter of gonorrhœa and lues venerea being the same, the latter ought to be a much more frequent occurrence than the former, from the greater ease with which the matter of infection must, in every instance, be applied to those parts on which it can produce chancres, than that of the urethra, where instead of chancre or ulceration, it almost always excites gonorrhœa. It is difficult to conceive how the matter, by which the disease is communicated, should find access to the urethra; while all the external parts of the penis, particularly the glans, must be easily and universally exposed to it; and yet gonorrhœa is a much more frequent disease than pox. Cases of gonorrhœa are in proportion to those of chancre, according to Mr. B. Bell's experience, as three to one. It is obvious, that the very reverse should happen, if the two diseases were produced by the same kind of matter.

I need not adduce other arguments, as the reader must be already acquainted with any worth knowing, from what is said in the previous part of this article.

The grand practical consideration, depending on the possibility of the venereal disease arising from gonorrhœa, is whether mercurials should not be exhibited, in all cases, with the view of preventing such a consequence.

Waving on my own part, all attempts to decide the point, whether the matter of a chancre, and that of one species of gonorrhœa, are of the same nature, I shall merely content myself with stating, that as far as my observation and inquiries extend, the majority of the best practitioners of the present day consider the exhibition of mercury unnecessary, and consequently improper in all cases of gonorrhœa. This fact almost amounts to a proof, that if venereal symptoms do ever follow a clap, they are so rare, and I may add, always so imputable to other causes, that the employment of mercury, as a preventive, would, upon the whole, do more injury, than benefit to mankind; and this even admitting (what, in my mind has never been unequivocally proved) that the matter of gonorrhœa is really capable, in a very few instances, of giving rise to the venereal disease.

The reader must weigh the different arguments himself. Some of Mr. B. Bell's reasoning is certainly untenable, as Mr. Sawrey has clearly shewn; but the latter, also, is not invulnerable in many points, which he strives to defend.

J. Andree, An Essay on the Theory and Cure of the Venereal Gonorrhœa, and the Diseases which happen in consequence of that Disorder, 8vo. *Lond.* 1777. *J. Nevill, A Description of the Venereal Gonorrhœa,* 8vo. *Lond.* 1754. *J. Norman, Method of Curing the Virulent Stillicidium, or Gonorrhœa, with an Account of the Efficacy of Plummer's Alterative Pills,* 8vo. *J. Clubbe, An Essay on the Gonorrhœa Virulenta, in which the different Opinions respecting the Treatment of the Disease are carefully examined, &c.* 8vo. *Lond.* 1786. *W. Thomas, An Essay on Gonorrhœa, with some Obs. on the Use of Opium in the Cure of that Disease,* 8vo. *Lond.* 1780. *A Treatise on the Venereal disease, by J. Hunter,* 1788. *W. Rowley, The most cogent Reasons, why, astringent Injections, &c. should be banished, &c,* 8vo. *Lond.* 1800. *J. H. G. Schlegel, Versuch einer Geschichte des Streites über die Identität des Venus und Trippergiftes,* 12*mo. Jenæ.* 1796. *Whately on the Gonorrhœa Virulenta,* 8vo. *Lond.* 1801. *Pract. Obs. on Venereal Complaints, by F. Swediaur, M. D. Edit.* 3. *An Inquiry into some of the Effects of the Venereal Poison, by S. Sawrey,* 1802. *Obs. on Morbid Poisons, by J. Adams, M. D. Edit.* 2, 1807. *J. C. Jacobs, Dêmonstration de l' Identité des Virus de la Verole et de la Gonorrhêe,* 8vo. *Bruxelles,* 1811. *J. F. Hernandez, Essai Analytique sur la nonidentitê des Virus Gonorhoique et syphilitique,* 8vo. *Toulon,* 1812. *R. Carmichael, Essays on the Venereal Diseases, which have been confounded with Syphilis, &c.* 4to. *Lond.* 1814; *and his Obs. on the Symptoms and Specific Distinctions of Venereal Diseases,* 8vo. *Lond.* 1818. *John Howship, On Complaints affecting the Secretion and Excretion of the Urine,* 8vo. *Lond.* 1823.

GORGET. An instrument, used, in the operation of lithotomy, for the purpose of cutting the prostate gland and neck of the bladder, so as to enable the operator to introduce the forceps and extract the stone. It is, in fact, a sort of knife at the end of which is a beak, that fits the groove of the staff, and admits of being pushed along it into the bladder.

Besides cutting gorgets, constructed for the preceding design, there are also blunt ones, intended to be introduced into the wound, when their concavity serves as a guide for the forceps into the bladder.

GRANULATIONS. The little, grain-like, fleshy bodies, which form on the surfaces of ulcers, and suppurating wounds, and serve both for filling up the cavities, and bringing nearer together and uniting their sides.

We must here consider the operations of nature, in bringing parts as nearly as possible to their original state, whose disposition, action, and structure have been altered by accident, or disease. Having formed pus, she immediately begins to form new matter upon surfaces, in which there has been a breach of continuity. This process is called *granulating*, or *incarnation*; and the substance formed is called *granulations*.

Granulations are an accretion of animal matter upon the wounded, or exposed surface; they are formed by an exudation of the coagulating lymph from the vessels; into which new substance, the old vessels very probably extend, and in which new ones are formed. Hence, granulations are extremely vascular; indeed, more so than almost any other animal substance. "That this is the case (says Mr. Hunter) is seen in sores every day. I have often been able to trace the growth and vascularity of this new substance. I have seen upon a sore a white substance exactly similar, in every visible respect, to coagulating lymph. I have not attempted to wipe it off, and, the next day of dressing, I have found this very substance vascular; for, by wiping, or touching it with a probe, it has bled freely. I have observed the same appearance on the surface of a bone that has been laid bare. I once scraped off some of the external surface of a bone of the foot to see if the surface would granulate. I remarked the following day, that the surface of the bone was covered with a whitish substance, having a tinge of blue. When I passed my probe into it, I did not feel the bone bare, but only its resistance. I conceived this substance to be coagulable lymph thrown out from inflammation, and that it would be forced off when suppuration came on; but on the succeeding day, I found it vascular, and appearing like healthy granulations." The vessels in granulations pass from the original parts to their basis, and thence towards their external surface, in tolerably regular parallel lines. The surface of this new substance has the same disposition to secrete pus, as the parts which produced it. The surfaces of granulations are very convex, the reverse of ulceration, having a great many small points, or eminences, so as to appear rough. The smaller such points are, the more healthy are the granulations. The colour of healthy granulations is a deep florid red. When livid, they are unhealthy, and have only a languid circulation. Healthy granulations, on an exposed or flat surface, rise nearly even with the surface of the surrounding skin, and often a little higher; but when they exceed this, and take on a growing disposition, they are unhealthy, become soft, spongy, and without any disposition to form skin. Healthy granulations are always prone to unite to each other, so as to be the means of uniting parts.

Granulations are not easily formed on the side of an abscess, nearest the surface of the body.

They are not endowed with the same powers as parts originally formed. Hence, they more readily ulcerate, and mortify. The curious mode in which granulations contract, when sores are healing, and even for some time after they are healed, has been explained in the article *Cicatrization.* (See *A Treatise on the Blood, Inflammation, &c. by John Hunter, p.* 473, *et seq.* 1794.)

It is a question, whether granulations can ever be formed without suppuration? Mr. Hunter seems inclined to think, that they may occasionally be produced without it, and he supports his opinion by the relation of the dissection of a fractured limb, in which he observed a substance resembling granulations. Dr. John Thompson, on the other hand, declares, that he has never seen any thing, which he could regard as an example of a granulation, and still less of a granulating surface, where pus was not formed. (See *Lectures on Inflammation, p.* 408.)

The exact process, by which the blood-vessels, nerves, and absorbents of granulations are formed, is still amongst the secrets of nature. The observations of Mr. Hunter on the subject amount only to conjecture. "The growth of nerves, and their development in new-formed flesh, or granulations (says Dr. J. Thomson), is a subject of equal curiosity with the growth of blood-vessels in the same structure. Their existence in granulations is proved by the pain, which is felt on our pinching, rubbing, or wiping, the surface of a sore. Even the granulations, which arise from the surface of bone, are sensible, (a statement not admitted by Sir Astley Cooper,) though we are not very well able to prove the sensibility of the larger branches of nerves, from which the newly formed, and sensible nerves and filaments in the granulation, are immediately derived. All the difficulties, which I formerly mentioned to you, as occurring in the explanation of the manner in which coagulable lymph, or granulations, are penetrated with blood-vessels, present themselves the moment we begin to reflect on the manner, in which the same granulations are provided with nerves, and these difficulties are still increased, when we reflect, that the same granulations are in the course of a few hours provided, not only with blood-vessels and nerves, but also with a system of absorbents. The existence of absorbents in granulations is proved, not only by the changes of bulk, which we see them daily undergo, becoming gradually, in the healthy state, smaller, firmer, and more compact, but, also, by the frequent disappearance, in whole, or in part, of a granulating surface by the process of ulcerative absorption." (See *Thomson's Lectures on Inflammation, p.* 419.) According to Sir Astley Cooper, granulations, which spring from parts endued with great sensibility, like muscles, are extremely sensitive; but, granulations, which arise from bones, he says, have no sensibility whatever. These observations are qualified with the condition, that the bone be uninflamed, and, it is acknowledged, that granulations, arising from the cancellated structure of bones, are sometimes extremely sensitive. He describes granulations from tendons as quite insensible, and those from aponeuroses and fasciæ as possessing very little sensibility. (See *Lancet, Vol.* 1, *p.* 223.) Every young dresser of sores at an hospital, who has been too lavish of the red precipitate ointment, must have learned from experience, that granulations are furnished with absorbent vessels, and that mercury may be absorbed from the surface of ulcers, and bring on an unwished-for salivation of the patient. It is observed by Sir Astley Cooper, that, in recently formed ulcers, the granulations are not good absorbent surfaces; but, that when the sores have existed a good while, they readily take into the system any substance, which may be applied to them. Thus, when old sinuses are injected with a solution of the oxymuriate of mercury, with the view of stimulating them to heal, the patients are sometimes salivated by the mercury being absorbed into the system. Sir Astley has seen the same effect produced by the application of the lotion of lime-water and the submuriate of mercury to the surface of ulcers. Indeed, the absorbent power of granulations is frequently the means of producing baneful effects upon the constitution, by the introduction of deleterious substances into the circulation. Thus, arsenic, applied to sores, is often conveyed into the system, and, on this account, is to be regarded as a dangerous external remedy. Sir Astley Cooper quotes one instance, in which the patient seems to have been poisoned, by the indiscriminate application of arsenic to a fungus of the eye. Opium also, when applied to the surfaces of sores, is very readily absorbed, producing similar effects to those which arise from its introduction into the stomach. Thus, when the quantity absorbed is too great, excessive costiveness, extreme pain in the head, and torpor of the system, are the consequences, which require the frequent administration of active purgatives for their removal. (See *Lancet*, *Vol.* 1, *p.* 219, *&c.*) A temporary amaurosis has been known to be produced by the absorption of the extract of belladonna, from the surface of irritable malignant ulcers. (*F. Tyrrell: A. Cooper's Lectures*, *Vol.* 1, *p.* 169.)

GUAIACUM. Many writers of the sixteenth century contended, that guaiacum was a true specific for the venereal disease; and the celebrated Boerhaave, in the eighteenth, maintained the same opinion. Mr. Pearson mentions, that when he was first intrusted with the care of the Lock Hospital, in 1781, Mr. Bromfield and Mr. Williams were in the habit of reposing great confidence in the efficacy of a decoction of guaiacum wood. This was administered to such patients as had already employed the usual quantity of mercury; but who complained of nocturnal pains, or had gummata, nodes, ozæna, and such other effects of the venereal virus, connected with secondary symptoms, as did not yield to a course of mercurial frictions. The diet consisted of raisins, and hard biscuit; from two to four pints of the decoction were taken every day; the hot bath was used twice a week; and a dose of antimonial wine and laudanum or Dover's powder, was commonly taken every evening. Constant confinement to bed was not deemed necessary; neither was exposure to the vapour of burning spirit, with a view of exciting perspiration, often practised; as only a moist state of the skin was desired. This treatment was, sometimes, of singular advantage to those whose health had sustained injury from the disease, long confinement, and mercury. The strength increased; bad ulcers healed; exfoliations were completed; and these anomalous symptoms, which would have been exasperated by mercury, soon yielded to guaiacum.

Besides such cases, in which the good effects of guaiacum caused it to be erroneously regarded, as a specific for the lues venerea, the medicine was also formerly given, by some, on the first attack of the venereal disease. The disorder being thus benefited, a radical cure was considered to be accomplished; and, though frequent relapses followed, yet, as these partly yielded to the same remedy, its reputation was still kept up. Many diseases also, which got well, were probably not really venereal cases. Mr. Pearson seems to allow, that, in syphilitic affections, it may, indeed, operate like a true antidote, suspending for a time, the progress of certain venereal symptoms, and removing other appearances altogether; but, he observes, that experience has evinced, that the unsubdued virus yet remains active in the constitution.

Mr. Pearson has found guaiacum of little use in pains of the bones, except when it proved sudorific; but, that it was then inferior to antimony, or ammonia. When the constitution has been impaired by mercury, and long confinement, a thickened state of the ligaments, or periosteum, or foul ulcers, still remaining, Mr. Pearson says, these effects will often subside, during the exhibition of the decoction. He says, it will often suspend, for a short time, the progress of certain secondary symptoms of the lues venerea; for instance, ulcers of the tonsils, venereal eruptions, and even nodes. Mr. Pearson, however, never knew one instance, in which guaiacum eradicated the virus; and he contends, that, its being conjoined with mercury, neither increases the virtue of this mineral, lessens its bad effects, nor diminishes the necessity of giving a certain quantity of it. He has seen guaiacum produce good effects in cutaneous diseases, the ozæna, and scrofulous affections of the membranes and ligaments. (See *Pearson on the Effects of Various Articles in the Cure of Lues Venerea*, *Edit.* 2. 1807.) Many of the foregoing observations on the virtues of guaiacum in syphilis, are considerably affected by the fact, now so completely established, that this disease is generally capable, in the end, of a spontaneous and lasting cure. (See *Venereal Disease.*)

GUMMA, a soft tumor, so named from the resemblance of its contents to gum.

GUN-SHOT WOUNDS receive their name from the manner in which they are produced, being generally caused by hard, obtuse, metallic bodies, projected from cannons, muskets, or some other species of fire-arm. With such injuries, it is also usual to comprehend a variety of dreadful accidents arising from the explosion of shells, or the violence, with which pieces of stones from ramparts, or splinters of wood on board of ship, are driven about. Gun-shot wounds are the most considerable of the contused kind; and what is to be said of them, will apply, more or less, to all contused wounds, according to the degree of contusion. They are particularly characterised by, what the French surgeons are fond of calling, a *disorganization* of their surface. The excessive contusion, and violence, observable in gun-shot wounds, depend upon the rapidity, with which the bodies occasioning them, are propelled. The parts, touched by the ball, are frequently converted into a blackish slough, the colour of which made our ancestors suppose, that bodies, projected by gunpowder, became heated, and actually burnt the flesh, with which they came into contact. But reason and experience have now proved, that whatever may be the rapidity of a projectile, it never acquires in its passage any perceptible heat. Indeed, a modern writer asserts, that such a degree of heat as would be requisite to make a ball burn parts in its passage, would really melt it. (*Richerand, Nosographie Chir. T.* 1, *p.* 217, *Edit.* 2.) In general, gun-shot wounds do not bleed much, unless large blood-vessels be injured; their circumference is often livid; and the shock, that attends their infliction, or the injury done to the nerves, may occasion in the limb, or part, a kind of torpor, sometimes extending itself to the whole system.

However, as Dr. Hennen most truly observes, "the effects of a gun-shot wound differ so materially in different men, and the appearances are so various, according to the nature of the part wounded, and the greater, or lesser force with which it has been struck, that no invariable train of symptoms can be laid down as its *necessary* concomitants. If a musket or pistol-ball has struck a fleshy part, without injuring any material blood-vessel, we see a hole, about the size of, or smaller than, the bullet itself, with a more or less discoloured lip, forced inwards; and, if it has passed through the parts, we find an everted edge, and a more ragged and larger orifice at the point of its exit. The hemorrhage is in this case very slight, and the pain inconsiderable, insomuch that, in many instances, the wounded man is not aware of his having received any injury. If, however, the ball has torn a large vessel, or nerve, the hemorrhage will generally be profuse, or the pain of the wound severe, and the power of the part lost. Some men will have a limb carried off, or shattered to pieces by a cannon-ball, without exhibiting the slightest symptoms of mental or corporeal agitation; nay, even without being conscious of the occurrence; and when they are, they will coolly argue on the probable result of the injury; while a deadly paleness, instant vomiting, profuse perspiration, and universal tremor, will seize another on the receipt of a slight flesh wound. This tremor, which has been so much talked of, and, which, to an inexperienced eye, is really terrifying, is soon relieved by a mouthful of wine, or spirits, or by an opiate; but, above all, by the tenderness and sympathizing manner of the surgeon, and his assurance of the patient's safety." (*Principles of Mil. Surgery, p.* 33, *Ed.* 2.)

On the other hand, it is correctly noticed by Mr. Guthrie, that the continuance of the constitutional alarm, or shock, ought to excite great suspicion of serious injury; and, when wounds have been received in such situations, or bear such appearances, as render it doubtful, whether any parts of vital importance have been injured, or not, the manner, in which the constitutional perturbation lasts, may be assumed as evidence of the fact, when other symptoms, more indicative of the injury, are wanting; and, under all such circumstances, a very cautious prognosis should be delivered. (*On Gun-Shot Wounds, p.* 11, *Ed.* 2.)

Respecting the general character of gun-shot wounds not to bleed much, unless large vessels be injured, it is a fact, which necessarily depends upon the degree of contusion usually attending these injuries. But it is also true, as the preceding author has stated, that, although some gun-shot wounds bleed but little at first, there is in the greater number of cases more or less of blood; and in wounds of vascular parts, like the face and neck, the quantity lost is often considerable, though the main arterial branches may not be injured. (*Op. cit. p.* 6, *Ed.* 2.)

In gun-shot wounds, another circumstance is observed, which is often remarked in other cases, viz. when a large artery is partially divided, the bleeding is more profuse and dangerous, than when the vessel is completely severed, and the hemorrhage, if not repressed, by a tourniquet, or other means, will often continue until the patient dies. Thus, Mr. Guthrie speaks of three cases, in which life was lost from wounds of the femoral, humeral, and carotid arteries, no effectual means of stopping the hemorrhage having been adopted. (*P.* 8.)

Until Ambroise Paré introduced more correct theories upon the subject of gun-shot wounds, ideas, the most false, and errors, highly prejudicial, prevailed both in their history and treatment, and particularly respecting what have been falsely named, wind-contusions. Cannon-balls and bullets sometimes produce dreadful degrees of injury, without occasioning any breach of continuity in the integuments. This observation is so strictly true, that the muscles and bones may actually be crushed and broken to atoms, without the skin being at all wounded. Such cases were for a long while imputed to the violent motion, supposed to be communicated to the air by the ball itself. It was imagined, that this elastic fluid, being rapidly displaced by the shock of the projectile, was capable of making such pressure on surrounding bodies, as to destroy their texture. But how could this violent pressure originate in the midst of the open and unbounded air? If this theory were true, the effect in question would constantly happen, whenever a ball passes near any part of the body. The contrary, however, is so much the case, that pieces of soldiers' and seamen's hats, of their feathers, clothes, and even hair, are shot away in every battle, without any other mischief being done.

In consequence of the manner, in which such injuries of the soft parts, and even of the bones, unattended with any breach in the skin, have been supposed to be produced, they have been erroneously termed *wind-contusions.* In fact, these cases are now universally acknowledged by all the most accurate observers never to proceed from the cause, to which formerly they were always ascribed.

The air does not move with the same rapidity as the ball; but its motion is less in proportion as it is a more subtile matter, and must be too feeble to account for such a violent degree of injury. The air, to which the ball must really communicate the greatest motion, is what is directly before it; and this never bruises the part untouched by the ball itself. It is only the air situated laterally to the shot, that is imagined to do injury, and it cannot be greatly agitated. The violent consequences of sudden explosions, and the effects produced on the organ of hearing, by strong commotions of the air, prove nothing relative to the point in question. Lastly, experience does not confirm the reality of such wind-contusions; for, cannon-balls often tear off whole members, without the adjacent parts being in the least injured. (See *Le Vacher, in Mémoires de l'Acad. de Chir. T.* 4, *p.* 22.)

An eminent professor, who visited the continent for the purpose of seeing the wounded after the battle of Waterloo, fully coincides with M. le Vacher and all the moderns upon this subject. "We saw, and were informed of, many instances, in which cannon-balls had passed quite close to all the parts of the body, and had removed portions of the clothes and accoutrements, without producing the slightest injury of any kind. In other instances, portions of the body itself were removed by cannon-balls, without the contiguous parts having been much injured. In one case, the point of the nose was carried off by a cannon-ball, without respiration being at all affected; and in another very remarkable case, the external part of the ear was shot away, without even the power of hearing being sensibly impaired." (See *Report of Observations made in the British Military Hospitals in Belgium, &c. by John Thomson, p.* 33, *Edinb.* 1816.)

I could cite many cases, which I have seen myself, in proof of the truth of Le Vacher's opinions; but, the point is now so universally admitted, that I shall merely add one observation that occurred to the notice of many as well as myself. At the bombardment of the French fleet in the basin of Antwerp early in 1814, a cannon-shot shattered the legs of two officers so badly, that the limbs were amputated. These gentlemen were walking at the moment of the accident in the village of Merksam, taking hold of the arm of my friend Assistant-surgeon Stobo, of the 37th regiment, who was in the middle. Now the ball, which produced the injury, did not the slightest harm to the latter gentleman, although it must have passed as close as possible to his lower extremities, and most probably between them.

Neither can what have been improperly called *wind-contusions*, be attributed to an electrical shock on the parts, in consequence of the ball being rendered electrical by friction in the calibre of the gun, and giving off the electricity as it passes by; (Vide *Plenk's Sammlungen*, 1 *Theil. p.* 99.) for, metals never acquire this property from friction.

The mischief, imputed to the air, is occasioned by the ball itself. Its producing a violent contusion, without tearing the skin, and entering the limb, is to be ascribed to the oblique direction, in which it strikes the part, or, in other instances, to the feebleness with which the ball strikes the surface of the body, in consequence of its having lost the greater part of its momentum, and acting principally by its weight, being, in short, what is called a spent ball. Daily observation evinces, that balls, which strike a surface obliquely, do not penetrate, but are reflected; though they may be impelled with the greatest force, and the body struck may be as soft and yielding as water. This alteration in the course of the ball, not only happens on the surface of the human body, but also in the substance of a limb which it has entered. Thus, a bone, a tendon, &c. may change the direction of a ball which touches them at all obliquely. Hence, it is manifest, how it happens that the track of a gun-shot wound is not always straight, and how balls sometimes run under the integuments nearly all round the body, or limb.

The causes of several of the peculiarities, attending gun-shot wounds, are to be sought among the laws, by which moving bodies are governed, and by which the mechanical effect of a ball, propelled against any part of the body, must therefore be determined. The form, the momentum, and the direction of the shot, that is received; the position, and the variety of structure, or, in other words, the variety of density and powers of resistance, in the part receiving it; must always be considered, in order to account satisfactorily for the effects, which it produces. And, though, says Mr. Chevalier, in many cases, a mathematical explication of the course of a ball cannot be given; this arises entirely from the want of data, the laws of matter being fixed and immutable. But, when the data are known, as, for instance, the velocity and direction of the shot, the position of the patient, or of the wounded part at the time of the accident, and the structure of the parts penetrated, a much more probable conjecture of the course of the ball may generally be formed, than if these circumstances had not been regarded.

On the principle of the density and resistance of parts, attempts have been made to explain the reason of the concussion, or shock, which is given in many instances, to the whole system by gun-shot wounds, and which is represented by writers on this subject, to be often attended with grave and even alarming effects, extending not only over the injured part, but affecting the system at large. Thus, a shot, striking against a tendon, or a bone, in one of the extremities, will produce a greater concussion, than if it struck only against softer parts. A shot, striking a muscle in action, will produce more concussion, than if it struck against the same part of the same muscle at rest; and a shot, striking the head, or wounding the liver, lungs, or intestinal canal, will generally bring on instantaneous derangement of the whole system, with which the functions of these parts are so closely connected. (*T. Chevalier on Gun-shot Wounds, Part I. sect.* 7.)

Respecting the mechanical effects of the concussion, I am disposed to think with Mr. Guthrie, that they have been rather exaggerated, and that in reality a more accurate explanation of the disorder of the system might be derived from other considerations; " a shot through the lungs (says he) will cause an instantaneous derangement of the whole system, but the resistance afforded by the part, has little to do with it: it is the lesion of the organic functions, intimately connected with life, that is the cause of the derangement. In the same manner, I do not conceive, that the general affection of the system depends alone on the shock received, but on the effect the injury committed has on the nervous system." (*On Gun-shot Wounds, p.* 26, *Ed.* 2.)

A ball, when it strikes a part of the body, may cause four kinds of injury. 1. It may only occasion a contusion, without penetrating the part, on account of its being too much spent, or of the oblique way in which it strikes the surface of the body. 2. It may enter and lodge in the substance of a part; in which case, the wound has only one aperture. 3. It may pierce through and through; and then there are two openings, one at the entrance, the other at the exit of the ball. The circumference of the aperture, where the shot entered, is usually depressed: that of the opening, from which it came out, elevated. At the entrance, there is commonly more contusion, than at the exit of the ball. The former opening is generally narrower; the latter wider, and more irregular, especially when the round smooth figure of the ball has been changed by its having struck a bone. 4. A cannon-ball may tear off a whole limb. (*Richter Anfangsg. der Wundarzn. B.* 1.)

Gun-shot wounds differ very much, according to the kind of body projected, its velocity, and the nature and peculiarities of the parts injured.

The projected bodies are mostly bullets, sometimes cannon-balls, sometimes pieces of broken shells, and very often, on board of ship, splinters of wood. On account of the contusion, which the parts suffer, from the violent passage of the ball through them, there is most commonly a part of the solids surrounding the wound deadened, which is afterwards thrown off in the form of a slough, generally preventing such wounds from healing by the first intention, and making most of them necessarily suppurate. This does not take place equally in every gun-shot wound, nor in every part of the same wound; and the difference commonly arises from the variety in the velocity of the body projected: for, where the ball has passed with little velocity, which is sometimes the case at its entrance, but, still more frequently at the part last wounded, the injury may often be healed by the first intention. (*J. Hunter*, *p.* 523.)

Until I had the pleasure of reading the last edition of a valuable book on gun-shot wounds, I did not know, that, at the present day, any surgeons entertained the idea, that the whole track of every gun-shot wound must unavoidably suppurate, and slough; (*Guthrie on Gun-shot Wounds*, *p.* 62, *Ed.* 2.) but, if this sentiment prevail, it is plain from the preceding statement, that the authority of Mr. Hunter cannot be adduced in its support. At the same time, I believe, that few army surgeons will be inclined to question the correctness of Mr. Hunter's account of the general occurrence of a degree of sloughing, or of the deadened state of a part of the surface of a wound, particularly in the vicinity of the entrance of the ball, or the truth of his observations about the common necessity of the separation of such slough before the parts will heal; and whether the dead parts be thrown off in small fragments with the matter, or larger portions, the fact is still correct.

Foreign bodies more frequently lodge in gun-shot wounds than any others, and are commonly of three kinds. 1. Pieces of clothing, or other things, which the ball forced before it into the limb. 2. The ball itself. 3. Loose splinters of bone. It is only when the ball strikes the naked flesh, touches no bone, and goes quite through the part, that the wound can be free from extraneous matter. Foreign bodies are the cause of numerous unfavourable symptoms, by irritating sensible parts, and exciting pain, inflammation, convulsions, hemorrhage, long suppurations, &c.; and the more uneven, pointed, and hard they are, the more likely they are to produce these evils. Hence spiculæ of bone are always the most to be dreaded. (*Richter.*)

The great obliquity and length of the fissures, produced in the cylindrical bones by musket balls, are such as are not remarked in any common cases of fracture. When I was with the army in Holland, in the year 1814, I had in my hospital at Oudenbosch several fatal compound fractures of the thigh, caused by gun-shot violence. The fissures in some of these examples were found to extend two-thirds of the length of the bone. This fact is noticed by Mr. Guthrie: "the fractures extend far above and below the immediate part struck by the ball, and as far as depends upon my information from the examination of limbs that were amputated, farther downwards than upwards; so that, from a fracture in the middle of the thigh, I have often seen fissures extend into the condyles, and cause ulceration of the cartilages of the knee-joint," &c. (*On Gun-shot Wounds*, *p.* 190.)

When a ball strikes a bone, the concussion produced is another occasion of bad symptoms, to be added to those already mentioned. When slight, its effects are confined to the injured limb; but, sometimes they extend to the neighbouring joints, in which they produce inflammation and abscesses.

It is commonly stated, in surgical books, that, when a cannon-ball tears off a limb, it produces a violent concussion of the whole body, and a general derangement of all its functions. This, however, is by no means always true. I saw some years ago, in London, a young sailor, whose arm had been completely torn off at the shoulder, by a cannon-ball from one of the forts at Guadaloupe, in March 1808; he suffered no dreadful concussion of his body, nor were his senses at all impaired. This case was very remarkable, as the scapula was so shattered, that Mr. Cummings, of Antigua, was under the necessity of removing the whole of it. The patient recovered in two months. From the accounts, which I heard, I do not believe, that the axillary artery bled immediately after the accident The young man was shown to the gentlemen of St. Bartholomew's Hospital, quite well.

There is one curious effect which occasionally follows gun-shot wounds; but, I do not pretend to understand the rationale of it: viz. inflammation and suppuration of some internal viscus, especially of the liver. Several such cases are related in the *Mem. de l' Acad. de Chirurgie*, and according to Mr. Guthrie, many patients in the peninsula, who had undergone secondary amputations for gun-shot injuries, were destroyed by affections of their lungs, liver, &c. (*On Gun-shot Wounds of the Extremities*, *p.* 74, *et seq.*)

From the circumstance of the inner surface of gun-shot wounds being often more or less deadened, they are late in inflaming. But, when a ball has fractured a bone, which fracture has occasioned great injury of the soft parts, independently of that caused immediately by the ball itself, the inflammation will come on as quickly, as in cases of compound fracture; because the deadened part bears no proportion to the laceration or wound in general. (*J. Hunter*, *p.* 524.)

From the same circumstance of a part being often deadened, gun-shot wounds frequently cannot be completely understood in the first instance, for, in many cases, it is at first impossible to know what parts are killed, whether bone, tendon, or soft part. Nor can this be ascertained till the slough separates, which often makes the wound much more complicated than was previously imagined. For, very often, some viscus, or a part of some viscus, or a part of some large artery, or even a bone, has been killed by the violence. If a piece of intestine has been killed, the contents of the bowel will begin to come through the wound when the slough separates. If a portion of a large blood-vessel be killed, a profuse, and even fatal hemorrhage may come on, when the slough is detached, although no material quantity of blood may have been previously lost. (See *Hunter*, *p.* 525.)

Thus, several days after the receipt of the wound, and when all danger from inflammation is over, a bleeding per anum, occasioned by the separation of a slough from some internal vessel, may destroy the patient, as happened in a very interesting case reported by Mr. Guthrie. (*P.* 13, *Ed.* 2.) A soldier of the 2d battalion of the 44th regiment was shot in the ham at the assault of Bergen-op-zoom in 1814. There was no hemorrhage for ten days; but, at the end of this period, the popliteal artery gave way, and I was obliged to take up the femoral artery, by which means the bleeding was effectually stopped, and the man recovered. This fact, and another related by Baron Boyer, (*Annuaire Med. Chir. de Paris*, *p.* 364, *4to. Paris*, 1819,) prove, that a ligature on the femoral artery may sufficiently check the current of blood through the popliteal artery to put a stop to hemorrhage from a wound in it; and, though such practice in some other cases of wounded arteries is inefficient, on account of the facility with which the blood passes through the anastomoses into the part of those vessels below the ligature, (See *Arteries,*) its general success, in gun-shot wounds of the ham, would be of infinite advantage, not only on account of the difficulties of taking up the popliteal artery itself (difficulties ably depicted by Scarpa), but because laying open the inflamed and diseased parts would frequently have a fatal termination. At the same time, I would have surgeons always recollect the important difference between an aneurismal and a wounded artery; for, as in the first case, there is no outlet for the blood, the transmission of this fluid into the part of the vessel below the ligature may keep up a pulsation in the tumor, and retard the cure of the disease, but is attended with no risk of hemorrhage: while the same free passage of the blood into the wounded portion of a large artery would give rise to dangerous bleeding; and hence, the general necessity of applying two ligatures, one immediately above, the other below, the aperture in such a vessel. A single ligature on the brachial artery fails, as I had an opportunity of seeing in Holland in a case of gun-shot wound, where either that vessel, or the commencement of the radial, or ulnar, gave way, on the loosening of the sloughs, and, as there was considerable swelling, œdema, and inflammation of the limb, threatening gangrene, the surgeon, under whose care the patient was, deemed it right to perform amputation.

I should be sorry, if these observations were to hold out any general encouragement of the wrong and dangerous practice of applying only one ligature above a wound in a large artery, or in any recent case of *false diffused* aneurism. The remarks, delivered above, were chiefly intended to refer to gun-shot wounds of the ham, with injury of the popliteal artery, and hemorrhage first breaking out several days after the receipt of the wound, when all the parts behind the knee are enormously swelled, and in a state of inflammation and suppuration. Here the hope of avoiding any additional violence, or injury of the diseased parts behind the knee, may be a good reason for taking the chance of stopping the bleeding by a ligature applied to the femoral artery; a reason, however, which would not exist in the case of a recent wound of the popliteal artery with a knife. At the same time, I believe, this means of checking the current of blood will not always suffice, and that occasionally either the dangerous expedient of cutting open the swelling in this diseased state of the ham, and of applying a ligature above and below the aperture in the popliteal artery must unavoidably be encountered, or amputation performed. Why the first plan has answered in some cases, and not in others, may depend upon the size and condition of the wound, or opening in the artery, and, in examples of sloughing, upon the degree in which the tube of the vessel may have been closed by the adhesive inflammation. Some wrong conclusions may also have been made, respecting the trunk of the vessel being wounded, or opened, while in fact only a branch of it was concerned. As a qualification, therefore, of any inferences, which might be drawn from the partial success of applying one ligature only in cases of large wounded arteries, I annex the following remarks, published some little time ago in an ably conducted periodical work. "It appears to us, that some of the cases, which M. Roux has given, as the most favourable for the operation of Hunter, are the least so; for example, he performs it in the cases, where aneurism has formed in consequence of the wound of the artery. In support of this, he gives two cases, where, upon the authority of M. Mirault, of Angers, the ligature of the artery above the wound was sufficient. In one case, the humeral was the artery said to be wounded; in the other, the femoral. We doubt if the femoral were really wounded in this case; for, on referring to the report, we do not find sufficient evidence of that fact; it appears more probable, that a branch only was wounded. We have seen the operation of Hunter performed unsuccessfully in two cases of aneurism, consequent upon a wound of the artery; and we have seen the preparation of a third case, where the same operation was performed and failed; that is to say, the inosculations were so free, that hemorrhage returned by the lower orifice. In the first case, the popliteal artery was ruptured by a spicula of bone. The second was a wound of the femoral artery by an iron spike: and the third was a stab of the femoral artery by a knife. In each of these cases, the hemorrhage returned by the lower part of the artery. There is, in the Bulletins de la Faculté de Médecine, for 1813, a case by the same Mirault, of an aneurism of the femoral artery, in consequence of a wound some considerable time before. Mirault operated according to the method of Hunter, that is, he tied the artery above the aneurism. The sac burst, two hemorrhages ensued, and the second carried off the patient on the fifteenth day after the operation. (N. B. Here, however, it is proper to remark, that, if the case had been a true aneurism, and the sac had burst, while a stream of blood was yet passing through it, as always happens for some days after the ligature of the artery, above the tumor, hemorrhage would have occurred, just as it did in the present case of false aneurism. The premature bursting of the tumor, in fact, converted the case directly into one, analogous to a wounded artery, the blood having a passage outwards.) It is rather curious that the first case, which occurred to M. Roux, after his return from England, should be one, which forms a strong argument against performing the operation of Hunter for a wounded artery. The case, here alluded to, was that of a wound of the femoral artery with a knife, a little below the middle of the thigh, where M. Roux immediately cut down to the vessel some way above the injury, and there applied two ligatures, besides a reserve-ligature. On the tenth day, hemorrhage came on, when the tightening of the latter ligature having no effect, M. Roux exposed the artery higher up, and applied fresh ligatures immediately below the profunda. This stopped the hemorrhage from the upper end of the vessel, but, on the following morning fresh bleeding took place from the lower end of the artery, and it became necessary to lay open the artery below the wound, and, also apply ligatures there. No further bleeding took place." (See *Quarterly Journ. of Foreign Medicine*, *Vol.* 1, *p.* 14, 8*vo. Lond.* 1819.) The tenor of the preceding observations is unquestionably correct, inasmuch as wounded arteries and recent false diffused aneurisms are concerned; but with respect to cases of false circumscribed aneurisms, of some standing, without any external opening in the skin, they are examples, to which the same principles should not always be applied, which are so properly recommended to be observed with regard to the other instances. In these latter, the blood may either escape from the lower end of the vessel out of the external wound, or into the cellular membrane after the ligature is applied above the aperture in the artery; but, no sooner is a false aneurism encysted, than these dangers are prevented.

When the ball moves with little velocity, the mischief is generally less; the bones are not so likely to be fractured; the parts are less deadened, &c. However, when the velocity is just great enough to splinter a bone, which is touched, the splintering is generally more extensive, than if the impetus of the ball had been much greater, in which case, a piece is more likely to be taken out. When the ball moves slowly, it is more likely to be turned by any resistance it may encounter in its passage through parts, and hence the wound is more apt to take a winding course.

When a ball enters a part with great velocity, but is almost spent, before it comes out again, in consequence of the resistance it has met with, there may be a good deal of sloughing about the entrance, and little or none about the exit, owing to the different degrees of celerity with which the ball traversed the parts. (See *Hunter.*)

Gun-shot wounds may have either one, or two apertures, according as the ball has lodged, or passed quite through the part. In some cases, the openings are diametrically opposite each other; in others they are not so, the direction of the ball having been changed by the resistance, which it met with from a bone, cartilage, tendon, &c. Thus a ball has been known to enter just on the inside of the ankle, and come out near the knee, to enter the forehead and come out at the temple, &c. (*Richerand, Nosographie Chir. T.* 1, *p.* 219, *Edit.* 2.) Dr. Hennen mentions an instance, in which a ball entered near the pomum Adami, and, after running completely round the neck, was found in the very orifice, at which it had entered. "This circuitous route is a very frequent occurrence, particularly when balls strike the ribs, or abdominal muscles; for, they are turned from the direct line by a very slight resistance indeed, although they will at times run along a continued surface, as the length of a bone, along a muscle, or a fascia, to a very extraordinary distance." Dr. Hennen refers to cases, in which the ball traversed almost the whole extent of the body and extremities. "In one instance, which occurred in a soldier, with his arm extended in the act of endeavouring to climb up a scaling ladder, a ball, which entered about the centre of the humerus, passed along the limb, and over the posterior part of the thorax, coursed among the abdominal muscles, dipped deep through the glutæi, and presented on the forepart of the opposite thigh, about midway down. In another case, a ball, which struck the breast of a man standing erect in the ranks, lodged in the scrotum." (*Principles of Military Surgery*, *p.* 34, *Ed.* 2.) The opening, where the ball enters, is always smaller than that from which it escapes, and its margin is forced inwards, while the circumference of the other aperture is quite prominent. The contusion and injury, which the parts suffer, are also greatest about the entrance of the ball, owing to the more considerable impetus, with which it moves. The yellowish livid hue, around gun-shot wounds, is a sort of ecchymosis, or extravasation of blood. The injured member is often benumbed and stupified, and, when mortification occurs, it spreads with extraordinary rapidity. When the whole constitution is thrown into this kind of torpor, the most fatal consequences are to be apprehended. "C'est dans cet état, (says Richerand) que mourut le chevauléger, dont parle Quesnay; l'état d'hébétude était tel, que cet individu à qui l'on proposa l'amputation de la jambe, répondit que ce n'était pas son affaire." (*Nosographie Chirurg. Tom.* 1, *p.* 221, *Edit.* 2.) In cases of gun-shot wounds, sudden shiverings, syncope, and nervous symptoms are not unfrequent. Such occurrences, with other bad effects, made the ancients suspect, that something poisonous was carried into the wound; an opinion, which is now well known to be erroneous.

When there is only one opening, we may infer, that the wound contains a foreign body. An exception to this observation occurs, however, when a ball, instead of tearing the clothes, or linen, carries a portion of them, in the form of a sac, into the wound, and when such portion of the clothes is withdrawn the ball falls out, and if this circumstance be not noticed, the presence of a single opening may lead to the idea, that the bullet is lodged in the part. An instance of this kind is cited by Paré for the purpose of refuting the former notion, that the ball burnt the parts. A case, in which a piece of a shirt was carried in this manner four inches into the flesh is mentioned by Mr. Guthrie. (*P.* 20, *Ed.* 2.) It is possible also for a ball to be stopped immediately it has entered the body, and then to be ejected by the elasticity of the parts, against which it strikes, as the cartilages of the ribs. (*Guthrie*, *p.* 19, *Ed.* 2.) When there are two apertures made by one shot, the ball has escaped: but pieces of the clothes, &c. may still be lodged in the part. Care must be taken, however, not to confound with these cases others, in which the plurality of openings has been made by different balls.

As a modern writer has accurately explained: "It is no uncommon thing for a ball, in striking against the sharp edge of a bone, to be split into two pieces, each of which takes a different direction. Sometimes it happens that one of the pieces remains in the place, which it struck, while the other continues its course through the body. Of a ball, split by the edge of the patella, I have known one half pass through at the moment of the injury, and the other remain in the joint for months, without its presence there being suspected. In the same manner, I have known a ball divided by striking against the spine of the scapula, and one portion of it pass directly through the chest, from the point of impulse, while the other moved along the integuments, till it reached the elbow-joint. But, the most frequent examples of the division of bullets, which we had occasion to see, were those which were produced by balls striking against the spherical surface of the cranium. It sometimes happens, that one portion of the ball enters the cranium, while the other either remains without, or passes over its external surface. Not unfrequently, in injuries of the cranium, the balls are lodged between its two tables, in some instances much flattened, and altered in their shape, and, in other instances, without their form being changed." From these facts, it must be evident, that even when a gun-shot wound has two orifices, the surgeon cannot be certain, that the bullet has not been divided, and that no portion is lodged, unless the entire ball itself happen to be found. (See *Thomson's Reports of Obs. in Military Hospitals in Belgium, p. 37, &c.)*

As the ends of the torn vessels are contused and compressed, gun-shot wounds have less propensity to bleed at first seriously, than most other wounds, unless vessels of importance happen to be injured. There may even be little hemorrhage at first, though a considerable artery be so hurt, that it afterwards sloughs, and a dangerous, or fatal bleeding arises. Thus (as I have already mentioned), in one of my own patients, who had received a musket-ball through the ham, the popliteal artery gave way about ten days after the injury, and compelled me to take up the femoral artery; and, in the Elizabeth Hospital at Brussels, amongst the patients under the care of my friend Mr. Collier and myself, about a week after the battle of Waterloo, the cases of hemorrhage, on the loosening of the sloughs, were tolerably numerous, not at all coinciding with a recent calculation, that the proportion of such examples, requiring the ligature of arteries, is only three or four in 1000. (*Guthrie on Gun-shot Wounds, p. 8, Ed. 2.*) In Holland, the truth of Mr. Hunter's observation upon this point appeared to me to be equally confirmed.

It has long been known, that a limb may be torn, or shot off, even near to the trunk of the body, and hardly any hemorrhage arise. We had numerous proofs of this fact after the battle of Waterloo. I had under my care a man of the rifle brigade, whose arm was shattered to pieces as high as the shoulder, yet there was no hemorrhage. I amputated the thigh of a Dutch soldier whose leg had been completely shot off by a cannon-ball; but there was no hemorrhage before the operation. At Merksam, in 1814, I saw a case, in which the greater part of the clavicle, scapula, and many adjacent parts had been carried away by a cannon-ball; and yet no bleeding of consequence occurred.

Sometimes, after these violent injuries, the large arteries do not bleed in amputation. "We saw a man (says Dr. Thomson), whose leg had been shot off by a cannon-ball; in amputating his limb above the knee, the arteries of the thigh were not perceived to bleed; nor did any of them afterwards require to be tied. A case, similar to this, also, presented itself, in which the arm had been shot away close to the shoulder-joint."

Sometimes the contusion, produced by a cannon-ball, or the passage of a bullet in the vicinity of a large artery, seems to cause a laceration of the inner coat of the vessel, and a subsequent obliteration of its cavity by the effusion of coagulable lymph. Facts in proof of this statement are recorded by Dr. Thomson. (See *Reports of Observ. in the Military Hospitals in Belgium, p.* 34—35.)

Angular uneven bodies, such as pieces of iron, cut lead, &c. produce far more dangerous wounds, than round even bodies, like leaden bullets. Wounds occasioned by a small shot are frequently more perilous, than others produced by larger balls; because their track is so narrow, that it cannot be traced, nor consequently the extraneous body itself extracted. Such a shot often injures a viscus, when there is not the smallest external symptom of the occurrence. Sometimes a great part of the danger, also, arises from the number of the shots which have entered.

TREATMENT OF GUN-SHOT WOUNDS.

The first thing in the treatment of a gun-shot wound in one of the extremities, is to determine, whether it is most advisable to amputate the limb immediately, or to undertake the cure of the wound. When a bone, especially at a joint, is very much shattered; when the fleshy parts, particularly the great blood-vessels and nerves, are lacerated; when the whole limb has suffered a violent concussion, and is cold and senseless; there is no hope of preserving it. In this case, it is the surgeon's duty to amputate at once, and not to delay till inflammation, fever, and a tendency to mortification come on. But, besides this violent degree of injury, in which the propriety of amputation is obvious, there are several lower degrees, in which it is often a difficult thing to decide whether the operation is necessary or not. Here the surgeon must look not only to the injury, but also to the patient's constitution, and even to external circumstances, such as the possibility or impossibility of procuring good accommodation, rest, attendance, and pure air. But it is impossible to determine the necessity of amputation by general rules. In every individual case, the surgeon must consider maturely the particular circumstances, before he ventures to decide. The grounds against the operation are; the pain which it causes at a period when the whole system is disordered by a terrible injury; the privation of a limb; and frequent examples, in which nature, aided by judicious surgery, repairs the most horrible wounds. The following are the reasons in favour of the operation. By it the patient gets rid of a dreadful contused wound, which threatens the greatest peril, and which is exchanged, as it were, for a simple incised one. The pain of amputation is not of more moment than the pain which the requisite incisions, and the extraction of foreign bodies, would cause in case the operation were abandoned. In cases of gun shot wounds, the loss of the limb cannot be taken into the account; for, the surgeon only undertakes the operation where he designs to save the patient's life by that privation, and anticipates that the part itself cannot be preserved. Even if he should deprive the patient of a limb, that, perhaps, might have been preserved, there is this atonement, that he can furnish him with an artificial leg, which often proves far more serviceable than the lost limb would have proved, had it been preserved. Should the operation be fixed on, it is to be immediately performed above the wound. (*Richter, Anfangsgr. der Wundarzn. B.* 1.)

When amputation is deemed unnecessary, the surgeon, according to precepts formerly in vogue, is to dilate the wound by one or more incisions. Many of the missile weapons employed by the ancients, when received into the body, required incisions before they could be extracted; and this was the case, not only with regard to darts and arrows, but also with regard to bits of stone, pieces of iron, and leaden bullets, which were thrown by means of slings. Celsus mentions the necessity of enlarging the orifices, through which these bodies had entered, and may there fore be justly regarded, as the first who recommended the practice of dilatation in the treatment of wounds made by leaden bullets. (*Thomson's Obs. in the Military Hospitals of Belgium*, *p.* 39.)

Such a dilatation has been said to have numerous advantages: to facilitate the extraction of foreign bodies; to occasion a topical bleeding, and afford an outlet for the extravasated fluid in the circumference of the wound; to convert the fistulous form of the track of the ball into an open wound; and, lastly, to divide ligamentous aponeuroses, which otherwise might give rise to spasmodic and other untoward symptoms.

More modern experience proves, however, (*Hunter*, *p.* 529,) that the utility of such incisions has been overrated; that they generally increase the inflammation, which, in these cases, is so much to be apprehended; that wounds which are not dilated, commonly heal more speedily than others which are; and that there are only a few cases, in which incisions are beneficial. In fact, as Dr. Hennen has correctly stated, the knife is now rarely, if ever employed in the first instance by English surgeons, except for the purpose of extracting balls, splinters of bone, and other extraneous bodies, or for facilitating the application of ligatures to bleeding vessels. (See *Principles of Military Surgery*, *p.* 49, *Ed.* 2.)

The injuries, arising from the practice of indiscriminate dilatation, (says Dr. Thomson) were very early pointed out by Botallus; and it is singular, how much the opinions of this author, with regard to this point in military surgery, coincide with those of Mr. Hunter. (*Op. cit. p.* 40.)

The cases of gun-shot wounds are various. Sometimes the track of the ball lies superficially under the skin, and only has one opening. When it lies in soft parts, and the ball has neither touched a bone, nor a considerable blood-vessel, all incisions are useless, let the wound have one or two apertures. Though dilating the wound has been practised with a view of giving vent to matter, eschars, and foreign bodies, and even its whole track has been laid open, when superficial; yet, experience proves the inutility of such steps. As, when a ball has passed with great force, there is often a real loss of substance in the skin, a portion of which is driven inward before the ball, it follows, that the opening of a gun-shot wound must be more capacious than that of a punctured one. By the separation of sloughs, the wound becomes still more dilated, so that not only matter, but foreign bodies, which approach the skin, easily find an exit. Besides, incisions commonly close again very soon, and, in a few days, the wound falls into the same state, as if no dilatation at all had been made. (*Hunter*, *p.* 532.)

Ligamentous fibres, and fasciæ, are often situated about the orifice of a gun-shot wound, and some surgeons have made it a rule always to divide them completely, lest, when the wound inflames, the tension and confinement of parts should cause violent spasms and nervous symptoms, and afterwards impede the discharge of matter and foreign bodies. When they obviously have the first effects, the propriety of dividing them cannot be doubted; but, with a mere expectation of the other evils, I consider the practice injudicious. Here, as Mr. Hunter wisely remarks, the method would be very good, if tension and inflammation were not a consequence of wounds, or, if it could be proved, that the effects of dilating a part, that is already wounded, were different from those of the first wound; but, the employment of the knife, being only an extension of the first mischief, must be contradictory to common sense, and common observation. (*On Gun-shot Wounds*, *p.* 534. *4to.*)

The extraction of foreign bodies ranks as one of the most urgent motives for the dilatation of the wound, and, no doubt, it is right to remove, at first, as many of them as possible. Their lodgment irritates the wound, causes violent nervous and inflammatory symptoms, and copious suppuration; circumstances, which the timely extraction of them may prevent. Yet, let it be remembered, that the extraction of foreign bodies is frequently attended with immense irritation, and that, while they lie too firmly fixed in parts, it is often a matter of impossibility. After the sloughs have separated, and the wound has become widened, suppuration frequently does not prevail long before the extraneous substances become loose, spontaneously approach the skin, and easily admit of removal without any dilatation.

Hence, it is generally prudent to extract, at first, only such foreign bodies as are near the external opening, quite loose, and removable without much irritation; or such as press on parts of importance, and, thereby excite dangerous symptoms. The surgeon should avoid interfering with those which are deeply and firmly lodged in the wound. He should await suppuration, and the detachment of sloughs, and when the foreign bodies become moveable and apparent, he should extract them, with or without an incision, as circumstances may demand. The examination of the wound ought to be made as much as possible with the finger, which irritates less, and feels more distinctly, than a probe. A great variety of instruments have been devised, either for ascertaining the position of balls, and other foreign bodies in gun-shot wounds, or for extracting them. But, however numerous and diversified bullet-drawers may be, they all admit of being divided into three kinds. The first are constructed on the principle of a pair of forceps: others are shaped more or less like spoons; and a third description are made on the plan of a cork-screw or worm. These last are only designed for cases, in which the ball is fixed in the substance of a bone, and is quite immoveable; for, if it were lodged in the soft parts, the pressure, requisite for introducing the screw into it, would injure and lacerate the parts at the bottom of the wound. Bullet-drawers, constructed on the plan of forceps, have the inconvenience of not being adapted for seizing the ball, unless their blades are expanded, which always stretches the wound, and creates a great deal of irritation. Forceps have been contrived with blades, which may be introduced separately, and then joined together with a screw. When a ball lies superficially, the fingers, or a small pair of forceps, will extract it most conveniently. And, with respect to bullet-extractors, as Dr. Hennen has justly observed, they are completely superseded by the common forceps, or that of Baron Percy, though unfortunately the aid of instruments is most required in tortuous deep passages, where we can least make use of them. (*Principles of Military Surgery*, p. 76, *Ed.* 2.)

The event of the treatment above recommended, is various. Extraneous substances remaining in the wound, either loosen gradually, and come into view so as to be easily removable; or they continue concealed, prevent the cure, and give birth to a fistulous ulcer. In some instances, the wound closes, and the foreign bodies remain in the limb during life, without inconvenience; and, in other cases, after a time, they bring on a renewal of inflammation and suppuration. Sometimes a foreign body varies its situation, sinking down, and afterwards making its appearance at a different part, where it may excite inflammation and suppuration.

When the ball lodges in the wound, it is usually difficult to trace it, as the parts collapse after its passage, and leave an opening in the skin much smaller than the ball itself. The ball does not regularly take a straight direction through the injured part, but, often, a very tortuous one, particularly when the ball is nearly spent. In every case, in which it is not easily discoverable, all painful examinations should be abandoned, and the foreign body left in its situation, until its place is better known, and the first inflammation is over.

Sometimes, the ball may be both easily found and extracted. At other times, it lodges on the opposite side of the limb, closely under the skin. According to Mr. Hunter, if the integuments, under which the ball is lodged, should be so contused that they will probably slough, they are to be considered as already dead, and an opening is to be made in them for the extraction of the ball. But, when the ball lies so remotely from the skin that it can only just be felt, and the skin itself is quite uninjured, no counter opening ought to be made. The wound heals better when the ball is left in, and far less inflammation takes place in the vicinity of this extraneous body, than about the orifice of the wound. A counter-opening always renders the inflammation at the bottom of the wound, as great as at its orifice. It is better to let the wound heal up, and extract the ball afterwards. (See *Hunter*, *p.* 541.)

To the justness of this advice, Mr. Guthrie does not assent, who assures us,, that he has cut out a great number of balls, which were not more than an inch from the surface, and never found any inconvenience ensue. But, when the ball lies three or four inches from the surface, and cannot be distinctly felt, he thinks, that no incision should at first be made with the view of extracting it. (*On Gun-shot Wounds*, *p.* 94—95, *Ed.* 2.)

Sometimes, the ball penetrates the spongy part of a bone, and lodges firmly in it. When it has only entered superficially, it may sometimes be loosened and extracted, by means of an elevator with a thin and somewhat curved extremity, and when it is more firmly fixed, a screw bullet-drawer will sometimes serve for its removal. Should the attempt fail, the employment of a trepan for the removal of the ball is recommended by some writers; while others, fearful of the irritation, difficulty, and effects of such an operation, and recollecting that balls have sometimes remained fixed in bones for many years, without any serious inconvenience, condemn that practice. On the contrary, Mr. Guthrie lays it down as a general rule, subject to a few exceptions, that a ball should never be allowed to remain in a bone; for, says he, "if a ball lodge in the head of a bone, and is not removed, it generally causes caries of the bone, disease of the joint, amputation, or death. If in the shaft of a long bone, necrosis for the most part follows, with months and years of misery. On a flat bone, caries is equally the result, and, if it be surrounded by large muscles, sinuses form in various directions, contractions of the limb take place, and the patient drags on for years, careless of life, and ready to submit to any thing to obtain relief." (*On Gun-shot Wounds*, *p.* 91—93, *Ed.* 2.) In many of these cases, one thing deserves to be recollected, however, that the necrosis, abscesses, and sinuses are less the effect of the lodgment of the ball, than of the violence originally committed on the parts, against which it has struck. Although Baron Larrey only sanctions the attempt to remove balls with a trephine, when they actually produce dangerous effects, (*Mém. de Chir. Mil. T.* 4, *p.* 185,) I am disposed to believe, that whenever the situation of the ball is such, that it can be removed at once from a bone with tolerable certainty, and without too much irritation, the practice is commendable. This branch of the treatment of gun-shot wounds appears to me still to require further elucidation, for though experience has been abundant, the right rules and principles of practice are not yet laid down in the best modern works.

As soon as the requisite incisions are made, and foreign bodies extracted, the prime objects in the treatment of gun-shot wounds are accomplished, and the rest is, in reality, not different from the surgery of other wounds.

With regard to probing gun-shot wounds; when it is evident that the shot has passed out, and no particular object can be fulfilled with the probe, it is often better to dispense with such examination, at least till suppuration has come on. Introducing any instrument is generally productive both of pain and irritation. But when the ball, or any other extraneous substance, has lodged in the wound, and its situation is not immediately evident, it will often be advisable to search for it at once, in order that it may be extracted, if its situation will allow, before inflammation begins. The surgeon, therefore, considering all the circumstances which can assist him in forming a reasonable conjecture of the course of the wound, must give to a probe that curvature, or form, which he thinks most likely to pass readily along it, and must then proceed to make the examination. But, when this is very painful, and the course of the wound obscure, it will often be better to desist, and renew the search when suppuration has taken place, in which stage it can be undertaken with more ease, and a greater prospect of success. When gun-shot wounds are inflamed, the tenderness and swelling of the parts are peculiarly strong reasons against painful probings, or efforts to extract foreign bodies, as long as this state lasts. (See *Chevalier on Gun-shot Wounds, p.* 67—68, *Edit.* 3.)

There is no fact in the practice of surgery better established, than that the cramming of narrow stabs and gun-shot wounds with lint is particularly hurtful. The only possible reason for doing so in the latter cases must be to keep the orifice of the wound from healing up, and confining extraneous bodies, matter, &c. The apprehension of this happening at first is quite unfounded; for the inside of the mouth of the injured part is often lined with a slough or eschar, which must necessarily be detached before the parts can heal. The first dressings, therefore, should be quite superficial, and of a mild unirritating nature. On the field of battle, indeed, it would be well for many of the wounded, if the surgeon were to content himself with applying simple pledgets, and covering the part with linen wet with cold water. This method would prove much more beneficial, than the hasty and indiscriminate use of adhesive plasters, sutures, and tight bandages, from the bad effects of which thousands of soldiers have lost limbs, or lives, which, under more judicious treatment, might have been saved. Hunter used to employ fomentations, pledgets of simple ointments, and, frequently, over the latter an emollient poultice. In the suppurative stage of gun-shot wounds, poultices are generally allowed to be the best applications.

Possessing these ideas, I cannot altogether approve the following directions, though they are certainly better, than are given in many surgical books. "A small bit of soft lint may be placed lightly between the lips of the wound, *in order to keep it from closing.* In some instances, it should be introduced a little beyond the lips, *in order to conduct off the fluids effused, and to prevent irregular adhesions from forming near the surface during the inflammatory stage;* as these would impede the direct exit of the discharge. But the wound is not to be filled with lint, much less crammed with it. A pledget of some simple ointment being then laid on, with tow or cloths to receive the discharge, and these prevented from coming off by a bandage loosely applied, the patient may be put to bed, and so placed, if possible, as to keep the orifice of the wound dependent." (*Chevalier, p.* 125—126.) The reasons for what I consider objectionable, namely, introducing lint on first dressing the wound, are too frivolous to need comment.

In considering the effects of poultices and cold applications upon gun-shot wounds, Mr. Guthrie expresses his decided preference to the use of cold water:—"The inflammation is, in some instances, materially prevented, in many greatly controlled, and, in almost all, very much subdued by it, whilst the suppurative process is not impeded in the generality of cases, in a degree sufficient to interrupt the subsequent one of granulation. In all simple cases of gun-shot wounds, that is to say, flesh wounds, in persons of a healthy constitution, a piece of lint, which has been dipped in oil, or on which some ointment has been spread, is the best application at first to prevent irritation, with two slips of adhesive plaster placed across to retain it in its situation. A compress, or some folds of linen, wetted with cold water, are then to be applied over it, and kept constantly wet and cold, even by the use of ice, if it can be obtained, and be found comfortable to the feelings of the patient. A roller is of no use, except to prevent the compress from changing its position during sleep, and is, therefore, at that period useful; but as a surgical application, it is useless, if not positively injurious, because it binds a part, which ought to a certain extent, to swell, and by pressure causes irritation. Rollers ought not to be applied surgically until after some days have elapsed, and it is inexpedient to employ them in the field of battle, even if they were useful, except where some parts are to be kept in position; because, when they are applied in the first instance, they soon become stiff and bloody, are for the most part cut, and are seldom preserved after the first dressing, so as to become useful at the period, when the surgical application of a roller is indispensable." To this just censure of the wrong employment of rollers, Mr. Guthrie annexes some remarks, in which he enters into a general condemnation of poultices, as applications to gun-shot wounds, believing, that, in many instances, cold water may be employed with the best effect, during the whole progress of the cure. These remarks are tempered with the following admission:—"Cold water is not, however, an infallible, or even always an advantageous remedy: there are many persons, with whom cold applications do not agree; there are more, with whom they disagree after a certain period; and, in either case, they should not be persisted in. Cold does no good in any stage of inflammation, when the sensation accruing from the first application of it is not agreeable to the feelings of the patient; when, in fact, it does not give relief; for, if it produces a sensation of shivering, or an uncomfortable feeling of any kind, with stiffness of the part, it is doing harm, and a change to the genial sensation of warmth will not only prove more agreeable, but more advantageous. This occurs in general about the period when suppuration has taken place; and cold, in such cases, is preventing the full effect of the action which warmth encourages. Fomentations are then proper; and, if a poultice be preferred for convenience, by day or by night, an evaporating one of bread will be found sufficient. In the spring of the year, the marsh mallow makes an excellent poultice, and so do turnips, gourds, carrots, &c. independently of oatmeal, linseed-meal, Indian-meal, and other farinaceous substances. In all those cases, where a poultice is resorted to, as much attention is to be paid to the period of removing, as of applying it. It is used to alleviate pain, stiffness, swelling, the uneasiness arising from cold, and to encourage the commencing, or interrupted, action of the vessels towards the formation of matter; and, as soon as the effect intended has been gained, the poultice should be abandoned, and recourse again had to cold water, with compress and bandage." (*P.* 62—67. *Ed.* 2.) Although I fully coincide with Mr. Guthrie, respecting the general advantage of cold water, the dangers of tight bandages, and the bad effects of continuing poultices too long, I do not join him in many of the sentiments which he has expressed about these last invaluable applications. On the contrary, I appreciate them as the best means, wherever a slough is to be thrown off, or matter is decidedly forming, and, as these effects are very frequent in cases of gun-shot wounds, my own opinion of the utility of cold applications is limited to the first three or four days after the receipt of the injury. Nor ought cold applications ever to be continued, where the torpor, low temperature, and languid circulation in the limb, indicate a risk of gangrene. Hence, when a principal artery is tied, their employment is always wrong and hazardous. At the same time, I have no hesitation in declaring my firm belief, that fifty times more mischief has been done by tight rollers applied to recent gun-shot wounds, than by either poultices or cold applications.

Formerly, when the track of the ball had two apertures, a seton was sometimes drawn through it, with the view of preventing a premature closure of the wound, and introducing proper applications. The seton was, also, imagined to give free vent to pus, and to promote the evacuation of foreign bodies. But a gun-shot wound is little inclined to close prematurely, and while a seton rather obstructs the exit of pus, it may as easily push foreign bodies more deeply into the limb, as out of it. There are preferable modes of applying the necessary remedies, and, as a seton is an extraneous substance itself, its employment cannot fail to be highly pernicious.

Gun-shot wounds generally demand the employment of antiphlogistic means, just as other cases, attended with equal inflammation. When they are in the inflamed state, the application of leeches is highly proper. In these cases, bleeding is recommended, and in such a manner as if it were of more service in them, than wounds in general. But the necessity for the practice is really not greater than in other wounds, which have done the same degree of mischief, and from which the same quantity of inflammation and other consequences are expected. Bleeding is certainly proper here, just as it is in all considerable wounds attended with a strong full habit, and great chance of extensive inflammation, and much symptomatic fever. In every instance, however, the practitioner must take particular care not to be too bold in the practice of bleeding; for when the patient is reduced below a certain degree, his strength is inadequate to support the large and long-continued suppurations which often cannot be avoided. (See *Hunter, p.* 563—564.)

As the orifices of the vessels torn by the ball are compressed, and, as it were, obliterated, sometimes no hemorrhage of importance is remarked at first. But as I have already stated, after some days, and frequently at a very late period, when the sloughs separate, copious hemorrhages may occur, which are the more dangerous as they come on unexpectedly, and often when the suppuration has already induced great debility. The surgeon himself may occasion the bleeding, by removing the dressings carelessly. Hence, in every case, where, from the situation of the wound, there is reason to apprehend injury of some considerable vessel, the patient must be constantly and attentively watched, and every thing necessary for the immediate stoppage of hemorrhage provided.

Another kind of hemorrhage, still more dangerous than the former, particularly occurs in such gun-shot wounds as have long been in a state of copious suppuration. The blood does not issue from one individual vessel, but from the whole surface of the wound, as from a sponge, and is so thin as to resemble blood and water. This hemorrhage is very dangerous, because it is particularly apt to exhaust the patient, who is already debilitated, and its causes are difficult of removal. The case demands the exhibition of bark, and diluted sulphuric acid; the decoction of bark, with a proportion of muriatic acid, being applied to the wound. (*Richter.*)

Gun-shot wounds, in crowded military hospitals, especially when they are established in unhealthy, low situations, and due attention is not paid to ventilation, cleanliness, and fumigations with nitric acid gas, are often attacked with hospital gangrene, a very serious and dangerous complication, of which I shall speak under the head of *Hospital Gangrene.*

The plan of removing the first dressings too soon is as injurious in gun-shot wounds as other cases, by creating a premature disturbance of the parts. This observation is particularly true, where dry lint has been used, and it is adherent to the wound. Unless the occurrence of bleeding, severe pain, or other untoward symptoms, were to render a different line of conduct necessary, I think such dressings should rarely be removed before the end of the fourth day. And if cold water has not been continually applied over the lint, so as to keep it moist, or if such lint has not been spread with some mild salve, or dipped in oil, I deem it a good rule to apply an emollient poultice over it the evening preceding the morning, on which the dressings are to be first changed. By this means, they will be loosened, and admit of being taken away without pain or irritation. With the same view, plenty of warm water should be squeezed from a sponge, and allowed to fall upon the dressings. Pledgets of oil, or ointment, should generally be taken off earlier than dry lint, for they are less adherent, and, in warm weather, soon become rancid and irritating

For the first days, the matter seldom assumes a healthy appearance; but as soon as the sloughs separate, it then becomes of a proper quality, and the wound is to be treated as a simple abscess.

Sometimes the healing process does not commence, though suppuration has prevailed a considerable time. On the contrary, notwithstanding the exhibition of tonics, and a generous diet, the suppuration ceases to proceed favourably, and the wound becomes unhealthy, and the matter thin. The bones show no disposition to unite, and the patient, reduced by hectic symptoms, is rapidly approaching dissolution. In this state, life may sometimes be preserved by amputation; the *anceps*, but *unicum remedium.* We ought never to be deterred from undertaking the operation by the fever and weakness, which frequently soon disappear when the local cause is removed.

OF AMPUTATION IN CASES OF GUN-SHOT WOUNDS.

The 2nd edition of this dictionary, published in 1813, contained all the valuable observations of Baron Larrey, in favour of *immediate* amputation in every instance, in which the operation is considered indispensable. Since then, the public have been favoured with several good practical books, in which the propriety and necessity of early or immediate amputation in such cases are urgently inculcated, and the truth of the doctrine is illustrated by additional facts. It is to be observed, however, that for nearly two hundred years past, there have always been some advocates for this judicious practice. "Du Chesne (says Dr. J. Thomson,) is the first writer on military surgery, in whose works I have found the recommendation to amputate in the severer injuries of the extremities; and it is worthy of remark, that *he directs the operation to be performed before inflammation and other constitutional symptoms* shall have supervened." (See *Traité de la Cure générale et particulière des Arcbusades. Par Jos. Du Chesne; Paris*, 1625, *p.* 143; and *Thomson's Report, &c. p.* 160.) Wiseman not only recommended and practised immediate amputation; but the same thing was not unfrequently done by the military surgeons of his time. (*Chirurgical Treatises, by R. Wiseman*, 3*d Edit. Lond.* 1696, *p.* 410.) The celebrated Le Dran, in his excellent little manual of military surgery, declared himself an advocate for *immediate* amputation in all cases, in which that operation from the first appears to be indispensable. Le Dran has at the same time stated briefly, but most distinctly, the comparative advantages of that practice, with those which may be expected by delay. (See *Traité où Réflexions tirées de la Pratique sur les Plaies d' Armes à feu. Par H. F. Le Dran; à Paris*, 1737.) Ranby, who was serjeant-surgeon to King George II. entertained similar opinions to those of Le Dran, with regard to the utility of immediate amputation. In order to give immediate relief to the wounded, and to facilitate the performance of the necessary operations, Ranby proposed, that the surgeons, during battle, should be collected into small bodies, and stationed in the rear of the army. (See *The Method of treating Gun-shot Wounds. By John Ranby. Edit.* 3, *p.* 29, *London*, 1781.)

After the battle of Fontenoy, in the year 1756, the Royal Academy of Surgery in France offered a prize for the best dissertation on the gun-shot injuries requiring immediate amputation, and on other cases of the same nature, where the operation, though deemed inevitable, might be delayed. "*L'amputation étant absolument nécessaire dans les plaies compliquées de fracas des os, et principalement celles qui sont faites par armes à feu, déterminer les cas où il faut faire l'operation sur le champ, et ceux ou il convient de la différer, et en donner les raisons.*" The prize was adjudged to the dissertation of M. Faure, the main object of whose paper was to recommend delaying the operation. The side of the question espoused by M. Faure has found some modern advocates of distinguished talents and celebrity. Suffice it to mention the names of Hunter, Baron Percy, and Lombard. It is, however, only justice to M. Faure to state in this place, that though he regarded immediate amputation as full of danger, he admitted, that there were several kinds of injuries of the extremities, in which it was indispensably and immediately required. "The enumeration (says Dr. Thomson) which this author has given of these injuries is more full and distinct than any which had been published before his time; and, what may appear singular, *it does not differ, in any essential respect, from the enumerations given by later writers*, who, in combating his opinions, have represented him as an enemy to amputation in almost all injuries of the extremities." (See *Report of Observations made in the Military Hospitals in Belgium, p.* 169.)

In 1792, Baron Percy, who was a few years ago at the head of the medical department of the French army, published a book, in which he gives a preference to delaying amputation at first, even in cases where it is certain, that the operation cannot ultimately be dispensed with. (See *Manuel de Chirurgien d' Armée.*) Even as late as 1804, Lombard, Professor in the Military Academy of Strasburgh, defended the doctrines of M. Faure. (See *Clinique Chirurgicale des Plaies faites par armes à feu.*)

Although, in France, the Academy of Surgery thought proper to decree the prize to M. Faure, whose doctrine thus received the highest approbation, yet, in that country, very opposite tenets were set up by some men of distinguished talents and extensive military practice. Thus Le Dran, consulting surgeon to the French army, in his work on gun-shot wounds, published in 1737, expressly states, "That when the amputation of a limb is indispensably necessary in the case of a gun-shot wound, it ought to be done without delay." (*Aphorism* 9.) De la Martinière in particular also wrote some excellent arguments in reply to Bilguer; arguments, which, I think, would do honour to the most accomplished surgeon of the age, in which we live. (See *Mémoire sur le Traitement des plaies d' armes à feu, in Mém. de l' Acad. de Chirurgie, T.* 11, *p.* 1, *Edit. in* 12*mo.*) M. Boucher, of Lisle, was an advocate for the same side of the question. (See *Obs. sur des plaies d'armes à feu, &c. in Mém. de l'Acad. de Chirurgie, Tom.* 5, *p.* 279, *&c. Edit. in* 12*mo.*) Schmucker, who was many years surgeon-general to the Prussian armies, published in 1776 an essay on amputation, in which he particularly mentions, that, during his stay at Paris, in 1738, the surgeons of the Hôtel Dieu had been in the habit of performing immediate amputation in severe injuries of the extremities. *He also declares himself an advocate for operating immediately, in all cases in which amputation from the first appears to be necessary,* and insists, in a particular manner, on the increased danger, which he had seen arise from the operation during the second period. He gives (as Dr. J. Thomson has observed) a minute and circumstantial enumeration of those injuries, both of the upper and lower extremities, in which he conceived amputation to be necessary, and in many of which he had actually performed it with great success. Schmucker appears to Dr. Thomson to have given a better account, than any preceding military surgeon, of the injuries of the thigh; and from the results of his experience, he was led to believe, that *though compound fractures of the lower part of the thigh-bone might, in favourable circumstances, be cured without amputation, yet that this operation is peculiarly necessary in all cases, in which the fracture is situated in, or above, the middle of that bone.* (*J. L. Schmucker, Vermischte Chirurgische Schriften, B.* 1. *Berlin,* 1785.) With the foregoing high authority we have to join one of not less celebrity, namely, that of Baron Larrey, who has proved most convincingly, that when amputation is to be done in cases of gun-shot wounds, nothing is so pernicious as delay. (See *Mémoires de Chirurgie Militaire, Tom.* 2, *p.* 451, &c.)

It becomes me here to state, also, that the principles inculcated by Baron Larrey, are, in point of fact, the same as those, which were so strenuously insisted upon by Mr. Pott, whose principal remarks on the necessity of amputation in certain cases, are detailed in another part of this publication. (See *Amputation.*) Mr. Pott, indeed, was not an army surgeon, and what he says, was not particularly designed to apply to military practice; but, he has represented, as well as any body can do, the propriety of immediate amputation for injuries, which leave no doubt, that such operation cannot be dispensed with.

Mr. John Bell, amongst the moderns, appears to me likewise to have much merit, for the able manner, in which he defended the propriety of early amputation, long before the sentiments of later writers were ever heard of. He distinctly states, that, "amputation should, in those cases where the limb is plainly and irrecoverably disordered, be performed upon the spot." (See *Discourses on the Nature, &c. of Wounds, p.* 488, *Edit.* 3.) In short, notwithstanding all the modern pretensions to novelty upon this interesting topic, we must acknowledge, with Dr. Thomson, that the evidence, in favour of the advantages of immediate amputation, has always preponderated over that for delay. (See *Report of Obs. made in the Military Hospitals in Belgium, p.* 225.)

The strongest body of evidence upon this matter, is undoubtedly adduced by Baron Larrey, whose situation at the head of the medical department of the French armies afforded him most numerous opportunities of judging from actual experience. "Upon this subject, (says he) now that twenty years of continual war have carried our art to the highest pitch of perfection, there can only be one opinion. It is after having incessantly directed the medical service, all this time, in quality of head-surgeon and inspector-general of the armies, that I proceed to discuss the different opinions delivered in the academy, and to settle definitively this great question, which I regard as the most important in military surgery.

"If we are to be told, that the amputation of a limb is a cruel operation, dangerous in its consequences, and always grievous for the patient, who is thereby mutilated; that, consequently, there is more honour in saving a limb, than in cutting it off with dexterity and success; these arguments may be refuted by answering, that amputation is an operation of necessity, which offers a chance of preservation to the unfortunate, whose death appears certain under any other treatment; and, that if any doubt should exist of amputation being absolutely indispensable to the patient's safety, the operation is to be deferred, till nature has declared herself, and given a positive indication for it. We are also justified in adding, that this chance of preservation is at the present day much greater, than at the epoch of the Academy of Surgery. We learn from M. Faure, that of about three hundred amputations, performed after the battle of Fontenoy, only thirty were followed by success, whilst, on the contrary, (says Baron Larrey) we have saved more than three-fourths of the patients, on whom amputation has been done, and some of whom also had two limbs removed." This improvement is ascribed by Larrey, 1st, To our now knowing better how to take advantage of the indication and favourable time for amputating. 2. To the better method of dressing. 3. To the mode of operating being more simple, less painful, and more expeditious, than that formerly in vogue.

To the preceding authorities against delaying amputation, in cases of gun-shot wounds requiring such operation, I have to add Mr. Guthrie, deputy inspector of military hospitals, whose opportunities of observation, during the late war in Spain, were particularly extensive. In his work, he has detailed the opinions of many eminent foreign and British surgeons, respecting the propriety, or impropriety, of the doctrine of immediate amputation; and he has introduced some good criticisms, particularly on Bilguer's statement of the success, which was experienced in the Prussian hospitals, from not performing the operation. Mr. Guthrie, however, does not recommend amputation to be done immediately, if the patient be particularly depressed by the shock of the injury directly after its receipt; a piece of advice, which I believe has in reality been at all times followed, not only in respect to amputations, in cases of gun-shot wounds, but all other severe local injuries. "I believe it to be (says Mr. Guthrie) a stretch of fancy in those surgeons, who conceive, that, if the knife followed the shot in all cases, the patient would have the best chance of success. No one will deny, that, if the shot performed a regular amputation, it would not be better, than to have it to do afterwards; but, if they mean to say the operation should in general be performed immediately after the injury, I can only oppose to them the facts above stated, and the general result of my experience, which is decidedly in favour of allowing the first *moments* of agitation to pass over before any thing be done; a period extending from that to one, six, or eight hours, according to the difference of constitution, and the different injuries that have been sustained. But, *from one to three hours* will in most cases be found sufficient." (*On Gun-shot Wounds, p.* 226, *Edit.* 2, *Lond.* 1820.) In the first edition of this gentleman's book, some little want of precision rather concealed his exact meaning, with respect to the period of time, which should generally be allowed to transpire between the receipt of the injury and the performance of amputation; but, after all the disposition to controversy upon this point, it appears there is little to fight about, as there is rather a misunderstanding, than a difference of opinion. All acknowledge the advantage of doing the operation immediately, when the patient is not faint and depressed by the shock of the accident; all admit the prudence of deferring the use of the knife in other cases until the constitution has revived sufficiently to be capable of bearing the removal of the limb. (See *A. C. Hutchison, Pract. Obs. in Surgery,* 8vo. *Lond.* 1816; and *his further Observations on the proper period for amputating in Gun-shot Wounds,* 1817. *Quarrier, in Med. Chir. Trans. Vol.* 8; *and Dewar, in Med. Chir. Journ. April,* 1819.)

As far as my experience goes, when the necessity of amputation is undoubted, all delay is improper beyond the short period, during which the faintness immediately arising from the injury usually lasts. In the campaign in Holland, 1814, the most successful amputations were those done in the field hospitals directly after the arrival of the patients, or rather, as Dr. Hennen has expressed it, with as little delay as possible. "While hundreds are waiting for the decision of the surgeon, he will never be at a loss to select individuals, who can safely and advantageously bear to be operated upon, as quickly as himself, or assistants, can offer their aid; but, he will betray a miserable want of science, indeed, if, in this crowd of sufferers, he indiscriminately amputates the weak, the terrified, the sinking, and the determined. While he is giving his aid to a few of the latter class, encouragement and a cordial will soon make a change in the state of the weakly, or the terrified; and a longer period, and more active measures, will render even the sinking proper objects for operation." (*On Military Surgery, p.* 45, *Ed.* 2.) It appears from some returns, collected by Mr. Guthrie, that in the peninsula, the comparative loss, in secondary or delayed operations, and in primary, or immediate amputations, was as follows:—

	Secondary.		Primary.
Upper extremities . .	12	to . .	1
Lower extremities . .	3	to . .	1

The great success attending amputation on the field of battle was also convincingly proved after the battle of Toulouse. Here of 47 immediate amputations, 38 were cured, while of the 51 delayed operations, on that occasion, 21 had fatal terminations. (*P.* 42—44, *Ed.* 1.) After the attack on New Orleans, out of 45 primary amputations, 38 patients recovered, while only 2 of 7 secondary amputations terminated in the preservation of the patients. (*Op. cit. p.* 294, *Ed.* 2.)

OF IMMEDIATE AMPUTATION.

When a limb, that has received a gun-shot wound, cannot be saved, amputation should be immediately practised. The first four-and-twenty hours, Baron Larrey observes, are the only time that nature remains tranquil, (I should say, she does not remain quiet so long,) and we must hasten to take advantage of this period, in order to administer the necessary remedy.

In the army, a variety of circumstances make the urgency for amputation still greater. 1. The inconvenience attending the transport of the wounded, from the field of battle to the military hospitals, in carriages badly suspended, the jolting of which would produce such disorder in the wound, and in the whole body, that most patients would die in the journey, especially if it were long, and the weather either extremely hot or cold.

2. The danger of a long continuance in the hospitals; a danger, which amputation materially diminishes, by changing a gun-shot injury into a wound, that may be speedily healed, and reducing the causes of fever, and the hospital gangrene.

3. The cases, in which there is a necessity for abandoning the wounded. In this circumstance, it is of importance to have amputated, for, after the operation, the patients may remain some days without being dressed, and the dressings are afterwards more easy. Besides, it might often happen, that these unfortunate objects would not meet with surgeons of sufficient skill to do the operation; a circumstance, says Larrey, that we have seen happen among certain nations, whose caravans, for the medical service of the army (*ambulances*), are not constructed like those in use with the French.

OF CASES, IN WHICH AMPUTATION SHOULD BE DONE IMMEDIATELY.

First case. A limb carried away by a cannon-ball, or the explosion of a howitzer, or bomb, requires amputation without any loss of time: the least delay puts the patient's life in danger.

In this case, the necessity of the practice is inculcated by M. Faure himself, as well as by Schmucker, Richter, Larrey, Dr. Thomson, and every modern writer upon gun-shot wounds.

When a cannon-ball has torn off a limb, amputation of the stump should be performed, in order to procure the patient an even, smooth incision, instead of an irregular, jagged, and highly dangerous wound. As the limb has commonly suffered a violent concussion, is almost bereft of sense, and power of motion, and the bone frequently has a fissure extending some way upward, the amputation is sometimes recommended to be done, if possible, above the nearest joint. Were the operation not done, this kind of injury would require large and free incisions, for the extraction of foreign bodies, the shortening of projecting muscles and tendons, and the discharge of abscesses; and, as these incisions are likely to occasion at least as much irritation as amputation itself, without being productive of equal good, the avoidance even of pain cannot be urged as a reason against the practice. The occasional healing of such wounds only proves, that it is not altogether impossible, in certain instances, to effect a cure without amputation. The surgeon can the more readily make up his mind to amputate, as in this case, the operation does not occasion the loss of a limb. As for the place of the incision, no one would be justified in amputating above the knee, when the limb is injured at the foot or ankle.

The skin has been violently stretched and lacerated; the muscles have been ruptured and irregularly torn away; the tendons and aponeuroses lacerated; the nerves and vessels divided and forcibly dragged; lastly, the bones broken and smashed to a greater or lesser extent. These first effects are followed by a general, or partial commotion; by a kind of torpor in the injured part, and a good way above the wound; by a painful trembling in the remains of the member, an event that is singularly afflicting to the patient; and by a local swelling preceding the erethismus, which quickly shows itself The hemorrhage, says Baron Larrey, an accident much more to be apprehended than has been supposed, often comes on a few moments after the injury, and, if prompt succour were not afforded, would put a period to the patient's existence. " I can even declare, that, had it not been for the activity of the train of flying surgical carriages (*ambulances volantes*), by means of which the wounded have always been dressed upon the field of battle, many soldiers would have perished from this accident alone."

If the operation is not speedily done, pain commences, fever occurs, and the functions of the system become disordered; the irritation then increases, and convulsive motions take place. If the patient should not be a victim to these first symptoms, gangrene of the stump follows, the fatal consequences of which it is extremely difficult to prevent.

After this short exposition, it is easy to see, that, in this case, amputation ought to be practised immediately, and to delay the operation, and merely apply simple dressings, would be affording time for the preceding accidents to arise.

At Strasburgh, during the bombardment of the fort of Kell, in 1792, three volunteers, says Baron Larrey, had limbs shot off by the explosion of shells; one, an arm; another, a fore-arm; and the third a leg. They were conveyed to the hospital for the wounded in that town, which was superintended by M. Boy. Several days were suffered to elapse before the amputation was performed: not one of the patients escaped.

At Mentz, after the retreat from Frankfort, several of the wounded, who had had limbs shot off, did not have amputation done till some time afterwards, and not one of them recovered.

At Nice, after the taking of Saourgio, two amputations were practised at the hospital, No. 2; one of the fore-arm, the other of the arm, nine or ten days after the receipt of the injuries; both the patients died.

At Perpignan, Barron Larrey visited two soldiers, on whom amputation had been done, seven or eight days after the receipt of gun-shot injuries in the action of the 14th of July, 1794. One had had a leg shot off, and the other his right arm. Notwithstanding Larrey's utmost care he could not save their lives: one died of tetanus; the other of gangrene.

In the month of August, 1805, two cannoniers of the guards, in discharging the artillery, had each a hand shot away, and all the forepart of their bodies burnt. These were the two men whose office it was to charge the gun. At the moment when they had just rammed down the wadding on the cartridge, a spark, that had been left unextinguished, from the neglect to keep the touch-hole closed, set fire to the powder: the ramrod was violently repelled by the explosion, together with every thing that was situated in front of the charge. The right hand of one of the cannoniers was completely torn off, between the two phalanges of the carpus, and thrown more than two hundred paces. The counter-shock even threw the man down into the ditch of the square of the Hôtel des Invalides. The left hand of the other cannonier was torn away, together with the fore-arm at the elbow-joint, and also forced to a considerable distance. The tendons and muscles sustained vast injury, and the worst symptoms would have occurred, if amputation had not been instantly performed. In one case, amputation was done at the wrist; and, in the other, at the lower third of the arm. The two operations were followed by complete success, although the burns upon the face and chest, in both the patients, were serious and extensive.

Second case. When a body, propelled by gunpowder, strikes a limb, in such a manner as to smash the bones, violently contuse, lacerate, and deeply tear away, the soft parts, amputation ought to be immediately performed. If this measure be neglected, all the injured parts will soon be seized with gangrene: and besides, as Larrey has explained, the accidents, which the gravity of the first case produces, will also here be excited. It is only doing justice to the memory of M. Faure to state, that this second case was one, which he also particularly instanced as demanding the immediate performance of amputation. (See *Prix de l'Acad. Royale de Chirurgie, T.* 8, *p.* 23, *Edit.* 12*mo.*)

Third case. If a similar body were to carry away a great mass of the soft parts, and the principal vessels of a limb (of the thigh, for instance), without fracturing the bone, the patient would be in a state demanding immediate amputation; for, independently of the accidents, which would originate from a considerable loss of substance, the limb must inevitably mortify. Mr. Guthrie also says, " a cannon-shot destroying the artery and vein, on the inside (of the thigh) without injuring the bone, requires amputation." (*P.* 185.) When, however, the femoral artery, or vein, is injured by a musket-ball, or small canister-shot, this gentleman recommends tying the vessel above and below the wound in it, if the nature of the case be evinced by hemorrhage. But, he believes, that when both vein and artery are injured, amputation is necessary. (*P.* 186.) With respect to bleeding from the femoral vein, as it may easily be stopped by moderate pressure, the propriety of using any ligature at all is questionable.

" An injury of the femoral artery (observes Mr. Guthrie,) requiring an operation, accompanied with fracture of the bone of the most simple kind, is a proper case for immediate amputation; for, although many patients would recover from either accident alone, none would, I believe, surmount the two united, and the higher the accident is in the thigh, the more imperious is the necessity for amputation."—(*Guthrie on Gun-shot Wounds, p.* 187.)

Fourth case. A grape-shot strikes the thick part of a member, breaks the bone, divides and tears the muscles, and destroys the large nerves, without, however, touching the main artery. According to Larrey, this is a fourth case, requiring immediate amputation.

Mr. Guthrie seems to coincide on this point with Larrey: "If a cannon-shot strike the back part of the thigh, and carry away the muscular part behind, and with it the great sciatic nerve, amputation is necessary, even if the bone be untouched, &c. In this case, I would not perform the operation by the circular incision, but would preserve a flap from the forepart, or sides, as I could get it, to cover the bone, which should be short." (*Guthrie on Gun-shot Wounds of the Extremities, p.* 184.)

Fifth case. If a spent cannon-shot, or one that has been reflected, should strike a member obliquely, without producing a solution of continuity in the skin, as often happens, the parts, which resist its action, such as the bones, muscles, tendons, aponeuroses, and vessels, may be ruptured and lacerated. The extent of the internal disorder is to be examined; and if the bones should feel, through the soft parts, as if they were smashed, and if there should be reason to suspect, from the swelling, and a sort of fluctuation, that the vessels are lacerated, amputation ought to be immediately practised. We learn from Larrey, that this is also the advice of Baron Percy. Sometimes, however, the vessels and bones have escaped injury, and the muscles are almost the only parts disordered. In this circumstance, we are enjoined to follow the counsel of De La Martinière, who recommended making an incision through the skin. By this means, a quantity of thick blackish blood will be discharged, and the practitioner must await events. According to Larrey, such incision is equally necessary in the preceding case, before amputation, in order to ascertain the extent of the mischief which the parts have sustained.

It is to such injury, done to internal organs, that we must ascribe the death of many individuals, which was for a long while attributed to the commotion produced in the air. (See *Ravaton, Traité des Plaies d'Armes à Feu.*)

Although, says Larrey, this opinion has been sanctioned by surgeons of high repute, we may easily convince ourselves of its falsity, if we carefully consider, 1st, the direction and course of solid hard bodies, and their relation to the air, through which they have to pass; 2dly, the internal disorder observable in the dead bodies of persons, whose death is imputed to the mere impression of the air, agitated by the ball; 3dly, the properties of the elastic substances, such as the integuments, cellular substance, &c. struck by the shot.

It is universally agreed amongst philosophers, that a solid body, moving in a fluid, only acts upon a column of this fluid, the base of which column is nearly equal to the surface which the solid body presents. (See *Le Vacher sur quelques particularités concernant les plaies faites par armes à feu, in Mém. de l'Acad. de Chirurgie, T.* 11, *p.* 34, *Ed.* 12*mo.*)

Thus a cannon-ball, in traversing a space equal to its diameter, can only displace a portion of air, in the relation of 3 to 2, compared with the size of the shot. This fluid, in consequence of its divisibility and homogenealness with the ambient air, is dispersed in all directions, and confounded with the total mass of the atmosphere. The effects of this aeriform substance amount to nothing, and not a doubt can be entertained, that if there is the slightest solution of continuity of any part of the body, it must depend upon the direct action of the ball itself.

If, besides, the quickness of the motion of a ball be considered, which quickness is known to diminish in an inverse ratio to the squares of the distance, it will be seen that the space through which the shot has passed, before striking the object against which it was directed, will already have materially lessened the celerity of the projectile, while the motion of the column of air must be totally lost.

The different movements which the ball describes in its course, and the elasticity of the skin, enable us to explain how internal injuries are produced, without any external solution of continuity, and often even without ecchymosis. The motion communicated to the ball by the power which projects it, is, for a given space, rectilinear. If, at this instance, it strikes against the body, it carries the part away to an extent proportioned to the mass with which it touches the part. But, the ball, after having traversed a certain distance, undergoes, in consequence of the resistance of the air, and the attraction of gravity, a change of motion, and now turns on its own axis, in the diagonal direction.

If the shot should strike any rounded part of the body, towards the end of its course, it will run round a great portion of the circumference of the part, by the effect of its curvilinear movement. It is also in this manner, observes Larrey, that the wheel of a carriage acts, in passing obliquely over the thigh, or leg, of an individual stretched upon the ground. In this case, the results are the same as those of which we have been speaking. The most elastic parts yield to the impulse of the contusing body; while such as offer resistance, as, for instance, the bones, tendons, muscles, and aponeuroses, are fractured, ruptured, and lacerated. For the same reason, it sometimes happens, that the viscera are similarly injured.

At first sight, all the parts appear to be entire; but, a careful examination will not let us remain long in doubt about the internal mischief. In this case, an ecchymosis cannot manifest itself outwardly, because the vessels of the skin, which communicate with the internal parts, are ruptured, because the extravasation of blood naturally takes place in the deep excavations, occasioned by the rupture of the muscles and other parts, and because this fluid cannot make its way through the texture of the skin. Such extravasations can only be detected by the touch.

The foregoing reasoning is supported by experience. How often, says Larrey, have we not seen the ball carry away pieces of helmets, hats, cartridge-boxes, knapsacks, or other parts of the soldier's dress, without doing any other injury? The same ball, perhaps, takes off his arm, often at a time when it is closely applied to the body of his comrade, and yet the latter does not receive the slightest harm. The shot may pass betwixt the thighs, and these members hardly exhibit an ecchymosis at the points, which are gently grazed; the only example in which ecchymosis does occur. In other instances, the ball severs the arm from the trunk, and the functions of the thoracic viscera are not at all injured.

Baron Larrey then relates the following case, which is analogous to one which I saw near Antwerp, and have already mentioned in the foregoing columns. M. Méget, a captain, marching in the front of a square of men, in the heat of the battle of Altzey, 30th March, 1793, had his right leg almost entirely carried away by a large cannon-shot, without the contiguous limb of his lieutenant, who was as close as possible to him, receiving the least injury. The violent general commotion excited, and the extreme severity of the weather, made this officer's condition imminently perilous. The progress of the symptoms, however, was checked by amputation, which was instantly performed. M. Méget was then capable of being conveyed to the hospital at Landau, fifteen leagues from the field of battle, where he got quite well.

Larrey declines relating numerous other analogous amputations, which he has been called upon to practise under the same circumstances. M. Buffy, a captain of the artillery of the army of the Rhine, was struck by a howitzer, his left arm being injured, and his head so nearly grazed, that the corner of his hat, which was placed forwards over his face, was shot away as far as the crown. This officer, the skin of whose nose was even torn off, was not deprived of his senses, and he was actually courageous enough to continue for some minutes commanding his company. At length he was conveyed to Larrey's *ambulance*, who amputated his arm: in about a month the patient was well.

Larrey expresses his belief, that what have been erroneously termed *wind contusions*, if attended with the mischief above specified, require immediate amputation. The least delay makes the patient's preservation extremely doubtful. The internal injury of the member may be ascertained by the touch, by the loss of motion, by the little sensibility retained by the parts, which have been struck; and, lastly, by practising an incision, as already recommended.

In order to confirm the principle, which he endeavours to establish, in opposition to many writers, Larrey indulges himself with the following digression.

At the siege of Roses, two cannoniers, having nearly similar wounds, were brought from the trenches to the ambulance, which Baron Larrey had posted at the village of Palau. They had been struck by a large shot, which, towards the termination of its course, had grazed posteriorly both shoulders. In one, Larrey perceived a slight ecchymosis over all the back part of the trunk, without any apparent solution of continuity. Respiration hardly went on, and the man spit up a large quantity of frothy vermilion blood. The pulse was small and intermitting, and the extremities were cold. He died an hour after the accident, as Larrey had prognosticated. This gentleman opened the body, in the presence of M. Dubois, inspector of the military hospitals of the army of the eastern Pyrenees. The skin was entire; the muscles, aponeuroses, nerves, and vessels of the shoulders were ruptured and lacerated, the scapulæ broken in pieces, the spinous processes of the corresponding dorsal vertebræ, and the posterior extremity of the adjacent ribs, fractured. The spinal marrow had suffered injury; the neighbouring part of the lungs was lacerated, and a considerable extravasation had taken place in each cavity of the chest.

The second cannonier died of similar symptoms, three quarters of an hour after his arrival at the hospital. On opening the body, the same sort of mischief was discovered, as in the preceding example.

In the German campaigns of the French armies, Larrey met with several similar cases; and accurate examination has invariably convinced him of the direct action of a spherical body, propelled by means of gunpowder.

Sixth case. According to Baron Larrey, when the articular heads are much broken, especially those which form the joints of the foot, or knee, and the ligaments, which strengthen these articulations, are broken and lacerated, by the fire of a howitzer or a grape-shot, or other kind of ball, immediate amputation is indispensable. The same indication would occur, were the ball lodged in the thickness of the articular head of a bone, or were it so engaged in the joint, as not to admit of being extracted by simple and ordinary means. (See also *Guthrie on Gun-shot Wounds, p.* 197.)

Fractures extending into the joints, and accompanied with great laceration of the ligaments, were cases of gun-shot injuries pointed out by M. Faure, as indispensably requiring immediate amputation. (See *Prix de l'Acad. de Chir. T.* 8.) Thus we see, that this author was not so averse to early amputation as several modern writers have represented.

It is only in this manner, that the patients can be rescued from the dreadful pain, the spasmodic affections, the violent convulsions, the acute fever, the considerable tension, and the general inflammation of the limb, which, Larrey observes, are the invariable consequences of bad fractures of the large joints. But, adds this author, if the voice of experience be not listened to, and amputation be deferred, the parts become disorganized, and the patient's life is put into imminent peril.

It is evident, says he, that in this case, if we wish to prevent the patient from dying of the subsequent symptoms, amputation should be performed before twelve, or at most twenty-four hours have elapsed: even M. Faure himself professed this opinion in regard to certain descriptions of injury. (*Mém. de Chir. Militaire, T.* 2.)

With respect to wounds of the knee, the sentiments of Mr. Guthrie nearly coincide with those of Larrey. "I most solemnly protest (says Mr. G.) I do not remember a case do well, in which I knew the articulating end of the femur, or tibia, to be fractured by a ball that passed through the joint, although I have tried great numbers, even to the last battle of Toulouse. I know that persons, wounded in this way, have lived; for, a recovery it cannot be called, where the limb is useless, bent backward, and a constant source of irritation and distress, after several months of acute suffering, to obtain even this partial security from impending death; but, if one case of recovery should take place in fifty, is it any sort of equivalent for the sacrifice of the other forty-nine? Or is the preserving of a limb of this kind an equivalent for the loss of one man?" (*On Gun-shot Wounds, p.* 196.)

In the attack of the village of Merksam near Antwerp early in 1814, a soldier of the 95th regiment was brought to our field-hospital, having received a musket-ball through the knee-joint. The staff-surgeons on duty, and Mr. Curtis, surgeon of the 1st guards, were preparing to amputate the limb, when a surgeon, attached to the 95th, urgently recommended deferring the operation. Superficial dressings were applied, and the patient sent to the rear. He lived several months after the accident, at times affording hopes of a perfect recovery; but, in the end, he fell a victim to hectic symptoms.

Indeed, such is the general unfortunate result of these cases, that Dr. Hennen lays it down as a law of military surgery, that no lacerated joint, particularly the knee, ankle, or elbow, should ever leave the field unamputated, where the patient is not obviously sinking. (*On Military Surgery, p.* 41, *Ed.* 2.)

According to Mr. Guthrie, fractures of the patella, without injury of the other bones, admit of delay, provided the bone is not much splintered.

Seventh case. Larrey observes, that if a large biscayen, a small cannon-shot, or a piece of a bomb-shell, in passing through the substance of a member, should have extensively denuded the bone without breaking it, amputation is equally indicated, although the soft parts may not appear to have particularly suffered. Indeed, the violent concussion, produced by the accident, has shaken and disorganized all the parts; the medullary substance is injured, the vessels are lacerated, the nerves immoderately stretched, and thrown into a state of stupor; the muscles are deprived of their tone; and the circulation and sensibility in the limb are obstructed. Before we decide, however, Baron Larrey cautions us to observe attentively the symptoms, which characterize this kind of disorder. The case can be supposed to happen only in the leg, where the bone is very superficial, and merely covered at its anterior part with the skin.

The following are described as the symptoms: the limb is insensible, the foot cold as ice, the bone partly exposed, and on careful examination, it will be found that the integuments, and even the periosteum, are extensively detached from it. The commotion extends to a considerable distance; the functions of the body are disordered; and all the secretions experience a more or less palpable disturbance. The intellectual faculties are suspended, and the circulation is retarded. The pulse is small and concentrated; the countenance pale; and the eyes have a dull moist appearance. The patient feels such anxiety, that he cannot long remain in one posture, and requests, that his leg may be quickly taken off, as it incommodes him severely, and he experiences very acute pain in the knee. When all these characteristic symptoms are conjoined, says Larrey, we should not hesitate to amputate immediately; for, otherwise, the leg will be attacked with sphacelus, and the patient certainly perish.

Larrey adduces several interesting cases in support of the preceding observations.

Eighth case. When a large gynglimoid articulation, such as the elbow, or especially the knee, has been extensively opened with a cutting instrument, and blood is extravasated in the joint, Larrey deems immediate amputation necessary. In these cases, the synovial membranes, the ligaments and aponeuroses, inflame, the part swells, and erethismus rapidly takes place; and acute pains, abscesses, deep sinuses, caries, febrile symptoms, and death, are the speedy consequences. Larrey has seen numerous subjects die of such injuries, on account of the operation having been postponed through a hope of saving the limb. In his *Mémoires de Chirurgie Militaire, Tom.* 2, some of these are detailed.

Although a wound may penetrate a joint, yet, if it be small and unattended with extravasation of blood, M. Larrey informs us, it will generally heal, provided too much compression be not employed. This gentleman believes in the common doctrine of the pernicious effect of the air on the cavities of the body; yet, in this place, a doubt seems to affect him: speaking of the less danger of small wounds of joints, he says; "*à quoi tient cette différence, puisque l'air pénètre dans l'articulation dans l'un comme dans l'autre cas?*"

When two limbs have been at the same time so injured, as to require amputation, we should not be afraid of amputating them both immediately, without any interval. We have, says Larrey, several times performed this double amputation with almost as much success, as the amputation of a single member. He has recorded an excellent case in confirmation of this statement. (*Mém. de Chir. Militaire, T.* 2, *p.* 478.)

When a limb is differently injured at the same time in two places, and one of the wounds requires amputation, (suppose a wound of the leg with a splintered fracture of the bone, and a second of the thigh, done with a ball, but without any fracture of the os femoris, or other bad accident,) Larrey recommends us, first to dress the simple wound of the thigh, and amputate the leg immediately afterwards, if the knee be free from injury. When it is necessary to amputate above this joint, the less important wound need not be dressed, till after the operation, provided it can be comprehended in the section of the member, or be so near the place of the incision as to alter the indication. When the wound, demanding amputation, is the upper one, the operation of course is to be done above it, without paying any regard to the injury situated lower down.

Ninth case. To the foregoing species of gun-shot wounds, pointed out by Baron Larrey as urgently requiring immediate amputation, my own experience, and the observations of Dr. Thomson, justify me in adding compound fractures of the thigh from gun-shot violence. I am particularly glad, that the latter gentleman has devoted a proper degree of attention to these cases; for, the opportunities, which I had of judging when abroad, incline me to believe, that military surgeons are hardly yet sufficiently impressed with the propriety of immediate amputation in gun-shot fractures of the thigh. There were brought into my hospital at Oudenbosch, in 1814, about eight of such cases, all in the worst state for an operation, because several days had elapsed after the receipt of the injuries. All these patients died, excepting one, whose fracture was not far above the condyles, and I do not know, that he ever regained a very useful limb. Another had indeed been rescued by amputation from the dangers of the injury; but was, unfortunately, lost by secondary hemorrhage about three days after the operation. The bleeding was almost instantly suppressed; yet, such was the weakness of the patient, that the irritation of securing the vessel, and the loss of blood together, destroyed at once every hope of recovery. Were I to judge, then, from my own personal observations in the army, and from some other cases, which I saw under my colleagues, I should without hesitation recommend immediate amputation in all cases of compound fractures of the thigh, caused by grape-shot, musket-balls, &c. If there are any exceptions to this advice, they are such as are specified in the article *Amputation.*

" Gun-shot fractures of the thigh (says Dr. J. Thomson) have been universally allowed to be attended with a high degree of danger; indeed, till of late years, very few instances have been recorded of recovery from these injuries. Ravaton acknowledges, that in his long and extensive experience, he had never seen an example of recovery from a gun-shot fracture of the thigh; and Bilguer, in his calculations, with regard to those, who recover from gun-shot fractures, sets aside those of the thigh-bone as being of a nature altogether hopeless. In the present improved state of military surgery, instances not unfrequently occur of recovery, from this fracture; but, of these, the number will be found, I believe, to be exceedingly small, in comparison with those who die, particularly when the fracture has had its seat above the middle of the bone, &c."

According to the observation of Percy, scarcely two of ten recover of those, who have suffered gun-shot fractures of the thigh-bone. Mr. Guthrie, who seems to have paid greater attention to this subject, than any preceding author, says, that " upon a review of the many cases, which I have seen, I do not believe, that more than one sixth recovered, so as to have useful limbs; two thirds of the whole died either with or without amputation; and the limbs of the remaining sixth, were not only nearly useless, but a cause of much uneasiness to them for the remainder of their lives.' (See *Guthrie on Gun-shot Wounds, p.* 191.)

" In fractures by musket-bullets of the lower part of the thigh-bone (says Dr. Thomson) recovery not unfrequently takes place; and both Schmucker and Mr. Guthrie conceive, that they are injuries, in which amputation may be delayed with safety. It would be very agreeable, that this opinion should be confirmed by future experience; but, it appears to me, that before it can be received as a maxim in military surgery, much more extensive and accurate observation, than we yet possess, will be required, with regard to the proportion of those, who recover without amputation, or after secondary operations, and of those who recover after primary amputation. Of those, who had suffered this injury, we saw, comparatively, but a small number recovering in Belgium, and they had been attended with severe local and constitutional symptoms." (See *Report of Observations made in the Military Hospitals in Belgium, p.* 247, *et seq.*)

In the article *Amputation*, I have described the manner, in which balls produce fissures of several inches in length in the thigh-bone. This state of the bone, observes Dr Thomson, must be very unfavourable to recovery, and his conclusion is, that, in general, even in fractures of the lower part of the thigh-bone, a greater number of lives will be preserved, in military practice, by immediate amputation, than by attempting the cure, without that operation. " When the bone appears, on a careful examination, to be broken without being much splintered, and when the patient can be removed easily to a place of rest and safety, it may be right to attempt to preserve the limb; but, if the bone be much splintered, or if the conveyance is to be long or uncertain, it will, in most instances, I am convinced, be a much safer practice, even in fractures of this part of the thigh-bone, to amputate without delay.

" Musket-bullets, in passing through the femur, near to the knee-joint, produce fissures of the condyles, which generally communicate with the joint. These cases, like those, in which the bullets have passed directly through the joint, require immediate amputation.

" The writings of military surgeons contain but few histories of cases, in which the thigh-bone had been fractured above its middle by the passage of musket-bullets. These are cases, I believe, which have generally had a fatal termination; and the danger, attendant upon the amputation, which they require, seems long to have deterred surgeons from attempting to ascertain what advantages might be derived from the employment of that operation. Schmucker recommends, and states, that he had practised with success, immediate amputation in those cases, in which a sufficient space was left below the groin for the application of the tourniquet. It is curious to remark, in the history of amputation, how long surgeons were in discovering the ease and safety, with which the femoral artery may be compressed by the fingers, or pads, in its passage, over the brim of the pelvis. Boy, from the immediate danger, protracted suffering, and ultimate want of success, which he had observed to follow this kind of injury, urges strenuously the propriety of immediate amputation. Mr. Guthrie's opinion, with regard to the dangerous nature of these injuries, and the advantages to be derived in them from immediate amputation, coincides in every respect with those of Schmucker and Boy. He observes, that, those, whose thigh-bone has been fractured in its upper part by a musket-bullet, generally die with great suffering, before the end of the sixth, or eighth week; and that few even of those escape, in whom that bone has been fractured in its middle part. Of the few, whom we saw, who had survived gun-shot fractures in the upper part of the thigh-bone in Belgium, scarcely any one could be said to be in a favourable condition. In all the limbs were much contracted, distorted, and swollen, and abscesses had formed round and in the neighbourhood of the fractured extremities of the bones. In some instances, these abscesses had extended down the thigh; but, more frequently, they passed upwards, and occupied the region of the hip-joint and buttocks. In several instances, in which incisions had been made for the evacuation of matter, the fractured and exfoliating extremities of the bones sometimes comminuted, and sometimes forming the whole cylinder, could be felt bare, rough, and extensively separated from the soft parts, which surrounded them. In other instances, these extremities were partially enclosed in depositions of new bone, which, from the quantity thrown out, seemed to be present in a morbid degree. It was obvious, that, in all of these cases, several months would be required for the reunion of the fractured extremities; that, in some, much pain and misery were still to be endured from the processes of suppuration, ulceration, exfoliation, and ejection of dead bone; that in some cases, the patients were incurring great danger from hectic fever, and from diarrhœa; that the ultimate recovery in most of them was doubtful, and that of those, in whom this might take place, there was but little probability, that any would be able to use their limbs! The sight of these cases (says Dr. Thomson) made a deep impression upon my mind, and has tended to increase my conviction, that this is, of all others, the class of injuries, in which immediate amputation is most indispensably required." (See *Obs. made in the Military Hospitals in Belgium*, *p.* 254—258.)

Dr. Thomson adds, that what has been said of the danger of fractures, produced by musket-bullets, in the upper part of the femur, is true in a still greater degree of those, which have their seat in the neck, or head of that bone. In such instances, Dr. Thomson joins the generality of modern army surgeons in strongly recommending amputation at the hip-joint; a subject, of which I have already spoken. (See *Amputation.*)

OF GUN-SHOT WOUNDS, IN WHICH AMPUTATION MAY BE DEFERRED.

If, says Baron Larrey, it be possible to specify the cases, in which amputation ought to be immediately performed, it is impossible to determine *a priori* those, which will require the operation subsequently. One gun-shot wound, for example, will be cured by ordinary treatment, while, another, that is at first less severe, will afterwards render amputation indispensable, whether this be owing to the patient's bad constitution, or the febrile complaints, which are induced. However this may be, the safe rule for fulfilling the indication, that presents itself, is to amputate consecutively only in circumstances, in which, every endeavour to save the limb is manifestly in vain. Upon this point, Larrey's doctrine differs from that of Faure.

The latter practitioner admits cases, which he terms cases *of the second kind*, in which he delays amputation, not with any hope of saving the limb, but, in order to let the first symptoms subside. The operation, done between the fifteenth and twentieth day, appears to him less dangerous, than when performed immediately after the receipt of the injury. At the above period, according to M. Faure, the commotion, occasioned by the gun-shot injury, is dispelled; the patient can reconcile himself to amputation, the mere mention of which fills the pusillanimous with terror in a greater or lesser degree; the debility of the individual is no objection; and it is laid down as an axiom "that the consequences of every amputation, done in the first instance, are in general extremely dangerous." In support of this theory, M. Faure adduces ten cases of gun-shot injuries, in which after the battle of Fontenoy, the operation was delayed, in order that it might afterwards be performed with more success: a plan, which, according to the author, proved completely successful. (See *Prix de l'Acad. de Chirurgie, Tom.* 8. *Edit. in* 12*mo.*)

This division of the cases for amputation into two classes, not consistent with nature, Larrey conceives, has been the cause of a great deal of harm. Very often the partisans of M. Faure have not dared to resort in the first instance to amputation, the dangers of which they exaggerate; while, on other occasions, they amputate, consecutively, without any success.

Larrey, after arguing, that the effects of commotion, instead of increasing, gradually diminish and disappear after the operation, ventures into some hypothesis about the proximate cause of the ill effects of commotion, which, as being wild and unsatisfactory, I shall not here repeat.

Baron Larrey will not even admit, that the patient's alarm ought to be a reason for postponing the operation: because the patient, just after the accident, will be much less afraid of the risk, which he has to encounter, than at the expiration of the first four-and-twenty hours, when he has had time to reflect upon the consequences of the injury, or of amputation; a remark, made by the illustrious Paré.

"Experience, agreeing with my theory (says Baron Larrey), has proved both to the army and navy surgeons, that the bad symptoms which soon follow such gun-shot injuries, as must occasion the loss of a limb, are much more to be dreaded, than those of immediate amputation. Out of a vast number of the wounded, who suffered amputation in the course of the first four-and-twenty hours after the memorable naval battle of the 1st of June, 1794, a very few lost their lives. This fact has been attested by several of our colleagues, and, especially, by M. Fercoc, surgeon of the ship *le Jemappe*."

The following is said to be an extract from one of his letters.

"After the naval engagement on the 1st of June, 1794, a great number of amputations were done immediately after the receipt of the injuries. Sixty of the patients, whose limbs had been thus cut off, were taken to the naval hospital, at Brest, and put under the care of M. Duret. With the exception of two, who died of tetanus, all the rest were cured; and there was one, who had had both his arms amputated. The surgeon of the *Téméraire*, which ship was captured by the English, was desirous, in compliance with the advice of their medical men, to defer the operation, which many of the wounded stood in need of, till his arrival in port; but, he had the mortification to see them all die during the passage," &c.

Larrey next acquaints us, that, when he was sent to the army of Italy, in 1796, he had also the pain of seeing, in the hospitals, great numbers of the wounded fall victims to the confidence, which many of the surgeons of that army placed in the principles of M. Faure. General Bonaparte saw, that the *ambulance volante* was the only thing, that, in the event of fresh hostilities, could prevent such accidents: and, in consequence of his orders, Larrey formed the three divisions d'ambulance which are described in his Mémoires de Chirurgie Militaire.

Since this period it has always been customary in the French armies, on the day of battle, to make every preparation for performing amputations as speedily as possible. The mere sight of these *ambulances*, (always attached to the advanced guard,) says M. Larrey, encourages the soldiers, and inspires them with the greatest courage. On this occasion, the following anecdote is cited from Ambroise Paré.

This famous surgeon having been urgently sent for by the duke de Guise, besieged in Metz, to attend the wounded of his army, who were in want of assistance, Ambroise Paré was shown to the frightened soldiers, at the breach. Upon this, they immediately filled the air with shouts of the most lively joy, and cried out: "*Nous ne pouvons plus mourir, s'il arrive que nous soyons blessés, puisque Paré est parmi nous.*" Their courage revived, and their confidence in this skilful surgeon, contributed to the preservation of a place, before which a formidable army was destroyed.

Larrey desires us to interrogate the invalids who have lost one, or two of their limbs, and nearly all will tell us, that they suffered amputation a few minutes after the accident, or in the first four-and-twenty hours.

"If Faure now retains any partisans," says Larrey, "I recommend them to repair to the field of battle, the day after an action; they would then soon be convinced, that, without the prompt performance of amputation, great numbers of soldiers must inevitably lose their lives. In Egypt, this truth was particularly manifested."

The following communication upon this point was made to Baron Larrey by M. Masclet, a French surgeon on duty at Alexandria.

"In the naval hospital of this port, I have seen eleven soldiers, or sailors, who were wounded in the naval action off Aboukir, and who had suffered amputation in the first four-and-twenty hours. In five of these cases, the operation had been done on the arm; in two, on the thigh; and, in three others, on the leg. All these men are recovering. In the army hospital, there have been only three thigh amputations, which we performed seven or eight days after the battle, and these three patients died a few days after the operation, although the operation was done methodically, and no grave symptoms prevailed at the time of its performance. You see, sir, experience has, in this instance, quite confirmed your principles."

In 1780, during the American war, we are informed by Larrey, that the surgeons of the French army performed a great number of amputations, according to the opinion then generally adopted in France, that the operation should not be undertaken till after the subsidence of the first symptoms. Almost all the patients, thus treated, died after the operation. On the contrary, the Americans, who had the boldness to amputate immediately (or in the first twenty-four hours) upon many of their wounded countrymen, lost only a very few. Yet, M. Dubor, at that time surgeon to the Artois dragoons, and from whom Larrey has collected this fact, relates, that the situation of the hospital for the French wounded was, on many accounts, the most advantageous. (*Dubor*, *These Inaugurale, soutenue* 16 *Sept.* 1803, *à l'Ecole de Strasburg.*)

Admitting that, by a concurrence of fortunate circumstances, which are not always to be calculated upon, some patients escape the danger of the first symptoms, as Larrey remarks, this proves nothing in favour of doing the operation afterwards: it must be seen what nature will do towards the event of the case.

If, at the end of twenty, or thirty days, the prognosis is as bad as it was previously, amputation cannot be avoided. Thus all the sufferings, which the patient has endured, have been undergone for nothing, and the operation will now be attended with considerable risk, inasmuch as the patient may lie in a dangerously weakened state.

If nature revives at all, no doubt, the success of the operation becomes more probable; but, in this case, the surgeon, instead of having recourse to amputation, should redouble his efforts to preserve the limb.

CASES DEMANDING AMPUTATION CONSECUTIVELY.

Upon this subject, Larrey gives us the annexed information.

First case. A spreading Mortification. If the disorder be owing to an internal and general cause, it would then be rashness in the surgeon to amputate before nature had put limits to the disease. Larrey describes this kind of gangrene, as being distinguished from that, which is named *traumatic*, by the symptoms, which precede and accompany it. These symptoms are similar to those, which are observed in nervous ataxia, or adynamia. Here the operation ought to be deferred, and endeavours made to combat the general causes with regimen and internal medicines.

But, when the gangrene is *traumatic*, Larrey advises the limb to be immediately cut off above the disorganized part. Several facts, in support of this doctrine, are related by this experienced surgeon in his *Mémoire sur la Gangrene Traumatique.* (See *Mortification.*)

In that part of the dictionary will be found several additional observations, in favour of the practice adopted and recommended by Larrey, which is so opposite to that inculcated by Sharp, Pott, and the generality of writers.

In the article *Amputation*, I have noticed a particular case of gangrene, which has been pointed out by Mr. Guthrie, as demanding the early performance of amputation, and a deviation from the old rule of waiting till the mortification has ceased to spread. (See *Guthrie on Gun-shot Wounds of the Extremities, p.* 63, *&c.*)

Second case. Convulsions of the wounded Limb. It is one of Larrey's doctrines, (though of a very questionable description,) that amputation of the member, performed immediately the first symptoms of tetanus manifest themselves, interrupts all communication between the source of the disorder, and the rest of the body. He states, that the operation unloads the vessels, and thus puts a stop to the tension of the nerves, and to the convulsions of the muscles. These first effects, he says, are followed by a general collapsus, which promotes the excretions, sleep, and the equilibrium of every part of the system. He argues, that the whole of the momentary pain, caused by the operation, cannot increase the existing irritation: besides the sufferings of tetanus render those of amputation more bearable, and lessen their intensity, especially, when the principal nerves of the limb are strongly compressed. Some observations will be made on this subject in the article *Tetanus.*

Third case. Bad State of the Discharge. It often happens, that, in gun-shot wounds, complicated with fractures, notwithstanding the most skilful treatment, the discharge becomes of a bad quality; the fragments of bone lie surrounded with the matter, and have not the least tendency to unite: the patient is attacked with hectic fever, and a colliquative diarrhœa. Under these circumstances, life may sometimes be preserved by amputation.

Fourth case. Bad State of the Stump. In hospitals, as Baron Larrey observes, the cure of amputations is sometimes prevented by a fever of a bad character. The stump swells, the integuments become at first retracted, and then reverted and diseased a good way upward. The wound changes into a fungous ulcer, the cicatrization of which is hindered by the deep disorder of the bone, and the ulceration of the soft parts. The extremity of the bone projects. In order to remedy this last evil, it has been proposed to saw off the projecting part of the bone, and, with this, even to amputate all the flesh beyond the level of the skin. Larrey condemns such practice, as unnecessary and dangerous, and he recommends giving nature time to effect the exfoliation of the diseased projecting part of the bone, and heal the wound. (See *Mémoires de Chir. Militaire, T.* 2.)

GUN-SHOT WOUNDS OF THE ABDOMEN.

These cases may be divided into two kinds; one only penetrates the parietes of the belly, without hurting the contained parts; the other does mischief also to the viscera. The event of these two kinds of wounds is very different. In the first, little danger is to be expected, if properly treated; but, in the second, the success will be extremely uncertain, for, in many instances, nothing can be done for the patient, and, on other occasions, a good deal of art may be employed with advantage.

It is observed by Mr. Hunter, that such wounds of the abdomen as do not injure parts like the stomach, intestines, bladder, ureters, gall-bladder, large blood-vessels, &c. all which contain particular fluids, will generally end well. But, he adds, that there will be a great difference, when the ball has passed with immense velocity, as a slough will be produced; whereas, when the ball has moved with less impetus, there will not be so much sloughing, and the parts will, in some degree, heal by the first intention. Even when the ball occasions a slough, the wound frequently terminates well, the adhesive inflammation taking place in the peritoneum, all round the wound, so as to exclude the general cavity of the abdomen from taking part in the inflammation. Such is often the favourable event, when the ball, besides entering the abdomen, has wounded parts like the omentum, mesentery, &c. and gone quite through the body. (*Hunter on Inflammation; Gun-shot Wounds, &c. p.* 543.)

In gun-shot wounds of the belly, an extravasation is apt to take place on the sloughs becoming loose, about eight, ten, twelve, or fourteen days, after the accident; but, says Mr. Hunter, although this new symptom is in general very disagreeable, most of the danger is usually over, before it can appear.

In the article, *Wounds,* I have detailed at large the general principles, which should be observed in the treatment of wounds of the belly; consequently, it would be superfluous here to go over the whole of this extensive subject again. As a modern writer observes, "In their treatment, the violence of symptoms is to be combated more by general means, than by any of the mechanical aids of surgery. The search for extraneous bodies, unless superficially situated, is altogether out of the question, except they can be felt with the probe, as in Ravaton's case, (*Chir. d'Armée, p.* 211,) or in other cases of lodgment in the bladder, where they may become the object of secondary operations. Enlargement, or contraction of the original wound, as the case may require for returning the protruded intestine, securing the intestine itself, and promoting the adhesion of the parts, are all that the surgeon has to do in the way of operation; and even in this the less he interferes the better. Nature makes wonderful exertions to relieve every injury inflicted upon her, and they are often surprisingly successful, if not injudiciously interfered with. In a penetrating wound of the abdomen, whether by gun-shot, or by a cutting instrument, if no protrusion of intestine take place, (and this, it must be observed, in musket or pistol wounds rarely occurs,) the lancet, with its powerful concomitants, abstinence and rest, particularly in the supine posture, are our chief dependence. Great pain and tension, which usually accompany these wounds, must be relieved by leeches to the abdomen (if they can be procured), by topical applications of fomentations, and the warm bath; and, if any internal medicine is given as a purgative, it must, for obvious reasons, be of the mildest nature. The removal of the ingesta, as a source of irritation, is best effected, by frequently repeated oleaginous clysters;" (see *Hennen's Principles of Military Surgery, p.* 431, *Ed.* 2;) and, with respect to dressings, as the same author has observed, concerning cases, in which a ball has passed directly through the abdomen, the mildest application should be employed, and no plugging with tents, nor introduction of medicated dressings thought of. (*P.* 406.) In this publication may be found cases, in which musket-balls were passed by stool; (*p.* 404;) in which an artificial anus was formed; (*p.* 407, *&c.*) or the kidneys, liver, (*p.* 430—432,) diaphragm, (*p.* 437,) and other viscera, injured.

The following case, exhibiting the possibility of recovery, though the small intestine be completely severed with a ball, is interesting, partiularly as cases of this kind have been regarded as positively fatal. The success was also obtained, notwithstanding the treatment appears to have been rather too officious, especially, in regard to four incisions made in the end of the bowel, when one would have removed the constriction spoken of.

At the assault of Cairo, 1799, M. N. was shot in the abdomen with a ball, which divided the muscular parietes of this cavity on the right side, and a portion of the ileum. Larrey being upon the field of battle, gave him the first assistance. The two ends of the intestine protruded in a separated and inflated state. The upper end was everted, in such a way, that its contracted edge, like the prepuce in a case of paraphymosis, strangulated the intestinal tube. The course of the feces was thus obstructed, and the contents of the bowel accumulated above the constriction.

Although the patient's recovery was nearly hopeless, both from the nature of the wound, and from the debility and cholera morbus, which had already seized him in the short period, that he remained without succour in one of the intrenchments, Larrey was desirous of trying what could be done for so singular a case. He first made four small cuts, through the constricted part of the intestine, with a pair of curved scissars, and put the bowel into its ordinary state. He passed a ligature through the piece of the mesentery, corresponding to the two extremities of the bowel. These he reduced as far as the margin of the opening, which he had taken care to dilate, and the dressings having been applied, he awaited events. The first days were attended with alarming symptoms, which, however, afterwards subsided. Those, which depended upon the loss of the alimentary matter, successively abated; and, after two months, the ends of the ileum were opposite each other, and disposed to become connected together. Larrey seconded the efforts of nature, and dressed the patient with a tampon, or sort of tent, that was occasionally employed for two months. The patient was then discharged from the hospital quite cured.

In several instances, says Larrey, the sigmoid flexure of the colon was injured, and yet the wounds were cured without any fecal fistulæ. At the siege of Acre, three examples occurred; and, at that of Cairo, two. Larrey dilated the entrance and exit of the ball. Clysters, made of the decoction of linseed, and emollient beverages, were frequently exhibited; and the patients were kept on low diet, and in the most quiet state.

Sword-wounds, and those made with the bayonet, or lance, may injure some part of the bladder, or even pass through both sides of this organ. In the latter case, the injury is usually fatal, as the urine escapes from the inner wound into the abdomen, and immediately excites mortal inflammation. Baron Larrey dressed on the field of battle several soldiers, whose bladders were thus completely transfixed, and who all perished of inflammation and gangrene, within the first forty-eight hours. However, he observes, that, if the weapon enter the bladder at that part of its fundus, which is not covered by the peritoneum, the case is curable, unless complicated with too much internal hemorrhage.

The surest criterion of these cases is the escape of the urine from the external wound; and its discharge may either be momentary, occasional, or continual; differences to be accounted for by the situation of the wound, and the changes, which happen in the bladder. When the bladder is full, and its upper part is pierced, the urine will issue only just at the moment of the accident, and, as soon as it is discharged, the edges of the wound will come together, and permanently close, especially, if the urine can pass freely through the natural channel. But, when this favourable condition is absent, the bladder becomes enormously distended again, the wound is opened anew, and the urine discharged once more from the external opening. The same things might happen, if one were to withdraw too soon the elastic gum catheter, which has been introduced: and, by introducing the instrument again, the urine might be diverted from the wound, and its natural course reestablished. Lastly, Larrey observes, that, when the wound is situated at one of the lowest points of the bladder, the discharge of urine may be incessant, and be of more or less duration.

When the track of these punctured wounds is extensive, and not direct, abscesses form at different points where the urine passes. These abscesses, Larrey directs to be immediately opened, and their recurrence prevented by the introduction of an elastic gum catheter through the urethra; one of the chief means of relief in all wounds of the bladder. Together with this treatment, he recommends the warm bath, the application of camphorated oily liniments to the belly, antispasmodic cooling medicines, frequent clysters, and sometimes cupping in the vicinity of the wound, or bleeding. (See *Mém. de Chir. Mil. T.* 4, *p.* 286, 287.) On the two last means of relief, it would have been better, if Larrey had laid more stress; for, next to the catheter, they are unquestionably the most essential.

Baron Larrey informs us, that the gun-shot wounds of the bladder, which occurred in Egypt, had for the most part a favourable termination. The most remarkable case was that of F. Chaumette, a light horseman, who was wounded at the battle of Tabor. The ball passed across the hypogastrium, about one finger-breadth above the pubes, to the point of the left buttock, which corresponds to the ichiatic notch. The direction of the wound, and the issue of feces and urine from the two orifices left no doubt, that the bladder and rectum were injured. M. Milioz, who directed the surgical affairs of the division of the army under Kleber, diligently pursued the same kind of treatment which he had seen Larrey adopt at the siege of Acre. During the suppurative stage, the patient was affected with fever; and, after the sloughs were detached, the discharge was very copious. A catheter that was passed into the bladder, prevented an extravasation of the urine, and, at the same time, promoted the union of the wound of that viscus. This was healed the first, and the patient, upon his return to Cairo, was quite cured.

Larrey has recorded several other interesting cases of wounds, either of the bladder alone, or of it and the rectum together, to which I must content myself with referring. (See *Mém. de Chir. Militaire, T.* 2, *p.* 160—165; *T.* 3, *p.* 340, *&c.*; *T.* 4, *p.* 296, *&c.*)

A ball may go through both sides of the bladder, and then either perforate the neighbouring parts, and escape externally, or bury itself deeply in the flesh. When it has gone quite through the bladder, and afterwards passed out of the body again, urine, blended with blood, immediately issues from one or both apertures, according to their situation. The flow of urine through the urethra is either lessened, or completely suppressed; but, through this passage, the patient generally voids more or less blood. Acute and incessant pain is felt in the course of the wound, together with a frequent painful desire to make water, nausea, sometimes actual vomiting, and extreme anxiety, and restlessness. Either in its passage inwards, or its course outwards, the ball may have injured, or perforated the rectum, in which case, the urine passes into this bowel, and mixing with the feces, is discharged from the anus.

When a part of the bladder, towards the cavity of the abdomen, is injured, as, for instance, its posterior surface which is covered by the peritoneum, the urine is generally extravasated within the belly, and inflammation of the preceding membrane is the immediate consequence. This inflammation spreads with rapidity, and attacks all the viscera, producing vast distension of the abdomen, fever, coma, and other bad symptoms, soon terminating in gangrene and death. (*Larrey, Mém. de Chir. Mil. T.* 4, *p.* 292—93.)

During the first four-and-twenty hours, very little urine escapes from gun-shot wounds of the bladder, in consequence of the swelling, which almost instantly affects the lips of the wound. When the bladder is full, this fluid is discharged, only at the moment of the accident, and mostly only from the wound, by which the ball has made its exit. An extravasation is prevented by the thick slough, which fills all the track of the injury, and it is not till the deadened parts become loose, that any effusion can happen. Hence, it is of the highest importance to introduce an elastic gum catheter into the urethra, where it should be kept, and the instrument should be large enough to fill exactly this canal; for, according to Baron Larrey's observations, if, at the period, when the sloughs are detached, the urine has not a ready passage outward, it passes through the wound, and is extravasated the more readily, inasmuch as the separation of the sloughs has occasioned many openings, by which the fluid may insinuate itself into the cellular membrane. Hence, gangrenous mischief and death.

On two points, my own experience would not lead me to join in the sentiments of Larrey; first, in opposition to his statement, I am sure, that there is risk of extravasation of urine earlier than the period which he specifies, having known this accident commence as it were within a few hours after the receipt of the wound; and therefore, I should not depend upon the sloughs being always at first a complete barrier to extravasation of urine, (indeed, their formation throughout the whole track of a gun-shot wound is by no means a regular occurrence), but invariably pass a catheter as soon as possible, for the more certain prevention of this dangerous consequence. Secondly, the period of the separation of sloughs, may, indeed, often be contemporary with the first appearance, or symptoms of extravasation, particularly in cases where the employment of the catheter is for some time deferred, as in Baron Larrey's practice, because then a partial extravasation of the urine, soon after the injury, and previous to the introduction of the catheter, will cause rapid sloughing, and actually prevent the adhesive inflammation from closing up the cavities of the cellular membrane in time to prevent a fatal extension of that irritating fluid amongst the surrounding parts. Were it not for the partial early effusion of urine, no doubt, the adhesive inflammation would, in these cases, soon have the same effect, in obviating the danger of urinary extravasation, which it has after lithotomy, or paracentesis of the bladder. (See *Bladder.*)

It is the practice of Baron Larrey to dilate the wounds, in order to facilitate the escape of the urine, which might otherwise lodge in the track of the ball; and perhaps, here the method may frequently be right, though I should conceive its propriety must usually depend upon whether the urine has a tendency to continue to flow out through the wounds, or not, and upon the presence of obstruction, or not. And, in confirmation of this opinion, I may cite Dr. Hennen's declaration, that, in these cases, he has very rarely found it necessary to enlarge the wound, when the catheter and proper dressings have been employed. (*On Military Surgery, p.* 421, *Ed.* 2.) And, as soon as possible, a large elastic gum catheter should be introduced, and left in the urethra, taking care to withdraw it, and pass in a clean one every two or three days, so that no incrustations may occur. Sometimes, however, the passage of a catheter is very difficult, as is the case, when there are splinters of bone in the urethra, or the parts about the neck of the bladder are inflamed. (*Mém. de Chir. Militaire, T.* 4, *p.* 294.) Emollient clysters, and acidulated demulcent drinks are to be prescribed, and the patient is to be kept upon a very low regimen, and in the most quiet state. The dressings are to be light and simple, and cleanliness observed. (*Op. cit. T.* 2, *p.* 165—170.) Instead of camphorated embrocations to the abdomen, another means commended by Larrey, it appears to me, that this author's directions would have been more complete and judicious, had he advised in these cases bleeding, both topical and general.

From the injury of arterial ramifications, or varicose vessels, blood is sometimes extravasated within the wounded bladder, and causes deep-seated irritation. According to Baron Larrey, the case is indicated by the symptoms of retention of urine, and those of inflammation, with a small pulse, pallor of the countenance, and dryness of the wounds. (*T.* 4, *p.* 295.) A more decided criterion, I should think, would be the partial escape of urine mixed with blood, a symptom, which could deceive only where the urethra itself had been injured. Larrey states, that blood, extravasated in the bladder, rarely coagulates, because blended with urine, and hence, he advises its discharge to be facilitated by means of a catheter, and tepid, emollient, anodyne injections. (*T.* 4, *p.* 295.)

Sometimes, balls carry before them into the bladder fragments of bone, small coins, pieces of buttons, &c.; or bits of bullets break off, and lodge in that viscus. When these extraneous bodies are not above a certain size, they are frequently voided through the urethra, (see *Cases in Dr. Hennen's Work, p.* 419, 422, 424, *&c. Ed.* 2,) and their evacuation may be materially facilitated by the introduction of an elastic gum catheter, the size of which is to be increased gradually, until the largest can be passed, when the foreign substances will readily enter the tube, or pass out through the dilated urethra. In this way, Baron Larrey has saved gravel patients from a vast deal of suffering. (*Mém. de Chir. Mil. T.* 4, *p.* 302.) In such cases, the urethral forceps, made by Mr. Weiss, might often be used with advantage. (See *Lithotomy.*) When the ball is too large to be taken out in this manner, the lateral operation is to be performed, and it ought to be done before the bladder falls into an ulcerated, or gangrenous state, from the pressure and irritation of the foreign body. However, as wounds of this organ frequently give rise to dangerous inflammation, Larrey recommends this operation to be done either before its attack, or not till after its subsidence. (*Vol. cit. p.* 309.) In fact, almost all the operations of this kind on record have been done some considerable time after the receipt of the wound, and to this practice my own judgment would lead me to give a general preference. In one case, however, Larrey operated on the fourth day after the receipt of the wound, and with success.

After the battle of Waterloo, I was not a little surprised to find, in the St. Elizabeth hospital at Brussels, a considerable number of cases, in which either the intestines, the stomach, the omentum, or the bladder, protruded. I think, we had in the division under Mr. Collier and myself, not less than three protrusions of the bladder. An order, which I received to join the army in the field on the 27th of June, deprived me of the opportunity of witnessing the progress and termination of these interesting cases. However, many had ended fatally before my departure from Brussels.

GUN-SHOT WOUNDS OF THE THORAX.

Wounds of the lungs, abstracted from other mischief, are now well known not to be always fatal. Balls have been found in the substance of the lungs after having lodged there twenty years, during all which time the patients were healthy, and free from symptoms indicative of the case. (*Percy, Manuel, &c. p.* 25.) Mr. Hunter had some reason to believe, that wounds of the lungs made with balls, were generally less dangerous than such as were made with sharp-pointed instruments; for, he had seen several patients recover after they had been shot through the lungs, while other persons died of very small wounds of those organs, done with swords and bayonets. Perhaps, one cause of this fact may be owing to the circumstance of gun-shot wounds generally bleeding less than other wounds, so that there is not so much danger of blood being effused in the cavity of the chest, or the cells of the lungs. The indisposition of the orifice of a gun-shot wound to heal up too soon, is also another circumstance that must lessen the hazard, as whatever matter happens to be extravasated has thereby an opportunity of escaping.

But, from what has been stated, it must not be inferred, that gun-shot wounds of the lungs are not accompanied with a serious degree of danger. Frequently the patient expires instantly, being suffocated in consequence of profuse hemorrhage from those organs; for, though it be true, that gun-shot wounds generally do not bleed much, when the injured vessels are under a certain size, yet, the contrary is the case, when the wounded vessels are like those situated towards the root of the lungs. Gun-shot wounds of the chest also often prove fatal by the inflammation that is excited within this cavity.

Appearances sometimes create a belief, that a ball has passed completely through the chest and lungs, when the fact is otherwise. "Thus (as Dr. Hennen observes), I have traced a ball by dissection, passing into the cavity of the thorax, making the circuit of the lungs, penetrating nearly opposite the point of entrance, and giving the appearance of the man having been shot fairly across, while bloody sputa seemed to prove the fact, and, in reality, rendered the same measures to a certain extent, as necessary as if the case had been what was suspected. The bloody sputa, however, were only secondary, and neither so active and alarming as those which pour out at once from the lungs when wounded." (*Military Surgery, p.* 368, *Ed.* 2.) A second cause of deception is the frequent long course of a ball, round the chest under the skin and muscles, previously to its exit, whereby an appearance is presented, as if the patient had been shot through the thorax. And, another source of deception, as to the actual penetration of balls, is "where they strike against a handkerchief, linen, cloth, &c. and are drawn out unperceived in their folds, a peculiarity which has not escaped M. Larrey, who gives an interesting notice on it in the *Bulletins da la Faculté de Méd. Paris*, 1815, *No.* 2. I have also given an instance in the preceding pages." (*Hennen, loco cit.*) In these cases, the absence of bloody expectoration directly after the injury, the undisturbed state of respiration, and the greater freedom from oppression, anxiety, syncope, and other bad symptoms, than in cases where the lungs are hurt, form grounds for a correct opinion on the true nature of the accident.

It cannot be supposed, that adhesions always take place round the opening of a gun-shot wound in the chest, because the lungs must sometimes collapse, and become considerably distant from the pleura, especially when the communication established between the atmospheric air and the cavity of the thorax is very free and direct. However, as adhesions are extremely common between the outer surface of the lungs, and the inner surface of the pleura costalis, they must, in many instances, exist before the receipt of a wound, and, of course, prevent the usual collapse of the lungs.

As the general symptoms, and treatment, of wounds of the chest, are detailed in the article *Wounds*, I shall not here detain the reader long upon the subject. When a patient has been shot in the chest, the most important indication is to prevent and subdue inflammation of the lungs and pleura. In few other cases, can repeated and large bleedings be so advantageously practised. Here, there will not be so much danger of an extravasation of blood as in stabs, and, even if an effusion of that fluid were to happen within the cavity of the pleura, the opening would generally be sufficient for its escape, and it would not be so frequently found necessary to dilate the wound, or make a new opening, as when the injury has been inflicted with a sharp-pointed weapon.

In this last kind of case, when attended in the beginning with bleeding, Baron Larrey particularly insists upon the advantage of immediately bringing the edges of the wound together with adhesive plaster, instead of leaving it open, as advised by the generality of writers; and he endeavours to prove, that this immediate closure of the wound has great effect in stopping the hemorrhage from the pulmonary vessels. Supposing an extravasation of blood in the chest were to follow, he argues, that it would be better to let it out afterwards by a suitable incision, than to suffer the patient to perish of hemorrhage at once by not closing the wound. (*Mém. de Chir. Mil. T.* 4, *p.* 151, &c.) Dr. Hennen is in favour of the same practice. (*On Military Surgery, p.* 373, *Ed.* 2.) In a penetrating gun-shot wound of the chest, after taking away from thirty to forty ounces of blood, the surgeon should extract all extraneous substances, and splinters of bone within reach, and even dilate the external wound for this purpose, if necessary. Light unirritating dressings are then to be applied. The patient may now be (comparatively speaking) easy, until the spitting of blood, and danger of suffocation, from inward hemorrhage, come on again, when the lancet must be again employed; "and, if by this management, repeated as often as circumstances demand, the patient survives the first twelve hours, hopes may begin to be entertained of his recovering from the immediate effects of hemorrhage," and, until this danger is over, as Dr. Hennen truly observes, the lancet is the only thing which can save life. Afterwards, when the paroxysms of pain, the sense of suffocation, and the return of hemorrhage, have become more moderate, digitalis may be prescribed with the most beneficial effect; and, if the cough be very troublesome, no medicine is more useful than the spermaceti mixture with opium. With this treatment must be combined the exhibition of saline purgatives, mild laxative clysters, and a strictly low diet, the patient being allowed only slops. (See *Hennen's Military Surgery, p.* 373, *Ed.* 2.)

When matter forms in the thorax, in consequence of gun-shot wounds, the opening will generally suffice for its escape; but, should the collection of pus be confined, and occasion dangerous symptoms, the external wound must either be enlarged, or a new incision practised, according as circumstances may indicate. The mode of making an opening into the chest is considered in the article *Paracentesis.*

When a ball lodges, without falling into the chest, it may lie either in the substance of the parietes of this cavity between the muscles, or in one of the intercostal spaces, and continue there a very long time without causing much inconvenience, or making its way outward. But, when it is lodged in the thoracic cavity itself, it descends by its weight, and sometimes excites considerable irritation, suppuration, sinuses, and hectic symptoms; in this case, if its situation can be ascertained, Baron Larrey recommends an attempt to extract it. In an early stage of the case, he says, that the intercostal space will often be wide enough to let the ball pass through it; but that, at a later period, this space becomes too narrow, and it will be necessary to cut away a portion of the upper edge of the rib with a lenticular knife, which is to be preferred to a trephine, or saw. This advice is supported by some very interesting cases. (See *Mém. de Chir. Mil. T.* 4, *p.* 253.) Frequently, the ball fractures the rib, and, with the aid of dilatation, sufficient room for its extraction may be made: but the possibility and propriety of removing it through the original opening will, of course, depend upon the situation of the foreign body, and the urgency of the symptoms. A case is recorded, in which a ball, weighing three ounces and a half, was thus removed. (*Med. and Surg. Journ. Vol.* 3, *p.* 353.)

Alphons. Ferrius de Sclopetorum, sive Archibusorum Vulneribus, &c. 8*vo. Romæ*, 1552. *J. F. Rota de Bellicorum Tormentariorum Vulneribus et Curatione,* 4*to. Bonon.* 1555. *Botallus de Curat. Vulner.* 1565. *Wm. Clowe's Approved Treatise for all young Chirurgians concerning Burnings with Gunpowder, and Wounds made with Gun-shot, &c.* 4*to.* 1591. *J. Quercetanus, Sclopetarius, sive de Curandis vulneribus quæ Sclopetorum et similium Tormentorum ictibus acciderunt,* 8*vo.* 1591, 12*mo. Leips.* 1614. *Fr. Plazzonus, de Vulneribus Sclopetorum, &c.* 4*to. Venet.* 1618. *J. Woodall, Viaticum, fol. Lond.* 1639. *H. F. Le Dran, Traité, ou Réflexions tirées de la Pratique sur les Plaies d'armes à feu,* 2*de Ed.* 12*mo. Paris,* 1740. *Desport, Traité des Plaies d'armes à feu,* 12*mo. Paris,* 1749. *Ranby's Method of treating Gun-shot Wounds,* 12*mo. London,* 1781. *Observations sur les Plaies d'armes à feu, compliquées de fracture, aux articulations des extremités, ou au voisinage de ces articulations, par M. Boucher, in Mém. de l'Acad. de Chirurgie, T.* 5, *p.* 279, *Edit. in* 12*mo. Observations sur des Plaies d'armes à feu, compliquées sur tout de fracas des os, par M. Boucher, in opere cit. T.* 6, *p.* 109, *&c. Edit. in* 12*mo. Observations sur les Plaies d'armes à feu:* 1. *Sur un coup de fusil, avec fracas des deux machoires; par M. Cannac:* 2. *Sur une Plaie d'arme à feu traversant la Poitrine d'un côté à l'autre; par M. Gerard:* 3. *Sur une Plaie d'arme à feu, pénétrante depuis la partie anterieure du pubis jusqu'à l'os sacrum; par M. Andouillé:* 4. *Sur une Jambe écrasée par un Obus, ou petite bombe, par M. Cannac:* 5. *Sur une Plaie à la partie inférieure et interne de la Jambe, faite par un éclat de Grenade, sans fracas d'os; par M. Cannac:* 6. *Précis de plusieurs Observations sur les Plaies d'armes à feu en différentes parties, par M. Bordenave:—all these papers are inserted in Mém. de l'Acad. de Chirurgie, T.* 6, *in* 12*mo.; and in T.* 11 *of the same edition, are inserted Mémoires sur le traitement des plaies d'armes à feu, par M. de la Martinière, & Mémoires sur quelques particularités concernant les Plaies faites par armes à feu, par M. Vacher. M. Faure's memoirs relative to amputation in cases of gun-shot wounds may be seen in T.* 8 *of the Recueil des Pieces qui ont concouru pour le Prix de l'Acad. de Chirurgie, Edit. in* 12*mo. John Hunter's Treatise on the Blood, Inflammation, and Gun-*

shot Wounds. Richter, *Anfangsgründe der Wundarzneykunst, B.* 1. Schmucker, *Vermischte Chir. Schriften,* 3 *vols.* 8*vo. Berlin,* 1776, 1782. *Chirurgische Wahrnehmungen,* 2 *vols. Berlin,* 8*vo.* 1744, 1789; *works of high value. Discourses on the Nature and Cure of Wounds, by John Bell, p.* 169, *&c. Edit.* 3. *Richerand, Nosographie Chir. T.* 1, *Edit.* 4. *Chevalier's Treatise on Gun-shot Wounds, Edit.* 3. *Léveillé, Nouvelle Doctrine Chirurgicale, T.* 1, *Chap.* 8, *p.* 436, *&c. Encyclopédie Méthodique, Partie Chir. art. Plaies d'armes à feu. Larrey, Mémoires de Chirurgie Militaire,* 4 *Tomes,* 8*vo. Paris,* 1812, 1817; *on the whole the most instructive book for army surgeons ever published. Memoire par M. De Conte, Prix de l'Acad. T.* 8. *Examen des plusieurs Parties de la Chirurgie, par M. Bagieu, à Paris,* 1756. *Bilguer, Dissert. de Membrorum Amputatione rarissime administrandâ, aut quasi abrogandâ; Halæ,* 1761; *this work is celebrated as having attracted most deservedly the just and severe criticisms of Pott, La Martinière, Morand, &c. Morand's Opuscules de Chirurgie,* 1768. *Van Gesscher, Abhandlung Von der Nothwendigkeit der Amputation; Freyburgh,* 1775. *M. G. Daignan, Reflexions Importantes sur le Service des Hopitaux Militaires,* 8*vo. Par.* 1785. *Mursinna, Neue Medicinisch-Chirurgische Beobachtungen, Zweiter, Theil. S.* 138. *Berlin,* 1796. *Wedekind's Nachrichten über das Fransische, Kriegspitalwesen, Erster B. Leipsig,* 1797. *Baron Percy, Manuel du Chirurgien d'Armée,* 8*vo. Paris,* 1792. *Paroisse, Opuscules de Chir.* 8*vo. Paris,* 1806. *Graefe, Normen fur die Ablösung Grösserer Gliedmassen,* 4*to. Berlin,* 1812. *Assalini, Manuale di Chirurgia,* 8*vo. Milano,* 1812. *Guthrie on Gun-shot Wounds of the Extremities, London,* 1815; *or the* 2*d Ed. entitled a Treatise on Gun-shot Wounds, &c.* 8*vo. London,* 1820; *a work detailing the practice of our military surgeons during the late war in Spain, and replete with valuable information. Thomson's Report of Observations made in the military hospitals in Belgium, Edinburgh,* 1816. *A. C. Hutchison's Practical Observations in Surgery,* 1816; *and Further Obs. on the Period for amputating in Gun-shot Wounds,* 8*vo. Lond.* 1817. *Millingen's Manual,* 8*vo. Lond.* 1819. *J. Hennen's Principles of Military Surgery,* 2*d Edit.* 8*vo. Edinb.* 1820; *a publication which I cannot too strongly recommend, not only to army and navy surgeons, but to practitioners in general. James Mann, Medical Sketches of the Campaigns of* 1812, 13, 14; *to which are added, Surgical Cases, Obs. on Military Hospitals and Flying Hospitals attached to a moving Army, &c.* 8*vo. Dedham,* 1816.

GUTTA SERENA. A term said to have been first applied by Actuarius to amaurosis, or the species of blindness arising from a morbid state of the retina, or optic nerve. (See *Amaurosis.*)

In the present place, I mean first briefly to advert to a case, which the late Mr. Ware has described as combined with a particular kind of ophthalmy, that occasions excruciating pain, and requires peculiar treatment. One example of this kind was greatly relieved by a puncture, made through the tunica sclerotica into the ball of the eye with a grooved needle, somewhat larger than a common-sized couching needle, nearly in the part where this instrument is introduced in the operation of depressing the cataract. Through the groove of the instrument, a watery fluid immediately issued, which was not unlike that which Mr. Ware several times found, after death, effused between the choroid coat and retina, in cases of gutta serena. After the pain of the operation had ceased, the patient became quite easy, and the inflammation soon subsided. Mr. Ware afterwards performed a similar operation in a considerable number of resembling instances, and in several of them the proceeding was attended with almost immediate good effect. (See *Ware on the operation of largely puncturing the capsule of the crystalline humour, &c. and on the Gutta Serena, accompanied with pain and inflammation,* 1812.)

Under the head of gutta serena, I promised to notice Beer's opinions concerning amaurotic remedies, which he divides into two classes, viz. *general,* or *internal* means; and *local,* or *external.* Sometimes only the first are requisite; more rarely only the second; but frequently both together.

Amongst the internal remedies are emetics, which may be useful in two ways, either as real evacuants, or as nauseating means. It was Beer's opinion, that for the purpose of exciting actual vomiting, they should be exhibited only when the stomach is foul, and no considerable plethora exists; and he deems them improper whenever any great determination of blood to the head and eyes prevails, or any increased velocity of the circulation. Should the surgeon find it necessary to employ emetic medicines, simply as alteratives, he must consider well whether the digestive organs will bear their great and long continued operation. (*Lehre von den Augenkr. B.* 2, *p.* 463.) Notwithstanding the favourable accounts given by Schmucker, Richter, and Scarpa, of the good effects of emetics in many cases of amaurosis abroad, this treatment has had but little success in England. Mr. Travers even declares, that he does not recollect an instance of decided benefit from the emetic practice, although he has often fairly tried it. "The cases of gastric disorder, to which it is especially applicable, are most benefited by a long continued course of the blue pill, with gentle saline purgatives and tonic bitters." (*Synopsis of Diseases of the Eye, p.* 304.)

When the bowels are loaded, and there is frequent determination of blood to the head and eyes, and an accelerated circulation, and, particularly, if, after these effects, the sight is always manifestly worse, brisk purgatives may be prescribed. When, however, constipation has prevailed for a long time, drastic purgatives should not be exhibited before one or two loose motions have been procured with laxative clysters. Gentle aperients are more particularly indicated, when the patient does not have a stool daily, and the evacuation is never made with ease, nor without considerable straining; when he often passes two or three days without any evacuation at all, circumstances sure to be followed by repeated determination of blood to the head and eyes, and other ill consequences, which, according to Beer, have a very prejudicial effect on amaurosis.

Beer is of opinion, that diaphoretics should be employed with great caution, because they are apt to bring on violent determinations of blood, and an accelerated state of the circulation; and they can only be employed with judgment, and a hope of benefit, when there are good grounds for believing, that a previous stoppage of the cutaneous functions has had a real share in producing, or keeping up, the blindness. They are still more strongly indicated, when the cessation of those functions is, in some measure, evinced by the dry state of the integuments, wandering pains between the skin and muscles, and considerable melioration of the eyesight after the breaking out of any accidental perspiration. (*B.* 2, *p.* 465.)

Professor Beer thinks, that in amaurosis medicines for promoting the menstrual discharge are too often employed on empirical principles, to the serious detriment of the patient, the cessation of this discharge being mostly regarded as the cause of the amaurosis, while, in reality, it is very seldom really so, both affections being dependent upon one and the same cause. Hence much circumspection, and the closest investigation, are necessary to trace the connexion between these morbid effects, and to ascertain when such medicines can be given without risk.

Still greater mischief results from the treatment of amaurotic children with anthelmintics; nay, Beer assures us, that he has seen numerous amaurotic boys and girls thus wrongly treated, who had not the slightest symptom of worms. However, when amaurosis is unattended with any leading indications, anthelmintics may be tried, for they are less injurious to the eyes than many other medicines, though, as they consist of drastic purgative means, they must soon occasion great debility.

According to Beer, when there is good ground for suspecting any thing syphilitic about the patient, mercurials may be given with great prospect of benefit. Also, when no suspicion of this kind can be entertained, but amaurosis is accompanied with infarction of the abdominal viscera, especially a manifest chronic disease of the liver, or serious chronic swellings and indurations of the glands, a periodical headache of no determinate character in other respects, and aggravation of the blindness after every such attack, mercurial preparations, as Beer can assert from manifold observation, are productive of the best effects upon the disease of the eyes. Yet, says he, under these circumstances, mercury should never be exhibited where the individuals are of a debilitated scorbutic diathesis, or subject to bleedings, and more particularly where there is the least mark of a dissolution of the vitreous humour. (*Lehre von den Augenkr. B.* 2, *p.* 466.) Upon the whole, from what I am able to learn of the practice in London, mercury is more extensively and successfully used, as a remedy for amaurosis, than any other medicine in the whole pharmacopœia. "When the amaurosis is recent and sudden (says Mr. Travers,) and either the signs of an obscure inflammation are present, or only the amplitude and inactivity of the pupil correspond to the patient's history—mercury should be introduced with all convenient rapidity into the system, I mean so as to ruffle it in the least possible degree. No advantage is obtained by salivation; on the contrary, I think it hurtful: when mercury is beneficial, its efficacy is perceived as soon as the mouth is sore." (*Synopsis of the Diseases of the Eye*, *p.* 305.)

Anti-nervous medicines have at all times, ranked very high, on empirical principles, as means for the cure of amaurosis; but, how often is this disease not simply a nervous affection? Beer divides the medicines of this sort, employed in cases of amaurosis, into three classes, namely, *antiparalytic*, *antispasmodic*, and *tonic*. To the *first class* belong arnica, naphtha, camphor, millepedes, sulphur auratum antimonii, liquor ammoniæ lavendulatus, pulsatilla, black hellebore, and phosphorus. These medicines can be safely given to amaurotic patients, when an evident general nervous debility, and morbid irritability prevail, without any other particular appearances of disease, and especially when, at the same time, there are genuine paralytic appearances in the eye itself, or in the parts immediately surrounding it, or not very far from it. Amongst the *antispasmodic* remedies, particularly when used on empirical principles, Beer has found the most efficacious to be valerian, liquor ammoniæ carbonatis, assafœtida, opium, hyosciamus, castoreum, musk, flores zinci, and extract of chamomile. *Tonic* nervous remedies, says Beer, are to be used with more caution; for bitter medicines, when injudiciously prescribed for nervous debilitated individuals, rather promote the formation of amaurosis. When calamus aromaticus is in question, care must be taken, that there be no tendency to pectoral complaints, which this medicine is too apt to bring on in weak subjects, in which event the sight is always very much impaired by it. In costive habits, bark is likewise apt to render the blindness worse. And, according to the same experienced oculist, it is necessary to be very circumspect with steel medicines, empirically prescribed, as they frequently occasion determinations of blood to the head and eyes, and quicken the circulation, whereby every remnant of vision may be abolished. Steel medicines do the greatest and quickest injury to amaurotic eyes, when combined with narcotics. Above all things, it is generally prudent, in cases of amaurosis, carefully to abstain from all the stronger and long-operating nervous medicines, whenever plethora, determinations of blood, and tendency to inflammation, exist. (*Lehre von den Augenkr. B.* 2, *p.* 467.) In this country, I do not believe that antinervous and antispasmodic medicines have obtained credit for their efficacy in this disease. Thus, Mr. Travers states, that he has never known any real benefit derived from camphor, assafœtida, valerian, &c. though he has seen much good derived from tonics, the mineral acids, bark, steel, and arsenic, after a due regulation of the digestive functions. (*Synopsis, &c. p.* 304.) In arnica montana, aconite, euphrasia, and stimulants in general, he has no confidence.

Local, or *external*, medicines, for amaurosis, are divided by Beer into two classes, namely, into those which are applied to parts more or less distant from the eyes, and having some sympathetic connexion with these organs; and into others, which are usually put upon the eye itself.

In the first class bleeding has obtained high repute, either by venesection in the common way, the application of leeches to the pudenda, the arms, behind the ears, or upon the temple; cupping the back, or by opening the temporal artery or jugular vein. Bleeding is indicated when manifest plethora, a determination of blood to the head and eyes, or an accelerated circulation, is combined with a considerable decrease of vision; when the menses are nearly or quite suppressed in plethoric subjects; a manifest determination of blood to the parts of generation prevails; or the same thing occurs in hemorrhoidal patients. (*Beer, Lehre, &c. p.* 469.)

According to Mr. Travers, all the cases of direct debility, and proper paralysis of the optic nerve, are aggravated by loss of blood. (*Synopsis, &c. p.* 303.)

Professor Beer gives his testimony, also, in favour of the efficacy of such applications as produce a counter-irritation, not merely as rubefacients, but as means occasioning an evacuation of lymph; such are blisters, sinapisms, laid on the back or calves of the legs, vesication by means of the bark of mezereon, issues, and setons. These means are proper when the blindness is attended with continual, but wandering, pains in the aponeurotic covering of the head, or in the vicinity of the eye, with a whizzing noise and irritating pain in the ear, or with the suppression of a purulent discharge from the meatus auditorius. In such cases, however, there must be no particular plethora, still less any determination of blood to the head and eyes. Here should also be mentioned friction with antimonial ointment, which is especially indicated where there is reason to believe, that the amaurosis has been preceded, and partly produced, by a long interruption of the cutaneous secretion.

Formerly, according to Beer, clysters were too commonly employed in cases of amaurosis; for, whenever the cause of the disease was not understood, it was usual to refer it to a morbid state of the abdominal viscera. At present, clysters in amaurotic cases are employed quite empirically, as stimulants to the intestinal canal, and evacuants, when the loaded state of the bowels and obstinate constipation require them, and when the scantiness and difficulty of the evacuations keep up a constant determination of blood to the head and eyes, and when, perhaps for other reasons, common purgative medicines cannot be employed. Beer says, that aperient clysters are attended with the most decided good effects in that amaurotic weakness of sight, which sometimes occurs towards the end of pregnancy, and is combined with obstinate constipation, continual head-ach, evident determination of blood to the head and eyes, and such an inflammatory diathesis as cannot be mistaken. On the other hand, the employment of clysters, as anodyne remedies, not as evacuants, is principally useful in hypochondriacal and hysterical amaurotic patients, when they are troubled with much general cramp, and spasms in the abdomen. (*Vol. cit. p.* 470.)

According to the statements of the same writer, baths, whether warm or cold, adapted for the whole body, or in the form of a slipper-bath, a pediluvium, or affusion, have hitherto not proved very efficacious empirical remedies for amaurosis, and this, whether they consist of simple water, or aromatic decoctions, or of waters impregnated with sulphur or iron. The reason why baths in general are less frequently employed as empirical remedies in cases of amaurosis, and why they are still more rarely successful, may be, because in the very cases of amaurosis, in which baths of various kinds are clearly indicated, the greatest attention must be paid to the patient's constitution, to the state of the skin especially, and to the temperature of the fluid employed; for, in a healthy subject, too warm a bath may, under certain circumstances, (as for instance when there is plethora,) of itself occasion a serious amaurotic amblyopia; and therefore, under similar circumstances, must be likely to increase any present amaurotic weakness of sight into complete blindness. In general, warm whole, or slipper, baths must be employed as empirical remedies in amaurosis only when the regular action of the skin is disturbed, without febrile symptoms, when the affection of the eyes has been preceded by the sudden stoppage of a profuse perspiration; or some cutaneous efflorescence is coexistent with the amaurosis. On the contrary, pediluvia with salt, mustard, &c. are chiefly proper when amaurosis is accompanied with a determination of blood to the head and eyes, or any local inflammations, after which the eyesight is always found to be worse. In cases of amaurosis affusion can be seldom used empirically, and only under those circumstances where modern experience has proved the shower bath to be allowable. Cold bathing generally agrees badly with an amaurotic patient, and when his skin is extremely sensible, when wandering pains are felt between the integuments, and muscles, or there is a tendency to erysipelatous inflammation, the power of vision evidently declines after every trial of the plan. But, according to Beer, mineral waters, impregnated with iron, in the form either of a bath for one half, or for the whole, of the body, generally produce, under these circumstances, the most favourable effects upon the skin, and, through the medium of it, upon the diseased eye. The case, however, is to be excepted where flying rheumatic, and perhaps gouty, pains constantly tease the patient, unaccompanied with fever, and where bathing of the whole body in sulphurous mineral water should be preferred. (*Lehre von den Augenkr. B.* 2, *p.* 471—472.)

If we are to believe Beer, the empirical employment of applications, which have the effect of increasing the secretion of mucus, is very seldom proper, such as irritating gargles, the smoking of tobacco, and sternutatory powders; for these means can only be adopted with any prospect of benefit when amaurosis is accompanied with plethora, a sense of spasm and weight about the frontal sinuses, an incessant obtuse heaviness at the bridge of the nose, and unusual dryness of the nostril, in an individual, who has frequently suffered catarrhal complaints, but some time previously to the origin of the amaurotic symptoms has continued nearly, or quite free from colds; and when the patient has no tendency to plethora, determination of blood to the head and eyes, and acceleration of the circulation. (*Vol. cit. p.* 473.)

The application of sternutative powders to the nostrils is, perhaps, to be regarded as a mode of treatment, established on empirical principles, unless we can place confidence in the statement of Schmucker, Richter, and Beer, that an unusual dryness of the mucous membrane of the nose, following tedious and severe catarrhs, may have the effect of inducing amaurosis. The snuff employed by Schmucker, is thus composed; ℞. Mercur. viv. ʒi. Sacchar. alb. ʒiij. Lill. Alb. Rad. Valerian. ā ā ʒj. Misce.

The late Mr. Ware imputed considerable efficacy to electricity and a mercurial snuff in cases of gutta serena. The snuff was compounded of ten grains of turbith mineral (*hydrargyrus sulphuratus*) well mixed, with about a dram of the pulvis sternutatorius, glycirrhiza, or common sugar. A small pinch of this snuff, taken up the nose, is found to stimulate it very considerably—sometimes exciting sneezing, but, in general, producing a very large discharge of mucus. (See *Chir. Obs. relative to the Eye*, *Vol.* 1.)

Amongst the remedies, which, in cases of amaurosis, are intended to be applied directly to the eye, and its surrounding parts, local bleeding merits the first rank. The extraction of blood, by means of leeches, is the only mode in which the practice can here be executed. The method, however, is only proper when manifest turgescence of the vessels of the conjunctiva and sclerotica is combined with a feeling of constant pressure about the eye, a sense of fulness and tension in the ball, and evident plethora, without any local inflammation or increase in the velocity of the circulation.

Experience proves also, says Beer, that the empirical application of rubefacients, or drawing plasters, to the temples or eyebrows, is fraught with not less efficacy, when all sensibility in the retina appears to be extinguished, without any defect in the texture of the eye, any varicose dilatation of its blood-vessels, or any particular determination of blood to it. Applications, producing an evacuation of lymph, including both blisters and antimonial ointment, may be alternately employed upon the eyelids and temples, when there are grounds for believing, that the functions of the skin have already been long suspended by porrigo, or the stoppage of perspiration on the forehead. (*Beer*, *Lehre von den Augenkr. B.* 2, *p.* 474.)

As in the rational plan of treatment, the rubbing of fluid, pungent or irritating medicines upon the eyebrows, in certain kinds of amaurotic blindness, is often attended with considerable efficacy; so, in Beer's opinion, it should not be neglected in cases where the surgeon is compelled to have recourse to empirical methods of cure; for instance, where it is observable, that generally in the evening, or the shade, the eyesight immediately grows weaker; that on the patient's first awaking in the morning, it is weaker than in the middle of the day; and what particularly merits notice, while the case is unattended with any sensations of imaginary flashes of light; a very feeble, or entirely abolished motion of the iris; not the least vestige of any defect in the structure of the eye; and no symptoms of determination of blood to the head and eyes, or of a general tendency to inflammation. Beer recommends pungent applications to be first tried; such as the spiritus aromaticus, balsamus vitæ Hoffmanni, or Cologne water. These may be followed by aqueous substances, naphtha, &c. then by narcotics, like the tincture of opium, and lastly, by irritating remedies, like the tinctura lyttæ. Fluid applications which are applied in the form of vapour to the eye, demand greater circumspection, like naphtha, the liquor ammoniæ, &c. These may be best applied by putting a small quantity of them into the hand, over which the eye must be held in such a manner that none of the fluid will come into contact with it. But, as soon as the eye begins to be irritated by the vapour, the tears to run, or actual pain is felt, the hand is to be removed, lest too much irritation be produced. (*Beer*, *vol. cit. p.* 475.)

Not only in the empirical, but also in every scientific mode of treating amaurosis, says this author, such remedies as are intended to produce a shock upon the nerves and vessels, require the utmost caution, because, of all the various classes of remedies, they are the most powerful; and consequently, if misapplied, are likely to convert an amaurotic weakness of sight into complete blindness. This mournful event is most rapidly produced, when applications of this description are employed in plethoric subjects, affected with partial determinations of blood and local inflammations, a varicose state of the blood-vessels of the eye, defects in the transparent media of that organ, or frequent head-ach. To this class of remedies belong especially the shower bath, electricity, galvanism, &c. On the empirical plan they can only be used with safety, or advantage, when decided marks of paralysis, either in the amaurotic eye or its appendages, are present. (*Lehre von den Augenkr. B.* 2, *p.* 477.)

Mr. Ware has observed, that the pupil has been generally dilated, in the cases benefited by electricity. He notices, however, that there are many instances, in which a contraction of the pupil is the only change which takes place in the appearance of the eye. In this sort of case, the impairment of sight is usually preceded by severe pain, and the original cause may be an internal ophthalmy of long continuance. The crystalline is sometimes visibly opaque. Here electricity has been found useful; but, Mr. Ware states, that, in these instances, the sublimate has proved superiorly and more certainly efficacious, and, consequently, he prefers it to all external applications whatever. He recommends one fourth of a grain, as a quantity proper for a common dose, and says, that it agrees best with the stomach when first dissolved, as Van Swieten directs, in half an ounce of brandy, and taken in a basin of sago or gruel. For young patients the dose must be diminished in proportion to their youth. The medicine is to be continued, as uninterruptedly as the constitution will allow, for a month, six weeks, or even longer.

Electricity is said to have proved more strikingly useful, in cases of amaurosis, originating from lightning, than when the disease has arisen from any other cause. Mr. Ware relates a most interesting instance of the success of electricity, in a case which came on very suddenly, after great pain in the teeth, and a swelling of the face, had gone off. The disorder came on more suddenly; the temporary blindness was more entire; the eyelids were more affected, and the cure more speedy, than in the instances related by Mr. Hey, in the 5th Vol. of the Med. Obs. and Inq. (*Chir. Observ. relative to the Eye, by J. Ware, Vol.* 1.) However, the amaurosis produced by lightning may also be sometimes cured in other ways. Mr. Wardrop mentions that he has only seen one case of this kind, and the sight was restored by the repeated application of small blisters over the frontal nerve. (*Essays on the Morbid Anatomy of the Human Eye, Vol.* 2, *p.* 173.)

With the exception of one case related by Valsalva, Scarpa was unacquainted with any instance of amaurosis, arising from a wound of the eyebrow, that was relieved, and he has, therefore, set down this species as incurable. The opinion, however, is not perhaps correct, for the first case related by Mr. Hey arose from this cause, and was cured by giving every night the following dose: ℞ *Calomel. Camphor.* ā ā gr. iij. *Conserv. Cynosb.* q.s. *probe misceant et f. Bolus*, in conjunction with electricity. The lady, however, had been previously bled twice, had taken some nervous medicines, and had had a blister between the shoulders. The patient was first set upon a stool with glass feet, and had sparks drawn from the eyes, and parts surrounding the orbits, especially where the superciliary, and infra-orbitary branches of the fifth pair of nerves spread themselves. After this operation had been continued half an hour, she was made to receive, for an equal time, slight shocks through the affected parts. In a few days, sight began to return, and in less than three months it was quite restored. —In another case, one grain of calomel, and two of camphor, given every night, and the employment of electricity, effected a cure. The disease had come on gradually, without any previous accident, or pains in the head. The patient a boy nine years old.

There are several other very interesting cases of amaurosis related by Mr. Hey, all of which make electricity appear an efficacious remedy, though it is true, as Scarpa observes, that, in most of these instances, internal medicines were also given, and bleeding occasionally practised. Mr. Hey attributes the benefit chiefly to the electricity, because, in two of his cases, no medicines were used, yet the progress of the amendment seemed to be as speedy in them, as in the rest, and in two instances, a degree of sight was obtained by the first application of electricity. At present, I think electricity and galvanism, as means of benefiting amaurosis, are less valued in England, than on the Continent. Mr. Travers states, that he has had recourse to them in many cases, some of which were of a very favourable description, but he never saw any good produced by them. (*Synopsis of the Diseases of the Eye, p.* 303.)

How far, however, the statements of Beer, Ware, &c. about the efficacy of local applications, can be trusted, is yet a question; for, they disagree with reports made by other writers. Thus, with the exception of cupping, issues, setons, and particularly blisters, Mr. Travers declares, that his experience leads him to attach no value to the various forms of external remedies. (*Synopsis, &c. p.* 30, *8vo. Lond.* 1820.)

H.

HÆMATOCELE. (From *αιμα*, blood, and *κηλη*, tumor.) A swelling of the scrotum, or spermatic chord, proceeding from, or caused by, blood.

According to Mr. Pott, when the tunica vaginalis has been long, or much distended, "it becomes thick, and tough; and the vessels (especially those of its inner surface) are sometimes so large, as to be very visible, and even varicous. If one of these lies in the way of the instrument, wherewith the palliative cure is performed, it is sometimes wounded; in which case, the first part of the serum which is discharged, is pretty deeply tinged with blood.

"Upon the collapsion of the membranes, and of the empty bag, this kind of hemorrhage generally ceases, and nothing more comes of it. But, it sometimes happens, either from the toughness of the tunic, or from the varicose state of the vessel, that the wound (especially if made by a lancet) does not immediately unite; but continues to discharge blood into the cavity of the said tunic, thereby producing a new tumor, and a fresh necessity of operation."

This is what Mr. Pott calls the first species of hæmatocele, which evidently proceeds from a wound of a vessel of the vaginal tunic.

"Upon the sudden discharge of the fluid, from the bag of an over-stretched hydrocele, and thereby removing all counter-pressure against the sides of the vessels, some of which are become varicous, one of them will, sometimes without having been wounded, burst; (hence, the last running of the water from a hydrocele is often bloody.) If the quantity of blood, shed from the vessel so burst, be small, it is soon absorbed again; and creating no trouble, the thing is not known. But if the quantity be considerable, it, like the preceding, occasions a new tumor, and calls for a repetition of the operation." This, Mr. Pott calls the second species: "which, like the first, belongs entirely to the vaginal coat, and has no concern either with the testicle, or with the spermatic vessels. In both, the bag which was full of water, becomes in a short space of time distended with blood; which blood, if not carried off by absorption, must be discharged by opening the containing cyst: but in neither of these can castration (though said to be the only remedy) be ever necessary: the mere division of the sacculus, and the application of dry lint to its inside, will in general, if not always, restrain the hemorrhage, and answer every purpose, for which so severe a remedy has been prescribed." With respect to filling the cavity of the tunica vaginalis with lint, I believe few good surgeons of the present day would consider the measure at all necessary or proper. I have seen three or four cases of hæmatocele of the above kind laid open, but never knew the surgeon compelled by the bleeding to cram the tunica vaginalis with lint, to the great irritation and injury of the testicle itself. On the contrary, after taking out the blood, letting the parts collapse, and applying the cold lotio plumbi acetatis, for a few hours to the scrotum, by means of linen wet with the application, they substituted for the lotion an emollient poultice, and had recourse to fomentations, saline purgatives, leeches, and even venesection, according to circumstances.

The next example, regarded by Pott and Richter, as a form of hæmatocele, is not admitted by Richerand, Jourdan (see *Dict. des Sciences Méd. T.* 20, *p.* 126,) and other modern surgeons.

"If," says Mr. Pott, "blood be extravasated within the tunica albuginea, or proper coat of the testicle, in consequence of a great relaxation, and (as it were) dissolution of part of the vascular compages of that gland, and the quantity be considerable, it will afford or produce a fluctuation, to the hand of an examiner very like to that of a hydrocele of the tunica vaginalis; allowing something for the different density of the different fluids, and the greater depth of the former from the surface.

"If this be mistaken for a simple hydrocele, and an opening be made, the discharge will be blood; not fluid, or very thin; not like to blood circulating through its proper vessels; but dark, and dusky in colour, and nearly of the consistence of thin chocolate (like to what is most frequently found in the imperforate vagina). The quantity discharged will be much smaller than was expected from the size of the tumor; which size will not be considerably diminished. When this small quantity of blood has been so drawn off, the testicle will, upon examination, be found to be much larger than it ought to be; as well as much more loose and flabby; instead of that roundness and resistance arising from a healthy state of the gland, within its firm strong coat, it is soft, and capable of being compressed almost flat, and that generally without any of that pain and uneasiness, which always attend the compression of a sound testicle. If the bleeding ceases upon the withdrawing the cannula (supposing a trocar to have been used), and the puncture closes, a fresh accumulation of the same kind of fluid is soon made, and the same degree of tumefaction is produced, as before the operation: if the orifice does not close, the hemorrhage continues, and very soon becomes alarming."

In the two first species, "the blood comes from the tunica vaginalis, the testis itself being safe, and unconcerned; and the remedy is found, by opening the cavity of the said tunic; but in this, the hemorrhage comes from the substance of the testicle: from the convolutions of the spermatic artery, within the tunica albuginea: the division of the vaginal coat can here do no good; and an incision made into the albuginea can only increase the mischief: the testicle is spoiled, or rendered useless, by that kind of alteration made in it, previous to the extravasation; and castration is the only cure which a patient in such circumstances can depend upon."

I confess, that no good reason appears for arranging cases of the preceding kind with hæmatocele; for, what are they but diseased testicles? which have been punctured, either on account of their seeming to contain a fluid, or really having within them cysts filled with a chocolate-coloured or other fluid, as I have seen in hundreds of instances of sarcocele, and, whatever blood is discharged, is not extravasated in the substance of the testis previously to the puncture; but issues as a necessary consequence of that proceeding: however, of the propriety of the practice advised by Mr. Pott, no doubt can be entertained.

The last species of this disease, noticed by Mr. Pott, "arises from a bursting of a branch of the spermatic vein, between the groin and scrotum, in what is generally known by the name of the spermatic process. This, which is generally produced by great or sudden exertions of strength, feats of agility, &c. may happen to persons in the best health, whose blood and juices are in the best order, and whose genital parts are free from blemish, or disease.

"The effusion, or extravasation, is made into the cellular membrane, which invests and envelops the spermatic vessels, and has something the appearance of a true hernia. When the case is clear, and the extravasated blood does not give way to discutient applications, the only remedy is to lay the tumor fairly open, through its whole length. If the vessel or breach be small, the hemorrhage may be restrained by mere compression with dry lint, or by the use of styptics; but if it be large, and these means do not succeed, the ligature must be made use of."

I cannot conceive, that, in any case of a mere rupture of one of the spermatic veins, it can ever be justifiable to tie the whole spermatic chord, and then perform castration, though Mr. Pott advises this plan, in case the bleeding branch cannot be tied singly. Discutient applications, and an occasional purge, will almost always disperse the swelling; and if not, opening it, taking out the blood, applying cold, or, if necessary, filling the cavity with lint, and using compression, would be according to my humble judgment the most judicious treatment.

A case, precisely of the latter kind is not very common, yet Mr. Pott has not omitted it, as one of the forms of hæmatocele: but, why he has not taken notice of the most frequent of all the varieties of this disease, I am at a loss to conjecture; I mean, the extravasation of blood in the loose cellular membrane of the scrotum from blows on the part, and sometimes from lithotomy, castration, &c. quite unconnected with any rupture of the spermatic veins. These are the cases, which are mostly met with in practice. I have seen them followed by suppuration; but, in general, the effused blood is gradually absorbed, with the aid of discutient applications, leeches, fomentations, poultices, and saline purges. A surgeon should generally be reluctant to lay open the tumor, as, in many instances, sloughing and very severe symptoms have been the result.

Celsus and Paulus Ægineta are the best of the old writers on hæmatocele. For modern information, consult Pott's Chir. Works, Vol. 2. *B. Bell on Hydrocele. Flajani, Collezione d'Osservazioni, &c. T.* 2. *Richter, Anfangsgr. der Wundarzn. B.* 6. *Richerand, Nosographie Chir. T.* 4. *Osiander, in Arnemann's Magazin für die Wun-*

darzn. B. 1, *p.* 355,—*the patient died after an opening had been made in the swelling. Follet, in Journ. de Méd. continué, Vol.* 13, *p.* 422,—*a case from contusion, cured by an incision. Harris in Mem. of Lond. Med. Society, Vol.* 5.

HARE-LIP. (*Labia Leporina.*) A fissure, or perpendicular division of one or both lips. The term has arisen from the fancied resemblance of the part to the upper lip of a hare. Occasionally the fissure is more or less oblique. In general, it is directly below the septum of the nose; but, sometimes, it corresponds to one of the nostrils. The two portions of the lip are generally moveable, and not adherent to the alveolary process; in less common cases, they are closely attached to the forepart of the jaw.

Children are frequently born with this kind of malformation, which is called a *natural* hare-lip, while that which is produced by a wound is named *accidental.* Sometimes the portions of the lip, which ought to be united, have a considerable interspace between them; while, in other instances, they are not much apart. The cleft is occasionally double, a little lobe, or small portion of the lip, being situated between the two fissures.

The fissure commonly affects only the lip itself, and usually the upper one. In many cases, however, it extends along the bones and soft parts forming the palate, even as far as the uvula; and sometimes those bones are entirely wanting. In a few instances, the jaw not only is imperfectly ossified in front, so that a cleft presents itself there, but one side of it projects forward, and is at the same time inclined too much outward, drawing with it the corresponding part of the palate, and the septum nasi, so that a very unsightly distortion of the nostril and nose is produced. This case, I believe, has not been described in surgical books.

A hare-lip, in its least degree, occasions considerable deformity: and when more marked, it frequently hinders infants from sucking, and makes it indispensable to nourish them by other means. When the lower lip alone is affected, which is rare as a malformation, the child can neither retain its saliva, nor learn to speak, except with the greatest impediment. The constant escape of the saliva, besides being an annoyance, is found to be detrimental to the health; for its loss impairs the digestive functions, the patient becomes emaciated, and even death would sometimes ensue, if the incessant discharge of so necessary a fluid in the animal economy were not prevented. Thus, a lady, who was in this state, consulted Tronchin, who immediately saw the cause of her indisposition, and recommended the fissure in the lip to be united; the operation was done, and the dyspeptic symptoms then ceased. And, when the fissure pervades the palate, the patient not only articulates very imperfectly, but cannot masticate, nor swallow, except with great difficulty, on account of the food readily getting up into the nose.

An early removal of the deformity must obviously be very desirable; but, as it cannot be accomplished without an operation, attended with some degree of pain, Dionis, Garengeot, and others, advise waiting till the child is four or five years old, on the supposition, that, at an earlier age, the child's agitations and cries would render the operation impracticable, or derange all the proceedings taken to ensure its success. It is plain, however, that such reasons are not of great weight. A child, four or five years old, and, very often, even one eight or ten years of age, is more difficult to manage, than an infant only a few months old. Every child of the above age has a thousand times more dread of the pain, than of the deformity, or of the inconveniences of the complaint, to which he is habituated; while an infant of tender years fears nothing, and only feels the pain of the moment.

A more rational objection is the liability of infants to convulsions after operations, and this has induced may excellent surgeons to postpone the cure of the hare-lip, till the child is about two years old. This custom is also sanctioned by Sir Astley Cooper, who mentions in his lectures several instances, which have either been communicated to him by others, or have occurred in his own practice, where operations for the cure of hare-lips in very young infants, have had a fatal termination, in consequence of an attack of convulsions, or diarrhœa. The period when dentition is completed, or the age of two years, he therefore sets down as the most advantageous for the operation, and if parents urge its being done earlier, he very properly advises the surgeon to let them be duly apprised of the risk, so that in the event of the child being cut off, he may not incur blame for having operated at a disadvantageous period of life. (See *Lancet, Vol.* 3, *p.* 108.) The latter end of 1823, I met Sir Astley Cooper in consultation in a case where this very question occurred. The deformity was particularly unsightly, in consequence of the upper jawbone being imperfectly ossified in front, and one side of it forming a considerable projection forwards through the fissure which extended into the nostril, at the same time that the nose was seriously distorted to one side of the face. The parents, persons of the first respectability, were therefore uncommonly solicitous for an early operation, some instances of the success of which in very young infants had already been communicated to them by their friends. The projection of bone, they had also learned, might be cut away, so as to permit the soft parts to meet, which they now would not do. The risk of an operation on the infant in question, then scarcely two months old, was fairly explained to the parents; but, I doubt, whether they could have been prevailed upon to wait three months longer, had not Sir Astley Cooper represented to them the disadvantages of cutting away the bony projection, and urged the allowance of a little time to reduce the protuberance by means of pressure. As I had not had any previous conference with Sir Astley on the subject, I was particularly gratified in finding his advice agree precisely with what I had already given, when the case was first shown to me. Exactly when the infant was five months old, a period selected on account of its being the latest previously to the usual time of the commencement of the ailments of dentition, I performed the operation in the presence of Messrs. Ives of Chertsey, and Mr. Ives, jun. of Chobham. By this time the bone had been so effectually depressed, by means of a kind of spring truss, constructed by Messrs. Salmon and Ody for the purpose, and worn several hours daily, that the soft parts admitted of being brought over it with tolerable facility. Union followed very well, and, though it was one of the worst hare-lips ever seen by Mr. Ives, senior, or myself, without an extensive division of the palate, the disfigurement is now very trivial, and the wrong direction of the nose constantly undergoing further diminution, in proportion as the jaw recedes under the pressure of the apparatus, which is still employed.

This is the youngest infant, on which I have operated; but, in October 1824, I performed the operations on an infant twelve months old at Walton on Thames, where I was kindly assisted by Mr. Stillwell, surgeon in that town. Union took place very favourably without any indisposition whatever. Only one pin was used at the lower part of the lip, as I found that the upper part of the division could be perfectly and readily closed with a strip of adhesive plaster.

Mr. Sharp observes, " there are many lips, where the loss of substance is so great, that the edges of the fissure cannot be brought together, or, at best, where they can but just touch ; in which case, it need not be advised to forbear the attempt ; it is likewise forbid in young children, and with reason, if they suck ; but otherwise it may be undertaken with great safety, and even with more probability of success, than in others that are older." (*Operations in Surgery, chap.* 34.)

Le Dran performed the operation on children of all ages, even on those at the breast. B. Bell did it with success on an infant only three months old. Muys advises it to be undertaken as soon as the child is six months old. Roonhuysen operated on children ten weeks after their birth, and all his contemporaries have praised his singular dexterity and success. As an essential step to the success of the operation, he recommended hindering the children from sleeping a certain length of time before it was undertaken, in order that they might fall asleep immediately afterwards ; and with the same view, opiates have been prescribed.

Putting out of consideration the partial success, which has attended the use of blistering plaster for making the edges of the fissure raw and capable of union, all practitioners entertain the same sentiment, with regard to the object of this operation, which consists in reducing the preternatural solution of continuity to the state of a simple wound, by cutting off the edges of the separated parts throughout their length, and then keeping these parts in contact until they have completely grown together. But, although such principles have been generally admitted, there was formerly some difference of opinion, with respect to the best method to be followed in practice ; some operators having preferred sutures for keeping the edges of the wound in contact ; while, others disapproved of them, believing, that a perfect cure might always be accomplished by means of adhesive plaster and an uniting bandage, so as to save the patient from all the pain and annoyance of sutures.

M. Louis thought, that the use of sutures, in the operation for the hare-lip, proceeded from a false idea respecting the nature of the disease ; for, the fissure in the lip being wrongly imputed to loss of substance, it was deemed impossible to keep the parts in contact, except by a suture.

" The separation of the edges of the fissure in the lip," says M. Louis, " is only the effect of the retraction of the muscles, and is always proportioned to the extent of the cleft. Persons with hare-lips, are capable of bringing the edges of the fissure together by muscular action, by puckering up their mouths. On the other hand, the separation is considerably increased when they laugh, and the breach appears excessively large, after superficially paring off its edges on both sides. The interspace in the hare-lip must not, therefore, be mistaken for a loss of substance. This truth is confirmed by the effects of sticking plaster, which has sometimes been applied to the hare-lip, as a preparatory measure before the operation, and which materially lessens the separation of the parts.

" According to the confession of all who have written in favour of the twisted suture, it seems advisable only on the false idea, that the hare-lip is the effect of a greater or lesser loss of substance ; and they say, positively, that we must not have recourse to it when there is only a simple division to be united. The twisted suture must then be proscribed from the operation for the natural hare-lip, since it is proved, that this malformation is unattended with loss of substance. At the same time, a loss of substance is but too real, after the extirpation of scirrhous and cancerous tumors, to which the lips are very subject. Yet, even in these cases, the extensibility of the lips allows an attempt to be made to reunite the double incision, by which the tumor has been removed, and it succeeds without the smallest deformity, when care is taken to direct each incision obliquely, so that both of them form, where they meet, an acute angle, in the base of which the tumor is comprised. Here the means of union ought to be the more efficacious, because the difficulty of keeping the edges of the wound approximated is greater. M. Pibrac, in his memoir on the abuse of sutures, when speaking of the hare-lip, has already explained, that they are badly-conceived means, and more hurtful in proportion as there is a greater loss of substance, because the greater the interspace is between the two parts, the more fear is there of their efforts on the needles or pins left in the wound. Hence, care has always been taken to make the dressings aid the operation of the suture. After this consideration, judiciously made by the partisans of this plan, there was only one more step to be taken, according to M. Pibrac, in order to evince the necessity of proscribing it. The cap, or copper head-piece, described by Verduc and Nuck, for compressing the cheeks ; the clasps of Heister ; and strips of adhesive plaster ; are all only inventions for the support of the parts, and keeping them from being disunited. When the suture failed, it was by these means, that the original deformity was corrected, together with that produced by the laceration, which would not have occurred without the suture. As, then, the dressings, when methodically applied, are capable of effectually rectifying the mischief of the suture, M. Louis inquires, why should they be considered only as a resource in a mere accidental case? Why should they not be made the chief and primary means of re-uniting the lip, even when there is a loss of substance?

" Nothing can be opposed to the proofs adduced upon this point. They are even drawn from the practice of those, who have employed sutures without success. Such persons have themselves furnished the proofs of the bandage being capable of repairing the mischief resulting from the twisted suture."

M. Louis, with a view of perfecting our notions on this matter, lays it down as a fact, that the retraction of the muscles being the cause of the separation of the edges of the fissure, it is not to these edges we are to apply the force which is to unite them; but that it should be applied further to the very parts, whose action (the cause of the separation) is to be impeded, and whose contraction is thus to be prevented. A great many means for supporting the wound, only irritate the muscles and excite them to action, and it is this action which we should endeavour to overcome. The means for promoting union can only be methodical, when directly employed to prevent such action, by an immediate application on the point where it is to be resisted. The facility, with which the parts may be brought forward, so as to bring the two commissures of the lips into contact, by the mere pressure of the hands, shows what may be expected from a very simple apparatus, which will execute the same office without any effort, in a firm and permanent manner, and which will render sutures unnecessary, the inconveniences of which are too well known.

M. Louis, after having explained the reasons of the theory, on which he founded his method, relates several cases, taken either from his own practice, or that of others, to illustrate its advantages. He details the history of twenty cases, in which his plan perfectly succeeded, both in accidental hare-lips, with considerable loss of substance, and in natural ones. In most of these instances, however, it was thought proper to assist the bandage with one stitch at the extremity of the fissure, close to the vermilion border of the lip, for the purpose of keeping the parts securely on a level.

Notwithstanding the operation, as performed with the twisted suture, is opposed by an authority of such weight as that of M. Louis, still it is the method most commonly practised. No modern surgeons doubt, that a hare-lip may be cured by means of adhesive plaster, and uniting bandages, quite as perfectly as with a suture; and all readily allow, that the first of these methods, as being more simple and less painful, would be preferable to the latter one, if it were equally sure of succeeding. But it is considered far more uncertain in its effect. To accomplish a complete cure, the parts to be united must be maintained in perfect contact, until they have contracted the necessary adhesion; and how can we always depend upon a bandage for keeping them from being displaced? What other means, besides a suture, affords in this respect perfect security?

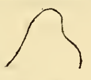
I shall first describe the operation, as usually done by surgeons of the present day with the twisted suture. The first thing is to examine, whether there is any adhesion of the lip to the gum; and, if there be, to divide it with a knife. Some authors (*Sharp*) recommend the frænulum, which attaches the lip to the gum, always to be divided: but when the hare-lip is at some distance from this part, it will not be in the way of the operation, and need not be cut. On the other hand, when the frænulum is situated in the centre of the division, it is clear that, in operating, we must necessarily include it in the incision, and it should therefore be divided beforehand, taking care not to encroach too much upon the gum, lest the alveolary process be laid bare; nor too much upon the lip, because making it thinner would be unfavourable to its union.

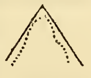
When one of the incisor teeth, opposite the fissure, projects forward, it must be drawn, lest it distend and irritate the parts, after they have been brought into contact.

Sometimes, but particularly in cases in which there is a cleft in the bony part of the palate, a portion of the os maxillare superius forms such a projection, just in the situation of the fissure in the lip, that it would render the union very difficult, if not impracticable. In this circumstance, the common plan has been to cut off the projecting angles of bone with a strong pair of bone-nippers. The part was then healed, and the operation for the hare-lip performed. Instead of cutting off the projection of bone, which is always a painful measure, Desault used to employ simple compression, by which means, the prominence was usually reduced in a few weeks, and the opportunity afforded of operating for the cure of the hare-lip. (*Œuvres Chir. par. Bichat*, *T.* 2, *p.* 207.) Of course, the actual necessity for using bone-nippers, or even of having recourse to compression of the bony projection, will depend upon circumstances; for if the prominence of bone be sharp and irregular, no surgeon, I conceive, would hesitate about the removal of such inequalities, in preference to the trial of pressure. Mr. Dunn of Scarborough, has expressed to me his doubts whether cutting off the projections of the alveolary process, be ever necessary, as the pressure of the entire lip gradually diminishes the deformity. "I had (says he) two very unseemly cases, with an immense division of the palate, together with a projection of the alveolar process, which, with the incisor teeth, resembled the talons of a bird. A tubercular appendage of skin hung upon the base of the nose. By drawing the teeth, in the first case, very delicately, I avoided fracturing the bony projection. I then cut off one edge of the nasal appendage, and of the lip on the same side, and attached them together with two needles. The wound was sufficiently united in a week or ten days to allow the same operation on the other side. In less than three weeks, the boy was sent home quite well, to the astonishment of the neighbourhood, where his frightful appearance had made him an object of disgust and ridicule. I succeeded in the other case, even without the extraction of the teeth. Both the patients can now articulate labial sounds, retain their saliva, and are gradually losing the inconvenience of the passage of the mucus from the nose into the mouth, as the fissure is more contracted, and the projection by no means so disagreeable." These facts should lessen the haste, with which certain operators proceed to cut off every projection of the alveolary process; for, a moderate prominence of bone without any sharp, irritating edges, or angles, will not hinder the success of the operation; and even the propriety of removing teeth must entirely depend upon their being likely, by their direction, to irritate the lip, and disturb the union of the fissure.

One serious objection to cutting away the projection of the jaw, is the deformity afterwards likely to continue during life from the deficiency of the incisores teeth; and another is, the subsequent overlapping of the lower jaw, and its projection beyond the upper one; communicating to the mouth an appearance seen in very old subjects. These were the considerations, which induced me, in the case above mentioned, to employ pressure, which is much more conveniently applied by means of a kind of spring truss, adapted to the child's head, than with bandages, which would be seriously annoying, and the right action of which could not be regulated without the utmost difficulty. When also some of the bone must be cut away, on account of its roughness and angular prominences, I advise the practitioner to remove only the irritating points, and afterwards have recourse to pressure.

In the operation, the grand object is to make as smooth and even a cut as possible, in order that it may more certainly unite by the first intention, and of such a shape, that the cicatrix may form only one narrow line. The edges of the fissure should, therefore, never be cut off with scissars, which constantly bruise the fibres which they divide, and a sharp knife is always to be preferred. The best plan is, either to place any flat instrument, such as a piece of horn, wood, or pasteboard, underneath one portion of the lip, and then holding the part stretched and supported on it, to cut away the whole of the callous edge: or else to hold the part with a pair of forceps, the under blade of which is much broader than the upper one; the first serves to support the lip, the other contributes also to this effect, and, at the same time, serves as a sort of ruler for guiding the knife in an accurately straight line. When the forceps are preferred, the surgeon must of course leave on the side of the upper blade, just as much of the edge of the fissure as is to be removed, so that it can be cut off with one sweep of the knife. This is to be done on each side of the cleft, observing the rule, to make the new wound in straight lines, because the sides of it can never be made to correspond without this caution. For instance, if the hare-lip had this shape, the incision of the edges must be continued in straight lines, till they meet in the manner here represented. In short, the two incisions are to be perfectly straight, and are to meet at an angle above, in order that the whole track of the wound may be brought together, and united by the first intention.





Two silver pins, made with steel points, are next to be introduced through the edges of the wound, so as to keep them accurately in contact, the lowest pin being introduced first, near the inferior termination of the wound, and the upper pin afterwards about a quarter of an inch higher up. A piece of thread is then to be repeatedly wound round the ends of the pins, from one side of the division to the other, first transversely, then obliquely, from the right or left end of one pin above, to the opposite end of the lower one, &c. Thus the thread is made to cross as many points of the wound as possible, which greatly contributes to maintaining its edges in even apposition. Any portion of the wound, above the pins, not closed by the preceding means, may now have its edges brought together with a strip of adhesive plaster. Lastly, the ends of the pins are to be supported by small dossils of lint, placed between them and the flesh; a minute, but essential circumstance, which, as my friend, Mr. Dunn, of Scarborough, reminds me, I forgot to mention in a former edition of this work. It is obvious, that a great deal of exactness is requisite in introducing the pins, in order that the edges of the incision may afterwards be precisely applied to each other. For this purpose, some surgeons previously place the sides of the wound in the best position, and mark with a pen the points at which the pins should enter, and come out again; a method, which, as far as my observations extend, merits imitation. The pins ought never to extend more deeply than about two-thirds through the substance of the lip, and it would be a great improvement always to have them of a flat, instead of a round shape, and a little curved, as this is the course which they naturally ought to take when introduced. The steel points should also admit of being easily taken off, when the pins have been applied; and, perhaps, having them to screw off and on is the best mode, as removing them in this way is not so likely to be attended with any sudden jerk, which might be injurious to the wound, as if they were made to pull off. In general, the pins may be safely removed in about four days, when the support of sticking plaster will be quite sufficient.

After the operation, the surgeon should never omit the use of compresses and a bandage for keeping forward the cheeks, so that the risk of the pins making their way out by ulceration, arising from the dragging of the soft parts on them, may be prevented. With this view, a close, strong nightcap, with a piece of broad tape attached to the back part of it, and with two ends of sufficient and equal length, is to be put on; a compress is then to be laid over one cheek and fixed by bringing one portion of the tape forward over it, which is to be fastened to the cap on the opposite side of the head. The other compress is then to be applied, and fixed in a similar manner. Lastly, a bandage is to be put under the chin, and brought over each compress up to the top of the head, where the ends of it are to be fastened to the cap. During all these proceedings, until the compresses are well secured, the assistant must support them steadily with his hands. Lastly, the bandage, compresses, and cap should all be securely stitched together.

The process just described, is what is well known by the name of the *twisted suture*, which is applicable to other surgical cases, in which the grand object is to heal some fistula or opening, by the first intention. Mr. Sharp says, it is of great service in fistulæ of the urethra, remaining after the operation for the stone, in which case the callous edges may be cut off, and the lips of the wound held together by the above method.

Although the generality of surgeons use the twisted suture, I ought to notice, that Sir Astley Cooper gives the preference to the common interrupted suture. On account of the difficulty sometimes experienced in withdrawing the pins, and the liability of the new adhesions to be broken on the occasion, whereas the threads of a common suture may be cut, and taken out with the greatest facility. (See *Lancet, Vol.* 3, *p.* 107.) However, as most children cry on the removal of the suture, whether one kind, or the other be employed, the only safe plan is not to withdraw the pins or ligatures till four complete days have elapsed from the time of the operation, when the adhesions will be tolerably strong, and the cheeks should always be held forward by a skilful assistant, during the period of changing the dressings, and until the compresses on the cheeks have been again duly secured with a bandage.

What has hitherto been stated, refers to the most simple form of the hare-lip, viz. to that which presents only one fissure. When there are two clefts, the cure is accomplished on the same principle; but, it is rather more difficult of execution; so that the old surgeons, until the time of Heister, almost all regarded the operation for the double hare-lip, as impracticable: only a few described it, with the direction to operate on each fissure, just as if it were single: M. de la Faye even operated in this way with success. (*Mémoires de l'Acad. de Chirurgie*, *Tom.* 4, *4to.*) M. Louis was of opinion, that all difficulties would be obviated by doing the operation at two different times, and awaiting the perfect cure of one of the fissures, before that of the other was undertaken. Heister had similar ideas; but he never put the scheme in practice, nor did he even positively advise it.

After all, however, experience proves, that it is not essential to perform two operations for the cure of the double hare-lip; Desault found, that when the edges of the two fissures were pared off, and care taken to let one of the pins pass across the central piece of the lip, the practice answered extremely well. (See *Œuvres Chir. par Bichat, T.* 2, *p.* 201.)

In cutting off the edges of the fissure, the incision must be carried to the upper part of the lip; and even when the fissure does not reach wholly up the lip, the same thing should be done; for, in this manner, the sides of the wound will admit of being applied together more uniformly, and the cicatrix will have a better appearance. We should also not be too sparing of the edges which are to be cut off. Practitioners, says M. Louis, persuaded that the hare-lip was a division with loss of substance, have invariably advised the removal of the *callous* edges. But, in the natural hare-lip there is no callosity; the margins of the fissure are composed, like those of the lip itself, of a pulpy, fresh-coloured, vermilion flesh, covered with an exceedingly delicate cuticle. The whole of the part having this appearance, must be taken away, together with a little of the true skin. At the lower part of the fissure, towards the nearest commissure, a rounded red substance is commonly situated, which it is absolutely necessary to include in the incision. Were this neglected, the union below would be unequal, and, through an injudicious economy, a degree of deformity would remain. The grand object, however, is to make the two incisions diverge at an acute angle, so that the edges may be put into reciprocal contact their whole length, without the least inequality.

M. Louis used to operate as follows: the patient being seated in a good light, his head is to be supported on an assistant's breast, who, with the fingers of both hands, pushes the cheeks forward, in order to bring the edges of the fissure near to each other. These are to be laid on a piece of pasteboard, which is to be put between the jaw and lip, and be an inch and a half long, from twelve to fifteen lines broad, and at most one line thick. The upper end should be rounded, by flattening the corners. In order to facilitate the incision, the lip is to be stretched over the pasteboard, the operator holding one portion over the right with the thumb and index finger of the left hand, while the assistant does the same thing on the left side. Things being thus disposed, the edges of the hare-lip are to be cut off with two sweeps of the bistoury, in two oblique lines, forming an acute angle above the fissure.

For the removal of the edges of the hare-lip, scissars have sometimes been preferred to a knife, but, notwithstanding Desault's partiality to them, as most convenient, (See *Œuvres Chir. par Bichat*, *T.* 2, *p.* 179,) they are now very generally disused. The pinching and bruising, which result from the action of the two blades, are circumstances which cannot be favourable to the union of the wound; and though they may not commonly be serious enough to prevent union by the first intention, they might occasionally tend, with any other untoward occurrence, to hinder this desirable event. Let not practitioners here be led by Mr. B. Bell's statement, that in one instance he cut off one side of the fissure with a knife, and the other with scissars; that the latter cut produced least pain, and that on this side there was no more swelling nor inflammation than on the opposite one.

The pins should be introduced at least two-thirds of the way through the substance of the lip, lest a furrow should remain on the inside of the part, which might prove troublesome, by allowing pieces of food to lodge in it. There is, however, a stronger reason for attending to this circumstance, viz. the hemorrhage which may take place when it is neglected. As soon as the edges of the wound have been brought together by means of the suture, and the pins are properly placed, the bleeding almost always ceases: but, when the pins have not been introduced deeply enough, and the posterior surfaces of the incisions are not applied to each other, the blood may continue to run into the mouth, and give the surgeon an immense deal of trouble. In the memoir, written by Louis, there is a case, in which the patient died in consequence of such an accident. Persons who had undergone the operation, were always advised to swallow their spittle, even though mixed with blood, in order to avoid disturbing the wound, by getting rid of it otherwise. In the case alluded to, the patient, who had been operated upon for a cancerous affection of the lip, swallowed the blood as he had been directed to do, and he bled so profusely that he died. On the examination of the body, the stomach, and small intestines were found full of blood. "This deplorable case," says the illustrious author who relates it, "deserves to be recorded for public instruction, for the purpose of keeping alive the attention of surgeons on all occasions, where, in consequence of any operation whatsoever, there is reason to apprehend bleeding in the cavity of the mouth. Platner is the only writer who, as far as I know, foresaw this kind of danger. The bleeding from the edges of the wound stops of itself (says he) as soon as they have been brought into contact, and stitched together; but, care must be taken that the patient does not swallow the blood, which might make him vomit, or else suffocate him. Hence, his head should be elevated, that the blood may escape externally, a precaution more particularly necessary in young children."

Having described the mode of operating for the hare-lip, as approved of by the generality of practitioners, and detailed every thing which seemed material, I have now only to explain the method adopted by M. Louis. His sentiments, respecting several particular points of the operation, have been already stated; and an account of the means, which he employed, in lieu of the twisted suture, for uniting the edges of the wound, is all that remains to be noticed.

Several bandages for supporting the two portions of the divided lip, and lessening the pressure, which they make against the pins, have been mentioned by authors. Franco and Quesnay, in particular, describe two kinds. These means were not only employed as auxiliary, but even sometimes as curative ones, when it was impossible to use needles. To such bandages, too complicated and too uncertain, in their effect, M. Louis prefers a simple linen roller, one inch wide, three ells long, and rolled up into two unequal heads. He begins with applying the body of this bandage to the middle of the forehead; he unrolls the two heads, from before backward, above the ears, between the upper part of the cartilage, and the cranium, in order to let them cross on the nape of the neck, and then pass forwards again. The assistant, who supports the head, and pushes forward the cheeks, must lift up the ends of his fingers, in the place of which, on each side, a thick compress is to be put. This being covered, and pushed from behind forward, by the roller, will constantly perform the office of the assistant's fingers, who is to continue to support the apparatus, until it is all completely applied. The longest of the two heads of the roller, being slit in two places near the lip, presents two parallel openings; the remnant of the shortest one is divided into two parts, as far as it ends. The two little narrow bands, in which it terminates, must then pass through the openings of the former, and cross upon the middle of the lip. The ends of the roller, being carried from before backward, are then to be made to cross again on the nape of the neck, where the shortest is to end. The remainder of the long one is to be employed in making turns round the head. This bandage may be still more securely fixed by means of a piece of tape, which is to pass the forehead, over the sagittal suture, and be pinned at each end to the circumvolutions of the roller; while a second piece of tape is to cross the first one at the top of the head, and also to be attached, at its extremities, to the uniting bandage, and the compresses placed under the zygomatic arches, for the purpose of pushing forward the cheeks.

This bandage is extremely simple, and would answer well as an auxiliary to the twisted suture. I think this last means will always be the favourite of the practical surgeon, because the desired effect can be produced by it, with much less trouble, than must be taken with the bandage, in order to render the operation of the latter sufficiently certain. Besides, as I have noticed, M. Louis himself mostly made one stitch near the red part of the lip, so that he cannot be said to have trusted altogether to the bandage.

What has been said, concerning the operation for the hare-lip, is equally applicable, not only to the treatment of cancer of the lip, but also to that of accidental cuts, or lacerations, of this part, from any cause whatsoever. We shall only remark, that, in a recent wound, all the surgeon has to do, is to apply the twisted suture, and adhesive plaster, without delay.

When there is a fissure in the bones forming the roof of the mouth, it usually diminishes, and gradually closes, after the hare-lip is cured. But, this does not always happen, and when the parts remain so considerably separated, as to obstruct speech and deglutition, or cause any other inconvenience, a plate of gold or silver, exactly adapted to the arch of the palate, and steadied by means of a piece of sponge, fixed to its convex side, and introduced into the cleft, may sometimes be usefully employed. When the sponge is of suitable size, and very dry, before being used, the moisture of the adjacent parts will make it swell, and, in many cases, be sufficient to keep it in its situation, so as greatly to facilitate speaking and swallowing. Sometimes, however, the fissure is so shaped, that the sponge cannot be fixed in it: this principally happens when the opening widens very much, towards the front of the jaw. In such cases, it has been proposed to fix a plate of gold, by means of springs, covered with the same metal. Platina, which is cheaper, might be used for the same purpose. The subject, however, of artificial palates, is one on which much mechanical ingenuity may yet be usefully exerted, and it can hardly be expected, that I should here do more, than give references to works, in which the reader may find information upon it. (See *Fauchard, Le Chirurgien Dentiste*, 2 *Tom.* 12*mo. Paris*, 1728. *Camper, Vermischte Schriften, No.* 13. *Loder's Journ.* 2 *B. p.* 25, *p.* 185, *&c. Von Steveling über eine merkwürdige Kunstliche Ersezung mehrerer, sowohl zur Sprache, als zum Schlucken nothwendiger, zerstörter Werkzeuge;* 8*vo. Heidelb.* 1793. *Siebold, Chir. Tagebuch, No.* 20. *J. H. F. Autenrieth, Supplementa ad Hist. Embryonis Humani, quibus accedunt Observata quædam circa Palatum fissum verosimillimamque illi medendi methodum,* 4*to. Tubing.* 1797. *Cullerion, in Journ. Gén. &c. T.* 19. *Recueil Périod. &c. T.* 11, *p.* 22. *Dict. des Sciences Méd. T.* 37, *art. Obturateur. C. Graefe et Ph. von Walther, Journ. der Chir.* 1 *B. p.* 1. 8*vo. Berlin*, 1820; *in this work, Graefe has described a method of curing fissures in the soft palate by means of a particular kind of suture, with the various instruments necessary in the operation.*

For information, relative to the hare-lip, see *B. Bell's Surgery, Vol.* 4. *Heister's Surgery. Le Dran's Operations. Sharp's Operations. F. D. Herissant, Mém. de l'Acad. des Sciences année* 1743, *p.* 86; *a very curious case, complicated, with a fissure in the palate, and two oblong apertures at the sides of this cleft. In play, the child would sometimes fill his mouth with water, and, through those apertures, let it spout out at the nostrils, in imitation of what takes* *place in whales. G. De la Faye, Mém. de l'Acad. Royale de Chir. T.* 1, *p.* 605, *année* 1743. *E. Sandifort, Obs. Anat. Pathol.* 4to. *et Museum Anat. p.* 110, 164, *Lugd. Bat.* 1777. *Flajani, Collezione d'Observazioni, &c. T.* 8, *8vo. Roma. Latta's Surgery, Vol.* 2. *L'Encyclopédie Méthodique, Partie Chir. Art. Bec. de Lievre. M. Louis, in Mém. de l'Acad. de Chirurgie, T.* 4. *p.* 385, 4to. *année* 1768, *T.* 5. *p.* 292, *année* 1774. *De la Médecine Operatoire, par Sabatier, T.* 3, *p.* 272, *8vo. Paris,* 1810. *Œuvres Chir. de Desault, par Bichat, T.* 2. *p.* 173. *Traité des Opérations de Chirurgie, par A. Bertrandi, Chap.* 19. *P. N. Haguette sur le Bec-de-lièvre naturel,* 4to. *Paris,* 1804. *J. Kirby, Cases, &c.* 8vo. *Lond.* 1819; *forceps recommended for holding the lip in the operation. Richter, Anfangsgr. der Wundarzn. B.* 2, *Kap.* 7. *Richerand, Nosographie Chir. T.* 2, *p.* 255, *&c. Edit.* 4. *Lassus, Pathologie Chir. T.* 3, *p.* 451, *&c. Edit.* 2. *Dict. des Sciences Méd. T.* 3, *art. Bec de Lièvre; Sprengel, Geschichte der Chir. Operationen, B.* 1. *p.* 155. *Graefe, Angiectasie, v. Langenbeck Bibl.* 2 *B. p.* 359, *Eckoldt. Ueber eine sehr complicirte Hasenscharte; Leipz.* 1804, *fol.*

HEAD, INJURIES OF THE. From the variety of parts of which the scalp is composed, from their structure, connexions, and uses, injuries, done to it by external violence, become of much more consequence, than the same kind of ills can prove, when inflicted on the common integuments of the rest of the body. One principal reason of the danger in these cases, depends upon the free communication between the vessels of the pericranium, and those of the dura mater, through the diploe of the skull; for, when inflammation is kindled in the former membrane, it may extend itself to the latter. According to Sir Astley Cooper, there are three modes in which wounds of the scalp may induce fatal consequences. 1st, By producing, what is called, an erysipelatous inflammation on the head; 2dly, by producing extensive suppuration under the tendon of the occipito-frontalis muscle; 3dly, by rendering a simple fracture compound, so as to cause more extensive inflammation of the dura mater. (*Lectures, Vol.* 1, *p.* 350.) The latter observation, as far as my information reaches, is new, and deserves the serious consideration of the practitioner; for, in the great hospital where I was educated, and in all the practice which I have seen in the army and elsewhere, no analogy of this kind was ever suspected between ordinary compound fractures, and those of the cranium. If the doctrine be correct, it forms another weighty argument against the method of cutting down to a fracture of the skull, without urgent motives.

Incised wounds of the scalp are, indeed, less liable, than contused or lacerated ones, to produce bad consequences; but, they are not entirely devoid of danger, in proof of which, Sir Astley Cooper mentions the case of a lady of rank in the country, who died from the removal of an encysted tumor of the scalp. (*Lectures, Vol.* 1, *p.* 349.) Passing over these cases, however, which generally heal as well as the generality of cuts in the skin of other parts of the body, and require no particularity of treatment, Mr. Pott proceeds immediately to lacerated and punctured wounds. "The former may be reduced to two kinds, viz. those in which the scalp, though torn, or unequally divided, still keeps its natural situation, and is not stript nor separated from the cranium, to any considerable distance beyond the breadth of the wound; and those, in which it is considerably detached from the parts it ought to cover. The first of these, if simple, and not combined with the symptoms, or appearances of any other mischief, do not require any particular or different treatment, from what the same kind of wounds require on all other parts;" but, with respect to those, in which the scalp is separated and detached from the parts it ought to cover, Mr. Pott makes no scruple of declaring it as his opinion, that its preservation ought always to be attempted, *unless it be so torn as to be absolutely spoiled, or there are manifest present symptoms of other mischief.* In former days, the excision of the lacerated and detached scalp was the general practice; but Mr. Pott had so often made the experiment of endeavouring to preserve the torn piece, and so often succeeded, that he recommended it as a thing always to be attempted, even though a part of the cranium were perfectly bare.

Here I may remark, that all practitioners now invariably avoid cutting away the scalp, even in the circumstances, in which such practice was allowed by Pott. By *spoiled*, this eminent writer must mean so injured as necessarily to slough afterwards. However, as no harm results from taking the chance of its not sloughing, which never can be with certainty foretold; and as the excision of the part is painful, and productive of no benefit, even if sloughing must follow, such operation is, in every point of view, hurtful and wrong. With respect to other mischief, as a reason, the examination of the cranium, and even the application of the trephine, never require any of the scalp to be cut away. See *Trephine.*

Let the surgeon, therefore, free the torn piece from all dirt, or foreign bodies, and restore it as quickly, and as perfectly, as he can, to its natural situation.

Notwithstanding Mr. Pott assents to the employment of sutures, for uniting certain lacerated wounds of the scalp, the best practitioners of the present day generally employ only sticking-plaster. Sometimes, the loosened scalp will unite with the parts, from which it is torn and separated, and there will be no other sore, than what arises from the impracticability of bringing the lips of the wound into smooth and immediate contact, the scar of which sore must be small in proportion. Sometimes such perfect re-union is not to be obtained; in which case, matter will be formed and collected in those places where the parts do not coalesce: but this does not necessarily make any difference, either in the general intention, or in the event; this matter may easily be discharged, by one or two small openings made with a lancet; the head will still preserve its natural covering; and the cure will be very little retarded by a few small abscesses.

In some cases (as Pott proceeds to describe), the whole separated piece will unite perfectly, and give little or no trouble, especially in young and healthy persons. In some, the union will take place in certain parts and not in others; and consequently matter will be formed, and require to be discharged, perhaps at several different points; and, in some particular cases, circumstances and habits, there will be no union at all, the torn cellular membrane, or the naked aponeurosis, will inflame and become sloughy, a considerable quantity of matter will be collected, and, perhaps, the cranium will be denuded. But, even in this state of things, which does not very often happen, where care has been taken, and is almost the worst which can happen, in the case of mere simple laceration and detachment, if the surgeon will not be too soon, or too much alarmed, nor in a hurry to cut, he will often find the cure much more feasible than he may at first imagine: let him take care to keep the inflammation under by proper means, let him have patience till the matter is fairly and fully formed, and the sloughs perfectly separated, and when this is accomplished, let him make a proper number of dependent openings for the discharge of them, and let him by bandage, and other proper management, keep the parts in constant contact with each other, and he will often find, that although he was foiled in his first intention of procuring immediate union, yet he will frequently succeed in this his second; he will yet save the scalp, shorten the cure, and prevent the great deformity arising, (particularly to women) not only from the scar, but from the total loss of hair.

This union may often be procured, even though the cranium should have been perfectly denuded by the accident; and, it is true, not only though it should have been stripped of its pericranium at first, (See *Abernethy on the Injuries of the Head*, *Case* 6,) but even if that pericranium should have become sloughy and cast off, as Mr. Pott has often seen.

" Exfoliation from a cranium laid bare by external violence, and to which no other injury has been done, than merely stripping it of its covering, is a circumstance (says Pott) which would not so often happen if it was not taken for granted that it must be, and the bone treated according to such expectation. The soft open texture of the bones of children and young people, will frequently furnish an incarnation, which will cover their surface, and render exfoliation quite unnecessary; and even in those of mature age, and in whom the bones are still harder, exfoliation is full as often the effect of art as the intention of nature, and produced by a method of dressing, calculated to accomplish such end, under a supposition of its being necessary. Sometimes, indeed, it happens that a small scale will necessarily separate, and the sore cannot be perfectly healed till such separation has been made; but this kind of exfoliation will be very small and thin, in proportion to that produced by art, that is, that produced by dressing the surface of the bare bone with spirituous tinctures, &c.

" Small wounds, that is, such as are made by instruments, or bodies which pierce, or puncture, rather than cut, are in general more apt to become inflamed, and to give trouble, than those which are larger, and in this part particularly, are sometimes attended with so high inflammation, and with such symptoms as alarm both patient and surgeon.

" *If the wound affects the cellular membrane only*, and has not reached the aponeurosis or pericranium, the inflammation and tumor affect the whole head and face, the skin of which wears a yellowish cast, and is sometimes thick set with small blisters, containing the same coloured serum; it receives the impression of the fingers, and becomes pale for a moment, but returns immediately to its inflamed colour; it is not very painful to the touch, and the eyelids and ears are always comprehended in the tumefaction, the former of which are sometimes so distended, as to be closed; a feverish heat and thirst generally accompany it; the patient is restless, has a quick pulse, and most commonly a nausea, and inclination to vomit.

" This accident generally happens to persons of bilious habit, and is indeed an inflammation of the erysipelatous kind; it is somewhat alarming to look at, but is not often attended with danger. The wound does indeed neither look well, nor yield a kindly discharge, while the fever continues, but still it has nothing threatening in its appearance, none of that look which bespeaks internal mischief; the scalp continues to adhere firmly to the skull, and the patient does not complain of that tensive pain, nor is he afflicted with that fatiguing restlessness, which generally attends mischief underneath the cranium.

" Phlebotomy, lenient purges, and the use of the common febrifuge medicines, particularly those of the neutral kind, generally remove it in a short time. When the inflammation is gone off, it leaves on the skin, for a little while, a yellowish tint, and a dry scurf, and, upon the disappearance of the disease, the wound immediately recovers a healthy aspect, and soon heals without any farther trouble. I do not believe that the exhibition of bark, in this form of erysipelas, is ever productive of any decided benefit.

" Wounds and contusions of the head, which affect the brain and its membranes, are also subject to an erysipelatous kind of swelling and inflammation; but it is very different, both in its character and consequences, from the preceding.

" In this, (which is one of the effects of inflammation of the meninges,) the febrile symptoms are much higher, the pulse harder and more frequent, the anxiety and restlessness extremely fatiguing, the pain in the head intense; and as this kind of appearance is, in these circumstances, most frequently the immediate precursor of matter forming between the skull and dura mater, it is generally attended with irregular shiverings, which are not followed by a critical sweat, nor afford any relief to the patient. To which it may be added, that in the former case, the erysipelas generally appears within the first three or four days; whereas, in the latter, it seldom comes on till several days after the accident, when the symptomatic fever is got to some height. In the simple erysipelas, although the wound be crude and undigested, yet it has no other mark of mischief; the pericranium adheres firmly to the skull, and upon the cessation of the fever, all appearances become immediately favourable. In that, which accompanies injury done to the parts underneath, the wound not only has a spongy, glassy, unhealthy aspect, but the pericranium in its neighbourhood separates spontaneously from the bone, and quits all cohesion with it. In short, one is an accident, proceeding from a bilious habit, and not indicating any mischief beyond itself; the other is a symptom, or a part of a disease, which is occasioned by injury done to the membranes of the brain; one portends little or no ill to the patient, and almost always ends well; the other implies great hazard, and most commonly ends fatally. It is therefore hardly necessary to say, that it behoves every practitioner to be careful in distinguishing them from each other.

"If the wound be a small one, and *has passed through the cellular membrane to the aponeurosis, and pericranium*, it is sometimes attended with very disagreeable, and even very alarming symptoms, but which arise from a different cause, and are very distinguishable from what has been yet mentioned.

"In this, the inflamed scalp does not rise into that degree of tumefaction, as in the erysipelas, neither does it pit, or retain the impression of the fingers of an examiner, it is of a deep red colour, unmixt with the yellow tint of the erysipelas; it appears tense, and is extremely painful to the touch; as it is not an affection of the cellular membrane, and as the ears and the eyelids are not covered by the parts in which the wound is inflicted, they are seldom, if ever, comprehended in the tumor, though they may partake of the general inflammation of the skin; it is generally attended with acute pain in the head, and such a degree of fever as prevents sleep, and sometimes brings on a delirium.

"A patient, in these circumstances, will admit more free evacuations by phlebotomy, than one labouring under an erysipelas; the use of warm fomentation is required in both, in order to keep the skin clean and perspirable, but an emollient cataplasm, which is generally forbid in the former, may in this latter case be used with great advantage.

"When the symptoms are not very pressing, nor the habit very inflammable, this method will prove sufficient; but it sometimes happens, that the scalp is so tense, the pain so great, and the symptomatic fever so high, that by waiting for the slow effect of such means, the patient runs a risk from the continuance of the fever, or else the injured aponeurosis and pericranium becoming sloughy, produce an abscess, and render the case both tedious and troublesome. A division of the wounded part by a simple incision down to the bone, about half an inch or an inch in length, will most commonly remove all the bad symptoms, and if it be done in time, will render every thing else unnecessary." (*Pott.*) With respect to the good effects of such an incision, Desault considers them greatly exaggerated by authors; and, while he admits, that, they are useful, when the inflammation extends under the aponeurosis, he is not inclined to sanction it as a right proceeding in every other instance. (See *Œuvres Chir. par Bichat, T.* 2, *p.* 8.)

Thus, Mr. Pott was of opinion, that the differences of the symptoms in the foregoing cases depended upon, whether the wound only affected the skin and cellular membrane, or reached more deeply to the aponeurosis and pericranium; a doctrine which has been justly regarded as questionable. With respect to the observation, that, in a puncture of the aponeurosis, the swelling is confined within the limits of this fascia, and does not extend to the ears and eyelids, it is a sentiment, which Desault thought arose rather from anatomical considerations, than the observation of nature. The doctrine, indeed, must appear doubtful, when it is recollected: 1st, That the aponeurosis and pericranium are parts of scarcely any sensibility. 2dly, That the opinion had its origin at a period, when these parts were imagined to be highly sensible. 3dly, That in other parts of the body, a wound in which a fascia, or the periosteum is concerned, is rarely attended with the above described severe symptoms. 4thly, That here, the wounds often affect only the skin and cellular membrane, and yet these symptoms occur, even with a phlegmonous character. 5thly, On the contrary, in other instances, in which the aponeurosis and pericranium are undoubtedly wounded, no bad symptoms at all take place. 6thly, These symptoms may almost always be removed by the exhibition of tartarized antimony. (*Œuvres Chir. de Desault, T.* 2, *p.* 8.) In the case, often named inflammation of the fascia after bleeding, it is not the fascia itself, which is the real and chief seat of the pain, inflammation, &c., but the subjacent cellular membrane and muscles. The theory of Desault is, that the erysipelatous affections of the scalp, so frequent after injuries of the head, are connected with disorder of the functions of the liver, produced by such accidents. Yet, it is difficult to understand, why a mere puncture of the scalp should cause this disorder of the liver, more commonly than the same kind of wound of any other superficial part of the body.

The injuries, to which the scalp is liable from contusion, or appearances produced in it by such general cause, may be divided into those, in which the mischief is confined merely to the scalp; and those in which other parts are interested.

The former, which only come under our present consideration, are not indeed of importance, considered abstractedly. The tumor is either very readily dissipated, or the extravasated blood causing it, is easily got rid of by a small opening. J. L. Petit first, and afterwards Pott, particularly noticed this case, on account of an accidental circumstance which sometimes attends it, and renders it liable to be very much mistaken.

"When the scalp receives a very smart blow, it often happens that a quantity of extravasated blood immediately forms a tumor, easily distinguishable from all others, and generally very easily cured. But it also sometimes happens, that this kind of tumor produces to the fingers of an unadvised or inattentive examiner, a sensation, so like to that of a fracture, with depression of the cranium, as may be easily mistaken." Now, if, upon such supposition, a surgeon immediately makes an incision into the tumid scalp, he may give his patient a great deal of unnecessary pain, and for that reason run some risk of his own character.

"The touch is, in this case, so liable to deception, that recourse should always be had to other circumstances and symptoms, before an opinion be given.

"If a person, with such tumor occasioned by a blow, and attended with such appearances, and feel, has any complaint, which seems to be the effect of pressure made on the brain and nerves, or of any mischief done to the parts within the cranium, the division of the scalp, in order to inquire into the state of the skull, is right and necessary; but if there are no such general symptoms, and the patient is in every respect perfectly well, the mere feel of something like a fracture will not authorize or vindicate such operation, since it will often be found, that such sensation is a deception, and that when the extravasated fluid is removed, or dissipated, the cranium is perfectly sound and uninjured."—(*Pott.*)

With the exception of instances, in which the dura mater suppurates from a blow on the head, and the symptoms are such as to require the trephine, or other examples, in which an abscess forms under the scalp, or a large quantity of blood is effused in the same situation, none of the cases, which have here been considered, can justify making incisions in the scalp; and the utility of the practice in what was supposed by Pott to be an inflammation of the aponeurosis is at least questionable, as far as it is done under the idea of merely obviating tension, without there being any matter to be discharged. Incisions, expressly for the purpose of exposing the bone, are only right, as a preparatory step to trephining, when the necessity for this operation is indicated by decided and urgent symptoms of pressure, on the brain. Now, such pressure, in any of the examples, above treated of, can only arise from a suppuration under the skull, a subject, which will presently be considered.

Dr. Hennen, in his truly practical work, has very properly advised surgeons not to be content with clipping away a little of the hair, around the injury, but always to have the head shaved to a proper extent. This proceeding, which is perfectly harmless in itself, is more generally right, than the custom of cutting the scalp, which has been too frequently employed without any rational aim. The free removal of the hair directly after the accident, often brings into view marks indicative of other parts of the head having been struck, besides that, which is at first noticed, and, thus, the practitioner will have a more correct notion of the serious nature of the accident, than he might otherwise have conceived, and, be more strict in his mode of treatment. Nay, fractures and depression of the skull, sometimes not denoted by any disturbance of the functions of the brain, and liable to escape observation, while concealed under the hair, are frequently detected after its removal, and the surgeon, being now aware of the extent and situation of the mischief, must of course be better qualified to conduct the treatment. In short, as Dr. Hennen has observed; "Independent of the more accurate view, (thus procured,) we facilitate the application of leeches, if they may be found necessary, and of a most excellent adjuvant on all occasions, viz. cold applications."

It affords me particular pleasure to be able to number so good a surgeon as Dr. Hennen, amongst the advocates of Schmucker's plan of having the head well shaved and covered with cloths, wet with a very cold lotion; a practice which the latter eminent surgeon always adopted, whether a sabre-cut, or gun-shot injury of this part, had the appearance of being serious or not. "As soon as the patient was brought to the hospital with a wound of the head, whether the injury looked important or not, (says Schmucker) I directed the hair to be immediately removed, and, after the necessary dilatation, applied dressings. Sixteen ounces of blood were next taken away, and the evacuation, in less quantity, repeated according to circumstances, three or four times, within the space of twenty-four hours. The pulse now generally became softer, and the determination of blood to the head lessened. Over the dressings, and the whole of the head, thick cloths, dipped in the cold mixture, hereafter specified, were laid, and renewed every hour. These cloths were kept in their place with the bandage called the grand couvre-chef. (See *Bandage.*) As internal medicines, the nitrate of potassa, neutral salts, and emollient and stimulating clysters, and gentle aperients were given. These means were employed, both in slight injuries, and in those where the bones were depressed, and fissures and fractures were accompanied with violent convulsive twitchings, coma, paralysis, and other bad symptoms; and even in cases, where the use of the trephine was indispensable, the practice was continued until the cure was complete." Schmucker assures us, that under such treatment, fewer patients with wounds of the head were lost, than used previously to happen, especially of those, whose injuries at first had the appearance of being but slight. (See *Chir. Wahrnehmungen,* 1 *B. p.* 154.)

Schmucker was led to try this practice by the great benefit, which he had seen afforded by the application of cold water to the head in cases of mania, attended with great determination of blood to the brain. And, in order to increase the efficacy of the water, he added to every five gallons of it two quarts of vinegar, sixteen ounces of nitre, and eight of the muriate of ammonia. This mixture was then preserved for use in a cold place. (*Vol. cit. p.* 153.) Or, in order to avail ourselves of the full frigorific effects of this mixture, it should be prepared, as Dr. Hennen observes, in small quantities, and used immediately, before its temperature has risen; or, "snow, or pounded ice, or ice-water applied to the parts in a half-filled bladder, or cloths simply dipped in cold water, will often answer every purpose." (*On Military Surgery, p.* 279, *Ed.* 2.) Dr. Hennen mentions one important fact, in recommendation of cold applications, antimonials, and saline purgatives, preceded by the common blue pill, and assisted with quiet and abstinence, viz. by such means, "those troublesome puffy enlargements and erysipelatous affections of the scalp, which so often succeed to bruises," are prevented, and, where the evacuant plan is duly observed, the "extensive and formidable erysipelatous affections, so common formerly, are rare and mild at present in military hospitals."

2. *Effects of Contusion on the Dura Mater and Parts within the Skull.*

In consequence of blows, falls, and other shocks, either blood may be effused under the cranium, or inflammation and suppuration of the dura mater may arise. The best description of the latter case is that delivered by Mr. Pott.

Smart and severe strokes on the middle part of the bones, at a distance from the sutures, he says, are most frequently followed by this kind of mischief; the coats of the small vessels, which sustain the injury, inflame and become sloughy, and, in consequence of such alteration in them, the pericranium separates from the outside of that part of the bone, which received the blow, and the dura mater from the inside, the latter of which membranes, soon after such inflammation, becomes sloughy also, and furnishes matter, which matter being collected between the said membrane and the cranium, and having no natural outlet, whereby to escape, or be discharged, brings on a train of very terrible symptoms, and is a very frequent cause of destruction. The effect of this kind of violence is frequently confined to the vessels connecting the dura mater to the cranium, in which case, the matter is external to the said membrane; but sometimes the matter, formed in consequence of such violence, is found on the surface of the brain, or between the pia and dura mater, as well as on the surface of the latter; or, perhaps, in all these three situations at the same time.

The difference of this kind of disease, from either an extravasation of blood, or a concussion of the brain, is great and obvious. "All the complaints produced by extravasation, are, such as proceed from pressure made on the brain and nerves, and obstruction to the circulation of the blood through the former; stupidity, loss of sense and voluntary motion, laborious and obstructed pulse and respiration, &c. and (which is of importance to remark,) *if the effusion be at all considerable, these symptoms appear immediately, or very soon after the accident.*

"The symptoms attending an inflamed or sloughy state of the membranes, in consequence of external violence, are very different; they are all of the febrile kind, and never, at first, imply any unnatural pressure; such are, pain in the head, restlessness, want of sleep, frequent and hard pulse, hot and dry skin, flushed countenance, inflamed eyes; nausea, vomiting, rigor; and toward the end, convulsion and delirium. And *none of these appear at first, that is, immediately after the accident; seldom until some days are passed.*"

This last observation, made by Pott, is one that is well worthy of the practitioner's constant recollection, lest he wrongly fancy his patient secure too soon, and neglect the early use of the only means, by which a recovery can be effected. Thus, as Sir Astley Cooper notices, the time when inflammation of the brain (and it may be added, of its membranes,) follows the violence, is generally about a week; rarely sooner. Frequently, it does not come on till a fortnight, or three weeks after the injury; and even more time must elapse before the patient is quite safe, or ought to deviate from a strict and temperate regimen. In confirmation of this remark, a case is mentioned, where the neglect to keep the bowels regular, brought on a fatal attack of inflammation of the brain, as late as four months after the receipt of a blow on the head. (*Lectures, &c. p.* 339.)

"One set or class of symptoms is produced by an extravasated fluid, making pressure on the brain and origin of the nerves, so as to impair or abolish voluntary motion and the senses; the other is caused by the inflamed or putrid state of the membranes covering the brain, and seldom affects the organs of sense, until the latter end of the disease, that is, until a considerable quantity of matter is formed, which matter must press like any other fluid.

"If there be neither fissure nor fracture of the skull, nor extravasation, nor commotion underneath it, and the scalp be neither considerably bruised, nor wounded, the mischief is seldom discovered or attended to for some few days. The first attack is generally by pain in the part which received the blow. This pain, though beginning in that point, is soon extended all over the head, and is attended with a languor, or dejection of strength and spirits, which are soon followed by a nausea, and inclination to vomit, a vertigo or giddiness, a quick and hard pulse, and an incapacity of sleeping, at least quietly. A day or two after this attack, if no means preventive of inflammation are used, the part stricken generally swells, and becomes puffy, and tender, but not painful; neither does the tumor rise to any considerable height, or spread to any great extent; if this tumid part of the scalp be now divided, the pericranium will be found of a darkish hue; and either quite detached, or very easily separable from the skull, between which and it will be found a small quantity of a dark-coloured ichor.

"If the disorder has made such progress, that the pericranium is quite separated and detached from the skull, the latter will even now be found to be somewhat altered in colour from a sound healthy bone.

"From this time the symptoms generally advance more hastily and more apparently; the fever increases, the skin becomes hotter, the pulse quicker and harder, the sleep more disturbed, the anxiety and restlessness more fatiguing; and to these are generally added irregular rigors, which are not followed by any critical sweat, and which, instead of relieving the patient, add considerably to his sufferings. If the scalp has not been divided or removed, until the symptoms are thus far advanced, the alteration of the colour of the bone will be found to be more remarkable; it will be found to be whiter and more dry than a healthy one; or, as Fallopius has very justly observed, it will be found to be more like a dead bone: the sanies, or fluid, between it and the pericranium, will also, in this state, be found to be more in quantity, and the said membrane will have a more livid diseased aspect.

"In this state of matters, if the dura mater be denuded, it will be found to be detached from the inside of the cranium, to have lost its bright silver hue, and to be, as it were, smeared over with a kind of mucus, or with matter, but not with blood. Every hour after this period, all the symptoms are exasperated, and advance with hasty strides: the head-ach and thirst become more intense, the strength decreases, the rigors are more frequent, and at last convulsive motions, attended in some with delirium, in others with paralysis, or comatose stupidity, finish the tragedy.

"If the scalp has not been divided till this point of time, and it be done now, a very offensive discoloured kind of fluid will be found lying on the bare cranium, whose appearance will be still more unlike to the healthy natural one; if the bone be now perforated, matter will be found between it and the dura mater, generally in considerable quantity, but different in different cases and circumstances. Sometimes it will be in great abundance, and diffused over a very large part of the membrane; and sometimes the quantity will be less, and consequently the space which it occupies smaller. Sometimes it lies only on the exterior surface of the dura mater; and sometimes it is between it and the pia mater, or also even on the surface of the brain, or within the substance of it, &c.

"As the inflammation and separation of the dura mater is not an *immediate* consequence of the violence, so neither are the symptoms immediate, seldom until some days have passed; the fever at first is slight, but increases gradually; as the membrane becomes more and more diseased, all the febrile symptoms are heightened; the formation of matter occasions rigors, frequent and irregular, until such a quantity is collected, as brings on delirium, spasm, and death."

When the scalp has been wounded, Mr. Pott observes, the wound will for some little time have the same appearance as a mere simple wound of this part, unattended with other mischief, would have; it will like that, at first discharge a thin sanies, or gleet, and then begin to suppurate; it will digest, begin to incarn, and look perfectly well; but, after a few days, all these favourable appearances will vanish; the sore will lose its florid complexion, and granulated surface; will become pale, glassy and flabby; instead of good matter, it will discharge only a thin discoloured sanies; the lint with which it is dressed, instead of coming off easily (as in a kindly suppurating sore) will stick to all parts of it; and the pericranium, instead of adhering firmly to the bone, will separate from it, all round, to some distances from the edges.

"This alteration in the face and circumstances of the sore, is produced merely by the diseased state of the parts underneath the skull; which is a circumstance of great importance, in support of the doctrine advanced; and is demonstrably proved, by observing that this diseased aspect of the sore, and this spontaneous separation of the pericranium, are always confined to that part which covers the altered or injured portion of the dura mater, and do not at all affect the rest of the scalp; nay, if it has by accident been wounded in any other part, or a portion has been removed from any part where no injury has been done to the dura mater, no such separation will happen, the detachment above will always correspond to that below, and be found no where else.

"The first appearance of alteration in the wound immediately succeeds the febrile attack; and as the febrile symptoms increase, the sore becomes worse and worse; that is, degenerates more and more from a healthy, kindly aspect.

"Through the whole time, from the first attack of the fever, to the last and fatal period, an attentive observer will remark the gradual alteration of the colour of the bone, if it be bare. At first it will be found to be whiter, and more dry, than the natural one; and as the symptoms increase, and either matter is collected, or the dura mater becomes sloughy, the bone inclines more and more to a kind of purulent hue, or whitish yellow; and it may also be worth while in this place to remark, that if the blow was on or very near to a suture, and the subject young, the said suture will often separate in such a manner as to let through it a loose, painful, ill-natured fungus; at which time also, it is no common thing for the patient's head and face to be attacked with an erysipelas.

"In those cases, in which the scalp is very little injured by the bruise, and in which there is no wound, nor any immediate alarming symptoms or appearances, the patient feels little or no inconvenience, and seldom makes any complaint, until some few days are past. At the end of this uncertain time, he is generally attacked by the symptoms already recited; these are not pressing at first, but they soon increase to such a degree, as to baffle all our art: from whence it will appear, that when this is the case, the patient frequently suffers from what seems at first to indicate his safety, and prevents such attempts being made, and such care from being taken of him, as might prove preventive of mischief.

"But if the integuments are so injured as to excite or claim our early regard, very useful information may from thence be collected; for whether the scalp be considerably bruised, or whether it be found necessary to divide it for the discharge of extravasated blood, or on account of worse appearances, or more urgent symptoms, the state of the pericranium may be thereby sooner and more certainly known; if in the place of such bruise, the pericranium be found spontaneously detached from the skull, having a quantity of discoloured sanies between them under the tumid part, in the manner already mentioned, it may be regarded as a pretty certain indication, either that the dura mater is beginning to separate in the same manner, or that if some preventive means be not immediately used, it will soon suffer; that is, it will inflame, separate from the skull, and give room for a collection of matter between them. And with regard to the wound itself, whether it was made at the time of the accident, or afterward artificially, it is the same thing; if the alteration of its appearance be as related, if the edges of it spontaneously quit their adhesion to the bone, and the febrile symptoms are at the same time making their attack, these circumstances will serve to convey the same information, and to prove the same thing.

"The particular effect of contusion is frequently found to attend on fissures, and undepressed fractures of the cranium, as well as on extravasations of fluid, in cases where the bone is entire; and, on the other hand, all these do often happen without the concurrence of this individual mischief. All this is matter of accident; but let the other circumstances be what they may, the spontaneous separation of the altered pericranium, in consequence of a severe blow, is almost always followed by a suppuration between the cranium and dura mater; a circumstance extremely well worth attending to in fissures and undepressed fractures, of the skull, because it is from this circumstance principally, that the bad symptoms, and the hazard, in such cases arise.

"It is no very uncommon thing for a smart blow on the head to produce some immediate bad symptoms, which after a short space of time disappear, and leave the patient perfectly well. A slight pain in the head, a little acceleration of pulse, a vertigo and sickness, sometimes immediately follow such accident, but do not continue many hours, especially, if any evacuation has been used. These are not improbably owing to a light commotion of the brain, which having suffered no material injury thereby, soon cease. But if, after an interval of some time, the same symptoms are renewed; if the patient, having been well, becomes again feverish, and restless, and that without any new cause; if he complains of being languid and uneasy, sleeps disturbedly, loses his appetite, has a hot skin, a hard quick pulse, and a flushed, heated countenance; and neither irregularity of diet, nor accidental cold, have been productive of these; mischief is most certainly impending, and that most probably under the skull.

"If the symptoms of pressure, such as stupidity, loss of sense, voluntary motion, &c. appear some few days after the head has suffered injury from external mischief, they do most probably imply an effusion of a fluid somewhere; this effusion may be in the substance of the brain, in its ventricles, between its membranes, or on the surface of the dura mater; and which of these is the real situation of such extravasation is a matter of great uncertainty, none of them being attended with any peculiar mark or sign that can be depended upon, as pointing it out precisely; but the inflammation of the dura mater, and the formation of matter between it and the skull, in consequence of contusion, is generally indicated and preceded by one which Mr. Pott has hardly ever known to fail; *a puffy, circumscribed, indolent tumor of the scalp, and a spontaneous separation of the pericranium from the skull under such tumor.*

"These appearances, therefore, following a smart blow on the head, and attended with languor, pain, restlessness, watching, quick pulse, head-ach, and slight, irregular shiverings, do almost infallibly indicate an inflamed dura mater, and pus, either forming or formed, between it and the cranium."

By detachment of the pericranium, is not meant every separation of it from the bone which it should cover. It may be, and often is, cut, torn, or scraped off, without any such consequence; but these separations are violent, whereas, that which Mr. Pott means is spontaneous, and is produced by the destruction of those vessels by which it was connected with the skull, and by which the communication between it and the internal parts was carried on; and therefore it is to be observed, that it is not the mere removal of that membrane which causes the bad symptoms, but it is the inflammation of the dura mater; of which inflammation, this spontaneous secession of the pericranium is an almost certain indication.

Sometimes the scalp is so wounded at the time of the accident, or so torn away, as to leave the bone perfectly bare; and yet the violence has not been such as to produce the evil just now spoken of. In this case, if the pericranium be only turned back, along with the detached portion of scalp, there may be probability of its reunion; and it should therefore be immediately made clean and replaced, for the purpose of such experiment; which, if it succeeds, will save time, and prevent considerable deformity. Should the attempt fail, it can only be in consequence of the detached part sloughing. Hence, removing it with a knife, though allowed by Pott, is now never practised. Frequently, when the scalp does not adhere at once, it becomes attached to the cranium afterwards by a granulating process. When the detached piece sloughs, the worst that can happen, is an exfoliation from the bare skull.

Sometimes, the force which detaches, or removes the scalp, also occasions the mischief in question; but, the integuments being wounded or removed, we cannot have the criterion of the tumor of the scalp for the direction of our judgment. Our whole attention must be directed to the wound and general symptoms. The edges of the former will digest as well, and look as kindly, for a few days, as if no mischief was done underneath. But, after some little space of time, when the patient begins to be restless, and hot, and to complain of pain in the head, these edges will lose their vermilion hue, and become pale and flabby. Instead of matter, they will discharge a thin gleet, and the pericranium will loosen from the skull, to some distance from the said edges. Immediately after this, all the general symptoms are increased and exasperated; and as the inflammation of the membrane is heightened or extended, they become daily worse and worse, until a quantity of matter is formed, and collected, and brings on that fatal period, which, though uncertain as to date, very seldom fails to arrive.

"The method of attempting the relief of this kind of injury consists in two points, viz. *to endeavour to prevent the inflammation of the dura mater*; or, that being neglected, or found impracticable, *to give discharge to the fluid collected within the cranium, in consequence of such inflammation.*

"Of all the remedies in the power of art, for inflammations of membranous parts, there is none equal to phlebotomy. To this truth many diseases bear testimony; pleurisies, ophthalmics, strangulated hernias, &c. and if any thing can particularly contribute to the prevention of the ills likely to follow severe contusions of the head, it is this kind of evacuation; but then it must be made use of in such a manner as to become truly a preventive; that is, it must be made use of immediately, and freely."

Acceleration, or hardness of pulse, restlessness, anxiety, and any degree of fever, after a smart blow on the head, are always to be suspected and attended to. Immediate, plentiful, and repeated evacuations by bleeding, have, in many instances, removed these, in persons, to whom Mr. Pott firmly believes, very terrible mischief would have happened, had not such precaution been used. In this, as well as some other parts of practice, we neither have, nor can have any other method of judging, than by comparing together cases apparently similar. Mr. Pott had more than once or twice seen that increased velocity and hardness of pulse, and that oppressive languor, which most frequently precede mischief under the bone, removed by free and repeated blood-letting; and had often, much too often, seen cases end fatally, whose beginnings were full as slight, but in which such evacuation had been either neglected, or not complied with. This judicious writer, "would by no means be thought to infer from hence, that early bleeding will always prove a certain preservative; and that they only die, to whom it has not been applied: this, like all other human means, is fallible; and, perhaps, there are more cases out of its reach, than within it: but, where preventive means can take place, this is certainly the best, and the most frequently successful.

"The second intention, viz. *the discharge of matter, collected under the cranium*, can be answered only by the perforation of it.

"When, from the symptoms and appearances already described, there is just reason for supposing matter to be formed under the skull, the operation of perforation cannot be performed too soon; it seldom happens, that it is done soon enough."

In short, whenever the dura mater, after the head has received external violence, separates, or is detached spontaneously from the bone underneath it, and such separation is attended with the collection of a small quantity of thin, brown ichor, an alteration of colour in the separated pericranium, unnatural dryness of the bone, chilliness, horripilatio, languor, and some degree of fever, Mr. Pott considers the operation indispensably necessary to save the patient's life.

"When the skull has been once perforated, and the dura mater thereby laid bare, the state of the matter must principally determine the surgeon's future conduct. In some cases, one opening will prove sufficient for all necessary purposes; in others, several may be necessary."

Notwithstanding the operation of perforation be absolutely and unavoidably necessary, as Mr. Pott remarks, "the repetition of blood-letting or cooling laxative medicines, the use of antiphlogistic remedies, and a most strict observance of a low diet and regimen, are as indispensably requisite after such operation as before; the perforation sets the membrane free from pressure, and gives vent to collected matter, but nothing more; the inflamed state of the parts under the skull, and all the necessary consequences of such inflammation, call for all our attention, full as much afterwards as before; and although the patient must have perished without the use of the trephine, yet, the merely having used it will not preserve him, without every other caution and care." (*Pott.*)

In relation to this subject, a remark, made by Sir Astley Cooper, merits notice: when pus lies between the dura mater and skull, the application of the trephine, he acknowledges, is a successful practice; but, according to his experience, the situation of the purulent matter there is comparatively rare, as it generally collects between the pia mater and surface of the brain, *for which case an operation will be useless*. (*Lectures, &c. Vol.* 1, *p* 325.)

I think it not improper to recommend again the practice of applying cold wet cloths to the head for the prevention and relief of inflammation of the dura mater; a plan, to which, as already explained, Schmucker ascribed a good deal of the success with which he treated injuries of the head. It is favourably mentioned by Dr. Hennen, and has received the recommendation of another modern writer, whose opinion must have great weight: "In the inflammation, which succeeds slowly to injuries of the head, a species of inflammation, not more insidious in its approach, than dangerous in its consequences, cold is by far the most efficacious remedy, that has yet been discovered." (See *Thomson's Lectures on Inflammation, p.* 181.)

Both tables of the skull sometimes exfoliate in consequence of external violence. The dead bone must be removed, as soon as loose; and, if necessary, the scalp divided for the purpose.

3. *Fissures and Fractures of the Cranium, without Depression.*

Fractures of the cranium are divisible into "those in which the broken parts keep their proper level, or equality of surface, with the rest of the skull, and those in which they do not; or, in other words, fractures without depression, and fractures with.

"These two distinctions are all which are really necessary to be made, and will be found to comprehend every violent division of the parts of the skull (not made by a cutting instrument) from the finest capillary fissure, up to the most complicated fracture."

No truth in surgery is now better understood and established, than that the bad symptoms very frequently accompanying a broken skull, are not produced by the breach made in the bone; nor indicate such breach to have been made. As Sir Astley Cooper remarks, the danger of fractures of the skull depends upon their being united with concussion, or extravasation; there is also a remote danger from inflammation. (*Lectures, &c. p.* 239.) This was the doctrine so well explained by Pott, who observes: "the sickness, giddiness, vomiting, and loss of sense and motion, can only be the consequence of an affection of the brain, as the common sensorium. They may be produced by its having been violently shaken, by a derangement of its medullary structure, or by unnatural pressure made by a fluid extravasated on its surface, or within its ventricles; but never can be caused by the mere division of the bone, (considered abstractedly); which division, in a simple fracture, can neither press on, nor derange the structure of the parts within the cranium.

"If the solution of continuity in the bone be either produced by such a degree of violence, as hath caused a considerable disturbance in the medullary parts of the brain, or has disturbed any of the functions of the nerves going off from it; or has occasioned a breach of any vessel, or vessels, whether sanguine or lymphatic, and that hath been followed by an extravasation, or lodgment of fluid; the symptoms necessarily consequent upon such derangement, or such pressure, will follow: but they do not follow, because the bone is broken, their causes are superadded to the fracture, and, although produced by the same external violence, are yet perfectly and absolutely independent of it: so much so, that they are frequently found where no fracture is.

"The operation of the trepan is frequently performed in the case of simple fractures, and that very judiciously and properly; but it is not performed, because the bone is broken or cracked; a mere fracture, or fissure of the skull, can never require perforation, or that the dura mater under it be laid bare; the reason for doing this, springs from other causes than the fracture, and those really independent of it: they spring from the nature of the mischief which the parts within the cranium have sustained, and not from the accidental division of the bone. From these arise the threatening symptoms: from these all the hazard; and from these, the necessity and vindication of performing the operation of the trepan.

"If a simple fracture of the cranium was unattended in present with any of the before-mentioned symptoms, and there was no reason for apprehending any other evil in future, that is, if the solution of continuity in the bone was the whole disease, it could not possibly indicate any other curative intention, but, the general one in all fractures, viz. the union of the divided parts." (*Pott.*)

I could relate numerous examples to the point, if it were any longer necessary, in the present state of surgical knowledge, to cite facts, in proof of the important truth, that the mere undepressed fissure, or fracture of the skull itself, cannot be the source of the immediate bad symptoms, but that, in these cases, the whole of the sudden peril arises, from the manner, in which the brain and its membranes have been hurt by the same violence, which caused the injury of the bone. Professor Thomson had opportunities of witnessing in the Netherlands several instances, which can leave no doubt upon this subject. "In some of the wounds (says he) in which the head had been struck obliquely by the sabre, portions of the cranium had been removed, without the brain appearing to have sustained much injury. In one case of this kind, where a considerable portion of the upper part of the occipital bone, *along with the dura mater*, had been removed, a tendency to protrusion of the brain took place during an attack of inflammation; a slight degree of stupor with loss of memory occurred; but, on the inflammatory state having been subdued, the brain sunk to its former level, the stupor went off, and the memory returned:"—and in another remarkable sabre cut, more than an inch in breadth of the left lobe of the cerebellum was exposed, and *was seen pulsating for a period of eight weeks*, yet the injury was unaccompanied with any particular constitutional symptoms. (See *Observations made in the Military Hospitals of Belgium*, *p.* 50, 51.)

In many cases of simple undepressed fractures of the cranium, it is true, that trephining is necessary: but, the reasons for the operation, in these instances are, first, the immediate relief of present symptoms arising from the pressure of extravasated fluid; and, secondly, the discharge of matter, formed between the skull and dura mater, in consequence of inflammation. The operation of trephining was also recommended by Pott, as a *preventive* of ill consequences; a practice, however, which is now never adopted; and many writers of the highest reputation, especially Desault, Dease, Mr. John Bell, and Mr. Abernethy, have strongly remonstrated against it.

The latter remarks: "In the accounts, which we have of the former practice in France, it is related, that surgeons made numerous perforations along the whole track of a fracture of the cranium; and, as far as I am able to judge, without any clear design. Mr. Pott also advises such an operation, with a view to prevent the inflammation and suppuration of the dura mater, which he so much apprehended. But, many cases have occurred of late, where, even in fractures with depression, the patients have done well without an operation."

Mr. Abernethy next relates several cases of fracture of the cranium with depression, which terminated favourably, although no operation was performed. This judicious surgeon thinks, that these cases, as well as a great many others on record, prove, that at all events a slight degree of pressure may not derange the functions of the brain, for a limited time after its application, and in this circumstance probably never; for all those patients whom he had an opportunity of knowing for any length of time after the accident, continued as well as if nothing of the kind had happened to them. In Mr. Hill's cases, in surgery, two instances of this sort are related, and Mr. Hill knew both the patients for many years afterwards: yet, no inconvenience arose. Indeed, it is not easy to conceive, that the pressure, which caused no ill effects at a time, when the contents of the cranium filled its cavity completely, should afterwards prove injurious, when they have adapted themselves to its altered size and shape. Severe illness, it is true, often intervenes between the receipt of the injury, and the time of its recovery; and many surgeons might be inclined to attribute this to pressure; but, it equally occurs when the depressed portion is elevated. If a surgeon, prepossessed with the opinion, that elevation of the bone is necessary in every instance of depressed cranium, should have acted upon this opinion in several of the cases, which Mr. Abernethy has related, and afterwards have employed proper evacuations, his patients would probably have had no bad symptoms, and he would naturally have attributed their well-doing to the mode of treatment, which he had pursued: yet, these cases did equally well without an operation. (See *Abernethy's Surgical Works*, *Vol.* 2, *p.* 4, *&c.* 8*vo. Lond.* 1811.)

Depressed fractures of the skull not being our immediate consideration, we need not expatiate upon them; but, it seemed right to make the preceding remarks, in order to show how unnecessary it must be to trephine a patient, merely because there is a fracture in the cranium, and with a view of *preventing* bad consequences. Even when the fracture is depressed, it is not necessary, unless there are evident signs, that the degree of pressure, thus produced on the brain, is the cause of existing bad symptoms.

The inflammation and suppuration of the parts, beneath the skull, which Mr. Pott wished so much to prevent by trephining early, do not arise from the occurrence of a breach in the cranium, but, are the consequences of the same violence, which was the occasion of the fracture. Hence, it is obvious, that removing a portion of the bone cannot in the least prevent the inflammation and suppuration, which must result from the external violence which was first applied to the head; but, on the contrary, such a removal being an additional violence, must have a tendency to increase the inevitable inflammatory mischief.

From what has been said, it is not to be inferred, however, that trephining is never proper, when there is a simple undepressed fracture of the skull. Such injury may be joined with an extravasation of blood on the dura mater; or, it may be followed by the formation of matter between this membrane and the cranium; in both which circumstances, the operation is essential to the preservation of the patient, immediately, but not before the symptoms indicative of the existence of dangerous pressure on the brain, begin to show themselves. (See *Trephine.*)

A fracture of the skull, unattended with urgent symptoms, and not brought into the surgeon's view by any accidental wound of the integuments, often remains for ever undiscovered; and as no benefit could arise from laying it bare by an incision, such practice should never be adopted. The surgeon ought only to be officious in this way, when he can accomplish by it some better object, than the mere gratification of his own curiosity. And as we shall find from the perusal of this article, and the one entitled, *Trephine*, that in these cases, the removal of pressure off the surface of the brain is the only possible reason for ever perforating the cranium with this instrument; and, as dividing the scalp is only a useful measure, when it is preparatory to such operation; neither the one, nor the other, should ever be practised, unless there exist unequivocal symptoms, that there is a dangerous degree of pressure operating on the brain, and caused either by matter, extravasated blood, or a depressed portion of the skull. If any exceptions can be made to this observation, they are cases, in which it is advisable to remove loose splinters and fragments of bone, or balls plainly felt under the scalp.

The true mode of *preventing* the bad effects, frequently following, but not arising from, simple fractures of the skull, is not to trephine, but, to put in practice all kinds of antiphlogistic means. For this purpose, let the patient be repeatedly and copiously bled, both from the arm and temporal arteries; let him be properly purged; give him antimonials; keep him on the lowest diet; let him remain in the most quiet situation possible; and if, notwithstanding such steps, the symptoms of inflammation of the brain continue to increase, let a large blister be applied to the scalp. If the scalp be wounded, it is to be healed as speedily as possible. Blood-letting and purgatives (as Sir Astley Cooper remarks) will sometimes remove the symptoms of concussion and extravasation, when they accompany the fracture, and a few hours will often show, that the trephine, which was at first thought indispensable, is unnecessary. Irreparable mischief might arise from your making an incision, and converting a simple into a compound fracture. "If you act prudently, (he adds), you will try bleeding and purgatives, before you operate; and the depletion will prove of the greatest possible advantage in preventing inflammation." (*Lectures, Vol.* 1, *p.* 299.) These are the cases, also, in which the topical application of cold water to the shaved and naked head, by means of cloths kept constantly wet, is an eligible, though in this country a much-neglected practice. Numerous instances, however, in favour of the method are recorded by the experienced Schmucker, (see *his Chirurgische Wahrnehmungen, B.* 1, *Berlin*, 1774,) and the trials, which I have seen made of it, give me a high opinion of its superior efficacy. When, in spite of all these measures, matter forms under the cranium, attended with symptoms of pressure, a puffy tumor of the injured part of the scalp, or those changes of the wound, if there is one, which Mr. Pott has so excellently described; not a moment should be lost in delaying to perforate the bone with the trephine, and giving vent to the matter beneath.

Experience teaches, that fractures at the basis of the skull are extremely dangerous, because they are generally attended with extravasation, or followed by inflammation of the brain, in consequence of the violence of the injury. According to Sir Astley Cooper, they are produced by falls from a great height on the summit of the head. The whole weight of the body is received on the foramen magnum, and cuneiform process of the os occipitis, and, in many instances, the consequence is a transverse fracture through the foramen magnum, the cuneiform process, and part of the temporal bone. A discharge of blood into each meatus auditorius accompanies the accident. It is supposed, also, that the deafness, which sometimes remains during life, in rare instances of recovery, is the result of this kind of injury. (*Lectures, &c. Vol.* 1, *p.* 289.)

A fracture within the orbit is sometimes occasioned by the forcible introduction of a stick, weapon, or pointed instrument, and is generally a fatal case, from the pressure and irritation of the depressed splinters of bone, and the simultaneous wound of the brain. The symptoms, in the beginning, however, are frequently mild and deceitful, and it is not till inflammation and suppuration ensue, that the patient's condition is always such as to create immediate alarm. A case, exemplifying this fact, is reported by Sir A. Cooper. (*Vol. cit. p.* 295.) The same eminent surgeon mentions the occasional production of a circular fracture of the entire cranium, by a blow on the vertex. Also the emphysema of the forehead, or the escape of the air, if there be a wound, caused when the nose is blown in the case of a fracture extending into the frontal sinuses. The complete detachment, sometimes met with, of the fragments, instead of their depression. His observations confirm the fact, that fractures of the skull, if unaccompanied with concussion, or compression, become united like those of other bones, but, he adds, that it is more slowly, and that where the interspace is wide, it will not be filled up with bony matter. (*P.* 297, 298.)

4. *Fractures of the Cranium with Depression.*

In simple fractures of the skull, or those in which the parts of the broken bone are not depressed from their situation, Mr. Pott remarks, that "The chirurgical intention, and requisite treatment, are the same in each, viz. to procure a discharge for any fluid which may be extravasated in present, (*provided the pressure of such extravasation produces urgent symptoms, a condition, which should here be added,*) and to guard against the formation, or confinement of matter." The prevention of suppuration will, as we have already remarked, be best accomplished, not by perforating the cranium, as Mr. Pott advised, but by copious bleeding, evacuations, cold washes to the head, blisters, and a rigorous antiphlogistic regimen. However, the confinement of matter, producing symptoms of pressure on the brain, certainly indicates the immediate use of the trephine.

"But, says the author, in fractures, attended with depression, there are other intentions. In these the depressed parts are to be elevated, and such as are so separated as to be incapable of reunion, or of being brought to lie properly, and without pressing on the brain, are to be totally removed. These circumstances are peculiar to a depressed fracture; but, although they are peculiar, they must not be considered as sole, but, as additional to those, which have been mentioned at large under the head of simple fracture; commotion, extravasation, inflammation, suppuration, and every ill which can attend on, or be found in the latter, are to be met with in the former, and will require the same method of treatment." That loose splintered pieces of the cranium, when quite detached, and already in view, in consequence of the scalp being wounded, ought to be taken away, no one will be inclined to question. That they ought also to be exposed by an incision, even when the scalp is unwounded, and then taken away, whenever they cause symptoms of irritation, or pressure, I believe will be universally allowed. But, the reader will already understand, from what has been said, in the preceding section, that several excellent surgeons do not coincide with Pott, in believing that every depressed fracture of the skull necessarily demands the application of the trephine.

"There certainly are (says Mr. Abernethy) degrees of this injury, which it would be highly imprudent to treat in this manner. Whenever the patient retains his senses perfectly, I should think it improper to trephine him, unless symptoms arose that indicated the necessity of it." *(P. 21.)*

It is extraordinary and unaccountable, but, it is not less true, that no calculation of the bad effects can be made by the degree, in which a part of the skull is depressed. This is a fact, which has been long known. It has also been particularly adverted to by an eminent modern writer. "Various instances also presented themselves, in which, though a considerable degree of compression must have been occasioned, sometimes by the depression of both tables, and at other times by the depression of the inner table only of the skull, yet neither stupor, paralysis, nor loss of memory were produced. In one of these cases, the middle of the right parietal bone was fractured, and considerably depressed by a ball which was extracted on the twentieth day. In this case, neither stupor, nor paralysis appeared. In another, a musket-ball had struck the right parietal bone, fractured it, and was flattened and lodged between the tables of the skull. The inner table was much depressed, yet no bad symptoms supervened." (See *Thomson's Observations made in the Military Hospitals in Belgium, p.* 59, 60.) The same author also saw a singular case, in which a ball, entering behind the right temple, and passing backwards and downwards, had fractured the bones in its passage, and lodged in the surface of the brain, over the tentorium, from which place it was extracted on the seventeenth day, after the injury. No bad symptom had manifested itself previously to the operation, and the man recovered under the strictest antiphlogistic regimen, with little or no constitutional derangement. Dr. Hennen has recorded two cases, fully proving the correctness of Mr. Abernethy's opinions, about the impropriety of using the trephine in cases of depression unattended with urgent symptoms: in one of these instances, the upper and posterior angle of the parietal, which had been struck by a musket-ball, was depressed exactly *an inch and a quarter from the surface of the scalp, yet no bad symptoms followed*, and with the aid of bleeding and other antiphlogistic remedies, the soldier recovered perfectly in a few weeks. "In a similar case, where the man survived thirteen years, with no other inconvenience, than occasional determination of blood to the head on hard drinking, *a funnel-like depression to the depth of an inch and a half* was formed in the vertex." (See *Hennen's Military Surgery, p.* 287, *Ed.* 2.)

If then the violence of the symptoms is not always in proportion to the compression, but is sometimes considerable when the pressure is slight, every surgeon cannot be too fully impressed with the following truth, that *existing symptoms of dangerous pressure on the brain*, which symptoms will be presently related, *can alone form a true reason for perforating the cranium.*

Although the doctrines of Sir Astley Cooper, generally speaking, coincide very much with the preceding maxim, which I regard as a very important one; there is an exception to it in his advice, in relation to compound fractures of the skull, as will be understood from the following passage. "The old practice used to be, the moment an injury of the brain was suspected, and the least depression of the bone appeared, to make an incision into the scalp. This is putting the patient to considerable hazard; for, the simple fracture would, by the incision, be rendered compound. In simple fracture, then, when it is attended with symptoms of injury of the brain, deplete before you trephine; and when it is unattended with such symptoms deplete merely, and do not divide the scalp, &c. If the fracture be compound, the treatment must be very different; because a compound fracture is very generally followed by inflammation of the brain; and it will be of little use to trephine, when inflammation is once produced. If the inflammation come on, the patient will generally die, whether you trephine or not," and, it is added, that the operation will even be likely to increase the inflammation, which has been excited by a depressed portion of the skull. "The rule (says Sir Astley) which I always follow, is this: when I am called to a compound fracture, with depression, which is exposed to view, whether symptoms of injured brain exist or not, I generally use an elevator, and very rarely the trephine. I put the elevator under the bone, raise it, and, if it has been comminuted, remove the small portions of bone." (*Lectures, &c. Vol.* 1, *p.* 304, 308.) Of the propriety of using the elevator in such cases, and also of taking away loose fragments, there cannot be a doubt; but, many surgeons object, (and I confess myself one of the number) to saw out a portion of the skull while the patient is free from urgent symptoms. I believe, also, that the inflammation, when it does arise, is mostly the effect of the violence itself, not of the depression of the bone, and, therefore, more likely to be increased than prevented, by the application of the trephine. I think a better reason for elevating the bone, when it is exposed, and there are no bad symptoms, is the fact, that many patients after their recovery from the imminent danger of the accident, become subject, whenever the circulation is hurried, to insanity, epilepsy, &c. Yet, here it is to be considered, that it may be quite time enough to trephine, when such ills follow the continuance of the depression, and that, perhaps, the operation would then be in itself less dangerous, inasmuch as the tendency to inflammation arising from the first violence must now have subsided.

Sometimes, a considerable depression of the bone arises from the external table, being driven into the diploe, while the inner table is entire. To trephine, therefore, merely because there is a depression of the bone, would be completely erroneous, and the only safe principle is that which I have just now specified. The depression of the outer table in the foregoing manner I have never seen myself; Sir Astley Cooper, however, mentions it as a frequent occurrence; but, that it is confined to persons of middle age, as in very young and very old persons, the skull is thin and without diploe. (*Lectures*, *Vol.* 1 *p.* 302.) Another sort of depression, I believe, is more frequent, at least, I have seen several examples of the case: it consists in a fracture and depression of the internal table, while the external one continues unbroken. A case of this kind, attended with urgent symptoms of compression, I trephined at Brussels: a large splinter of the inner table was driven more than an inch into the brain, and on its extraction, the patient's senses and power of voluntary motion instantly returned. Part of the skull, to which the trephine was applied, of course, did not indicate externally any depression, and it was selected because the appearance of the scalp showed, that there the external violence had operated. I rather expected to find extravasated blood, than a depression of the inner table of the skull.

In military surgery, particular cases present themselves, which scarcely admit of being comprehended within the tenor of any general rules and principles. Thus, it sometimes happens, that a ball breaks the os frontis, and the whole or a part of it lodges in the frontal sinus, with, or without fracture of the inner boundary of this cavity. In cases of this description, Baron Larrey recommends exposing the course of the fracture by a free incision, and the use of the trephine for the removal of the extraneous body. When the inner side of the sinus was found broken and depressed, he next perforated that part of the cavity with a small conical trephine, took away such pieces of bone as required removal, and let out any extravasated blood. Sometimes, however, the front of the sinus is so splintered, that the fragments, when taken away with the forceps, leave the cavity sufficiently opened, not only for the extraction of the ball, but for the application of the trephine to the inside of the sinus, as we find exemplified in one of the two cases of this nature, which Larrey met with in the Egyptian campaign. (*Mém. de Chir. Militaire*, *T.* 2, *p.* 138.) After the battle of Witepsk, in 1812, he was called to two Russian soldiers, whose cases were remarkable; one of them had been struck above the right eyebrow, with a grape-shot, which, after breaking and penetrating the frontal bone, entered the cavity of the cranium, so as to lodge upon the anterior right lobe of the brain, and the obitar process and internal crista of the os frontis. Notwithstanding the large size of the ball, little of it could be seen externally, and the aperture, through which it had passed was not more than three, or four lines broad; every attempt to extract it, therefore, was in vain. The patient experienced a painful sense of oppression and weight in the head, and, whenever he inclined it backward, was seized with syncope. He kept himself constantly in a sitting posture, with his head on his knees. Larrey adds, that every symptom of compression of the brain also prevailed, though this account is rather difficult to comprehend, considering that the patient could sit up, and choose his posture. As for any description given by himself, of his sufferings, that is another circumstance, on which I should not be inclined to dwell, supposing, that, probably, the Baron was not able to converse in the Russian language, and that the inferences respecting the man's feelings, were made in some other way. But, whatever might be the real state of the symptoms, (and in a case of this kind a correct account of them would have been interesting,) the ball was plainly ascertained by means of a probe, to be of iron, and of much larger diameter, than the opening through which it had entered; and, that for the purpose of extracting it, the application of the trepan was urgently necessary. The fracture was fairly brought into view by suitable incisions, three perforations were made with a small trephine at its upper part, and, after the removal of the angles of the bone between these perforations, the ball, which weighed seven French ounces, was readily extracted with the aid of a strong pair of forceps, and an elevator. A considerable quantity of coagulated blood was also removed, under which the brain was found with a depression of three or four lines deep. As soon as some splinters of the bone had been taken away, the part was dressed with a bit of fine linen dipped in warm wine, sweetened with sugar, over which were placed charpie, several compresses, and a bandage. With respect to the application of warm wine, and other stimulants, to the surface of the brain, in wounds exposing or interesting that organ, it seems to be an invariable practice with Larrey, as well as Schmucker, and the older surgeons. On what principle the custom, is still kept up? and whether it is truly right and useful? are questions which may be rationally put. In whatever way experience may hereafter decide these matters, suffice it to add, that the patient was relieved by the treatment, and fell into a quiet sleep for two hours; but, in the evening, he became feverish, and the wound acutely painful. A considerable quantity of blood was taken from the vena saphena: (and why bleeding was not practised at first, seems extraordinary.) The dressings, which, according to my ideas, were highly objectionable, were removed, and a large emollient poultice applied. Cooling beverages, containing a small quantity of tartarized antimony, and antispasmodic anodyne medicines, were prescribed. The following day, the patient's state appeared satisfactory, without the slightest disturbance of the senses, and, in due time, he perfectly recovered.

The other soldier had been wounded in the left temple, with a leaden ball, five days before Larrey saw him. One half of the ball had gone into the cranium, through a very narrow breach; the other had burrowed under the temporal muscle, and lodged near the mastoid process. The right side of the body was paralytic, the senses were annihilated, and the man was in a state of incessant agitation. After dilating the wound in the temple, and exposing the fracture, Larrey discovered the track of the piece of lead, which had gone towards the mastoid process, and which he immediately extracted by a counter-opening. At the lower part of the temporal wound, he applied a trepan, very near the spot, where the other portion of the ball was lodged. This, with some fragments of the bone, and extravasated blood was easily extracted. The patient however, was not saved; a circumstance ascribed by Larrey to the operation having been done too late.

In another case, one of the Imperial Guards, wounded at the battle of the Moskowa, died with symptoms of compression, and, after death, a quarter of a bullet, and a fragment of bone, were found under the skull, attended with an ulcerated or wounded state of the adjacent portion of the brain. Larrey very properly expresses his opinion, that this soldier would have had a chance of being saved, had the trepan been used. (See *Mém. de Chir. Mil. T.* 4, *p.* 183, *&c.*) The practice of trephining for the removal of balls, situated near a fracture of the skull, within this bony cavity, or lodged amongst the fragments, or between the two tables, forced asunder, (see *Engel's Case in Vermischte Chir. Schriften von J. L. Schmucker, B.* 1, *p.* 242,) is not peculiar to Larrey, for it has been done by many other surgeons; (see *Schmucker's Wahrnehmungen, B.* 1, *p.* 298;) but I do not know, that he has been anticipated in his bold practice of making a counter-opening in the skull, when the ball is lodged at such a distance from the fracture, that it cannot be extracted through any perforation made in the vicinity of the original injury; for, it is a principle which he ventures to lay down, that *when a ball has entered the cranium, without quitting the roof of this cavity, the case is one requiring the application of the trepan.* (*Mém. de Chir, Mil. T.* 4, *p.* 180.) In the 2d vol. of this work, (*p.* 139,) the reader will find the account of the soldier, who was struck on the middle of the forehead with a ball, which penetrated the os frontis, and then passed obliquely backwards, between the skull and the dura mater, in the course of the longitudinal sinus, as far as the lambdoidal suture, where it stopped. Larrey traced the situation of the ball, by the introduction of an elastic gum catheter into the opening, and measuring the distance between the fracture and the place where he felt the ball, he cut down upon that part of the skull, beneath which he concluded that the ball was lodged. The bone was then perforated with a large trepan; *a good deal of pus was discharged;* the ball was extracted and the patient recovered. One thing here merits the attention of surgeons: Larrey tells us, that a good deal of pus issued as soon as an opening was made in the skull: there must then have been suppuration under the bone, and inflammation and detachment of the dura mater; circumstances, always indicated, according to Pott, by a corresponding separation of the pericranium, and a puffy tumor of the scalp. Did these symptoms take place in the foregoing case, so as to be of any assistance to Larrey, in judging of the place where the ball was lodged? And, has the mention of them been omitted only by accident? or, are we to infer, that suppuration may happen between the cranium and dura mater, without any detachment of the pericranium and puffy tumor of the scalp; a thing, which Bichat asserts is proved by daily experience in the Hôtel-Dieu, at Paris? (See *Œuvres Chir. de Desault, T.* 2, *p.* 29.) Larrey, in his 3d vol. (*p.* 82,) gives us another case, in which a ball pierced the left parietal bone, and lodged near the lambdoidal suture. Its situation was detected with the aid of an elastic gum catheter, and partly in consequence of there being a slight ecchymosis over the part. Here a crucial incision was made through the scalp, and a small fissure discovered. As the symptoms of compression increased, the trepan was applied, so as to include the fissure. A half of the ball flattened was found directly under the perforation, and a good deal of blood was voided from the two openings in the cranium. For a fortnight, the case went on favourably, but, the patient was then attacked with what Larrey terms hospital fever, but which, in all probability, was inflammation and suppuration of the membranes of the brain, and died.

The records of surgery furnish numerous instances, in which the patients lived a considerable time with balls lodged in the cavity of the cranium. Thus, one is related by Paroisse, where the patient soon recovered his senses after the injury, and, at the end of six months, felt no inconvenience, except a difficulty of opening the mouth. (*Opuscules de Chir. Obs.* 1, *8vo. Paris*, 1806.) Ramdohr has published another case, where a soldier was shot through the frontal sinus, and the ball was found after death in the medullary substance of the left hemisphere of the brain, half an inch above the ventricle: yet, this patient lived four months after the injury, and soon recovered his senses after its occurrence. For a considerable part of this time, he was also free from any bad symptoms. At last, he was affected with a kind of stupor, and an inability to open his left eye, and fell into a lethargic and convulsed state. (*Schmucker Vermischte Chir. Schriften, B.* 1, *p.* 277.) A French soldier at the battle of Waterloo, was wounded with a musket-ball, which entered at the anterior portion of the squamous suture, lodged in the substance of the brain, and on the fifth day, after an enlargement of the wound, and the removal of several fragments of bone, was extracted from the posterior lobe of the right hemisphere of the brain, where it was found resting on the tentorium. Yet, during the several previous days, the man, with the exception of a slight headach, and partial deafness of the right ear, seemed to enjoy perfect health. The case ended well. (See *Hennen's Mil. Surg. p.* 289. *Ed.* 2.) Still more remarkable instances of the duration of life, and even of the absence of very serious symptoms, after great and serious wounds of the brain, and the lodgment of balls, might here be cited; but, it will suffice to refer to the instructive Essay of M. Quesnay, on the subject, in vol. 1, of the *Mém. de l'Acad. de Chir.* 4to. and to the account of twenty-two French soldiers, whose vertices, with more or less of the brain, were cut off by sabre strokes. All these men ultimately died; but, at first, had not a single bad symptom, and performed a journey of thirty leagues after being wounded, and one-half of this distance on foot. (See *Paroisse Opuscules de Chir. p.* 41, *&c.*)

5. *Extravasation under the Cranium, Symptoms of Pressure on the Brain, &c.*

Mr. Pott remarks, "the shock, which the head sometimes receives by falls from on high, or by strokes from ponderous bodies, does not unfrequently cause a breach in some of the vessels, either of the brain, or its meninges; and, thereby, occasions extravasation of the fluid, which should circulate through them. This extravasation may be the only complaint produced by the accident; or it may be joined with, or added to, a fracture of the skull. But, this is not all, for it may be produced not only when the cranium is unhurt by the blow, but even when no violence of any kind has been offered to, or received by the head."

The effused blood may lie between the cranium and dura mater; between the latter membrane and the arachnoides; on the surface of the pia mater; or under this membrane, on the surface, in the substance, or cavities of the brain. The first species of extravasation, which is observed to be always more or less circumscribed, may occur at any part of the skull, but, when situated at its base, is generally fatal. In the second, the blood is widely scattered about between the dura mater and arachnoides, and on this account, unless its quantity be very considerable, it does not cause any great degree of pressure. In the third example, if the blood be situated in the convolutions, it is also widely diffused, but, if it be within the substance, or ventricles of the brain, it is circumscribed. (*Œuvres Chir. de Desault par Bichat, T.* 2. *p.* 23.) Sometimes, in cases of great violence, as Mr. Pott has justly observed, the blood is found at the same time in all these different parts.

When blood is extravasated beneath the skull, the violence, which produces the rupture of the vessel, usually stuns the patient, from which state, provided the quantity and pressure of the blood, and the force of the concussion be not too great, he gradually recovers and regains his senses. If the first extravasation be trivial, the patient, after regaining his senses, may only feel a little drowsiness, and go to bed. The bleeding from the ruptured vessel continuing, and the pressure on the brain increasing, he becomes more and more insensible, and begins to breathe in a slow, interrupted, stertorous manner. In cases of compression, whether from blood or a depressed portion of the skull, there is a general insensibility; the eyes are half open; the pupils dilated, and motionless, even before the vivid light of a candle; the retina is insensible; the limbs relaxed; the breathing stertorous; the pulse slow, and, according to Mr. Abernethy, less subject to intermission, than in cases of concussion. The absence of stertor, however, as this gentleman admits, must not be relied upon, as a proof of their being no compression; for, Morgagni relates dissections of apoplectic persons, in whom the effusion was considerable, yet no stertor had occurred.

In a case of wound of the posterior part of the skull, with depression, seen by Dr. J. Thomson, the pulse at one time sunk as low as 36 strokes in a minute. This eminent professor, however, is at variance with Mr. Abernethy upon one point, by stating, that irregularity of the pulse is a very frequent attendant upon compressed brain. (*Report of Observations, &c. p.* 54, 55.) Sometimes convulsions arose from the pressure of portions of the skull, driven in upon the brain. This is a very dangerous symptom; but, Dr. Thomson saw it cease in a few examples, after the depressed piece of bone had been elevated, and the antiphlogistic regimen adopted. (*P.* 60.) Convulsions I am disposed to regard with Bichat, rather as a symptom of injury of the brain, than of compression. (*Œuvres Chir. de Desault, T.* 2, *p.* 27.)

Indeed, the difficulty of the diagnosis of many cases may be well conceived by what Dr. Hennen remarked, in his practice, viz. that, in some instances, the pupils were contracted, in others dilated, where the injury was nearly of a similar nature and degree; while, sometimes, in the same patient, one pupil was dilated, and the other much contracted. He saw, also, paralysis occur on one side, and convulsions on the other, when the blow had been on the forehead, and the same when it had been on the occiput. (*Op. cit. p.* 300, 301.)

The patient is hardly ever sick, when the pressure on the brain and the general insensibility, are considerable; for the very action of vomiting betrays sensibility in the stomach and œsophagus. These symptoms are not peculiar to pressure from blood, but arise also from that of many depressed fractures of the skull, and of suppuration under this part. They are all attributable to the unnatural pressure made on the brain and nerves, and have too often been mistaken, as indications of an injury, which, considered abstractedly, can never cause them; we allude to a simple undepressed fracture of the cranium, which may be accompanied with them, but cannot cause them. They differ in degree, according to the quantity, kind, and situation of the pressing fluid. The hemorrhage from the nose and ears, which often follows violence applied to the head, leads to no particular or useful inference: we cannot even calculate, by this sign, that the force has exceeded a certain degree; for such bleedings take place, in some persons, from much slighter causes than in others.

Paralysis is a symptom, which generally attends hurtful pressure on the brain. The particular circumstances, however, which determine its degree, extent, and situation, are not well understood. "In some instances of paralysis from sabre-wounds, as well as in those made by gun-shot, says (Dr. J. Thomson) paralysis was confined to the upper, and in others to the lower extremity. *In every instance, in which it distinctly appeared, that the injury existed on one side of the head, the paralysis uniformly manifested itself upon the other;* but, we were unable to perceive any other fixed relation between the part of the brain, which had been injured, and the part of the body affected with palsy. A wound of the right parietal bone by a musket-ball was followed by palsy of the left arm and leg. In another case, a wound, penetrating the upper part of the right parietal bone, was accompanied with a slight paralytic affection of the left side of the mouth, and complete palsy of the left leg. In a third case, a sabre-wound of the same bone, followed by extensive exfoliations, gave rise to a complete palsy of the left side." (*Observations made in the Military Hospitals in Belgium, p.* 52, 53.)

With respect to paralysis, it is unquestionably one of the common symptoms of pressure on the brain; but, according to Bichat, it may also be caused by concussion; and we know, that it may arise in cases of inflammation and suppuration, within the skull. The above statement, respecting the paralysis being always on the side of the body opposite that on which the brain is compressed, agrees with what is generally remarked by other surgical writers. (See *Larrey's Mém. de Chir. Mil. T.* 4, *p.* 180; *Hennen's Principles, p.* 301, *Ed.* 2, *&c.*) Yet, at the Hôtel-Dieu, at Paris, says Bichat, extravasation has very often been found both on the side affected with paralysis, and on the opposite one; or else the blood was generally diffused, while the paralysis was local. (*Œuvres Chir. de Desault, T.* 2, *p.* 27.)

The preceding class of symptoms only informs us, that the brain is suffering compression; and leaves us quite in the dark, respecting several other very important circumstances. "We not only have no *certain infallible* rule, whereby to distinguish what the pressing fluid is, or where it is situated, but we are, in many instances, absolutely incapable of knowing whether the symptoms be occasioned by any fluid at all; *for a fragment of bone broken off from the internal table of the cranium, and making an equal degree of pressure, will produce exactly the same complaints.*" (*Pott.*) In detailing the symptoms of pressure from blood, I took particular notice of the patient being at first generally stunned by the blow; of his gradually regaining his senses, and of his afterwards relapsing into a state of insensibility again. *The interval of sense*, which thus occurs, was pointed out by Petit as a circumstance of the greatest consequence in elucidation of the nature of the case.

"A concussion, and an extravasation (as Mr. Pott observes) are very distinct causes of mischief, though not always very distinguishable.

"M. Le Dran, and others of the modern French writers, have made a very sensible and just distinction between that kind and degree of loss of sense, which arises from a mere commotion of the brain, and that which is caused by a mere extravasation, in those instances, in which the time of the attack, or appearance of such symptoms, are different or distinct. The loss of sense, which immediately follows the violence, say they, is most probably owing to a commotion; but that which comes on after an interval of time has past, is most probably caused by extravasation.

"This distinction is certainly just and good, as far as it will go. That degree of abolition or diminution of sense, which immediately attends or follows the blow or fall, and goes off again without the assistance of art, is in all probability occasioned by the sudden shake or temporary derangement of the contents of the head; and the same kind of symptoms recurring again some time after they had ceased, or not coming on until some time has passed from the receipt of the violence, do most probably proceed from the breach of a vessel within or upon the brain. But unluckily, we have it not very often in our power to make this exact distinction. An extravasation is often made so immediately, and so largely, at the instant of the accident, that all sense and motion are instantaneously lost, and never again return. And it also sometimes happens, that although an extravasation may possibly not have been made at the moment of the accident, and the first complaints may have been owing to commotion merely, yet a quantity of fluid having being shed from its proper vessels very soon after the accident, and producing its proper symptoms, before those caused by the commotion have had time to go off, the similarity of the effects of each of these different causes is such, as to deprive us of all power of distinguishing between the one and the other, or of determining with any tolerable precision, to which of them such symptoms as remain are really owing."

As Bichat remarks, a man meets with a fall; a slight concussion of the brain is the consequence, and the patient is instantly stunned. The effects of concussion gradually subside, but an extravasation takes place, and the loss of the senses continues, though from a different cause. Here, according to the principles of Petit, the case would be set down as concussion; yet, things are quite the contrary, the extravasation now keeping up the symptom, which was only temporarily produced by concussion. In many instances also, the effects of concussion and extravasation exist together, and then how is a surgeon to judge of the nature of the case? (See *Œuvres Chir. de Desault, T.* 2, *p.* 25.)

"When an extravasation of any kind is made, either upon or within the brain, if it be in such quantity, or so situated, as to disorder the œconomy of the animal, it always produces such disorder, by making an unnatural pressure on the parts where it lies. The nature and degree of the symptoms, hereby produced, are various and different in different persons, according to the kind, quantity, and situation of the pressing fluid. Sometimes it is mere fluid blood, sometimes blood in a state of coagulation, sometimes it is a clear lymph, and at others blood and water are found mixed together; each of these is found either simple or mixed in different situations, that is, between the skull and dura mater, between the dura and pia mater, or in the natural cavities of the brain called its ventricles, and sometimes, in cases of great violence, they are found at the same time in all these different parts. Sometimes a considerable quantity is shed instantly, at the time of the accident; and sometimes the breach by which the effusion is made is so circumstanced, both as to nature and situation, that it is at first very small, and increases by faster or slower degrees. In the former, the symptoms are generally immediate and urgent, and the extravasation is of the bloody kind; in the latter, they are frequently slight at first, appear after some little interval of time, increase gradually till they become urgent or fatal, and are in such case generally occasioned by extravasated lymph. So that although the immediate appearance of bad symptoms does most certainly imply mischief of some kind or other, yet on the other hand, no man ought to suppose his patient free from hazard, either because such symptoms do not show themselves at first, or because they appear to be but slight: those which come on late, or appearing slight at first, increase gradually, being full as much to be dreaded as to consequence, as the more immediately alarming ones; with this material difference between them, that the one *may* be the consequence of a mere concussion of the brain, and may by means of quietude and evacuation go quite off; whereas, the other being most frequently owing to an extravasation of lymph (though sometimes of blood also) within the substance of the brain, are very seldom removed by art." (*Pott.*)

The case of extravasation, between the cranium and dura mater, is almost the only one, which admits of relief from trephining. Mr. Abernethy informs us, that in the cases, which he has seen, of blood extravasated, between the dura and pia mater, on a division of the former membrane being made for its discharge, only the serous part of it could be evacuated; for, the coagulum was spread over the hemisphere of the brain, and had descended, as low as possible, towards its inferior part, so that very little relief was obtained by the operation. (*Surgical Works*, *Vol.* 2, *p.* 46.) This statement, we see, is confirmed by that of Bichat, and the practice inculcated, agrees with what Sir Astley Cooper also directs, as will be presently noticed.

Fractures of the cranium, which take place across the lower and front angle of the parietal bone, and the rest of the track of the trunk, and large branches of the spinous artery of the dura mater, are cases very apt to be attended with a copious extravasation. This vessel, and others more deeply seated, however, may be ruptured, pour out a considerable quantity of blood, and induce urgent symptoms of pressure on the brain, not only without the co-existence of a fracture, but even of any external mark of violence on the scalp.

The effused blood is frequently situated below the part, on which the violence has operated, and hence, when such part is pointed out by a wound, or discoloration of the scalp, or a fracture, and the symptoms of pressure are considerable, I should have no hesitation about immediately trephining, in the situation of the external injury. I have seen many cases, in which such practice was justified by the result, and even when no extravasation exists, this plan will sometimes detect a depression of the inner table of the skull, and be the means of saving life, as happened in one very remarkable case, which I trephined at Brussels after the battle of Waterloo. At the same time, it would be wrong to hold out the expectation, that, by acting on this principle, the surgeon will always find blood immediately under the part of the cranium which he perforates. With respect to a fracture also, as a guide to the place for the application of the trephine in cases of extravasation, Desault regards it as very fallacious, dissections proving that numerous fractures of the skull are unattended with any effusion of blood immediately under them; and his experience taught him, that the most frequent cases were those, in which there was either extravasation without fracture, or a fracture with blood effused in a part of the head remote from the injury of the bone. (*Œuvres Chir. T.* 2, *p.* 130.) Even when blood is seen issuing from the fissure, he regards it as no proof of the dura mater being detached, as such blood may proceed from the vessels of the diploe. (*P.* 31.) But what is to be done, when dangerous symptoms of pressure prevail, without any external mark to denote, what part of the head has received the blow, or whether any at all? for, a general concussion of the head may produce an effusion of blood within the cranium. Under these circumstances, Mr. Pott was against the operation, and says, that "the only chance of relief is from phlebotomy, and an open belly; by which we may hope so to lessen the quantity of the circulating fluids as to assist nature in the dissipation or absorption of what has been extravasated. This is an effect which, although not highly improbable in itself, yet is not to be expected from a slight or trifling application of the means proposed. The use of them must be proportioned to the hazard of the case. Blood must be drawn off freely and repeatedly, and from different veins; the belly must be kept constantly open, the body quiet, and the strictest regularity of general regimen must be rigidly observed. By these means, very alarming symptoms have now and then been removed, and people in seemingly very hazardous circumstances have been recovered." Desault also promulgated the same advice, and blamed the doctrine formerly in vogue, that it was better to apply the trephine many times uselessly, than to let a single extravasation remain undetected; for, Desault was convinced, that the trephine, when used on this principle, was a source of greater mischief, than the effused blood itself. (*Œuvres Chir. T.* 2, *p.* 34.) The same doctrine is espoused by Sir Astley Cooper, (*Lectures, &c. Vol.* 1, *p.* 288.) and I believe all the best modern surgeons.

But should the mode of judging, whether blood lies immediately under the skull, suggested by Mr. Abernethy, prove invariably correct, the question, whether the trephine should be applied, or not, may in future be more easily determined. Even when the injured scalp shows where the violence has operated, the criterion, about to be noticed, may inform us, whether we should perforate the bone or not; for, though the extravasation is sometimes found immediately under the external mark, yet, it often is not so; but, is in a part distant from that mark, to which situation we have nothing to lead us, and to which, indeed, if we knew it, we could not reach. Mr. Abernethy has observed, "that unless one of the large arteries of the dura mater be wounded, the quantity of blood, poured out, will probably be inconsiderable; and the slight compression of the brain, which this occasions, may not be attended with any peculiar symptoms, or perhaps, it may occasion some stupor or excite an irritation, disposing the subjacent parts to become inflamed. It is indeed highly probable, that, in many cases, which have done well without an operation, such an extravasation has existed. But, if there be so much blood on the dura mater, as materially to derange the functions of the brain, the bone, to a certain extent, will no longer receive blood from within, and by the operation, performed for its exposure, the pericranium must have been separated from its outside. I believe, that *a bone so circumstanced, will not be found to bleed* ; and, I am at least certain, it cannot with the same freedom and celerity, as it does when the dura mater remains connected with it internally. (See *Abernethy's Surgical Works, Vol. 2, p.* 47.) In some cases, related by this gentleman, there was no hemorrhage; twice he was able, by attending to this circumstance, to tell how far the detachment of the dura mater extended; and often, when symptoms seemed to demand a perforation of the skull, he has seen the operation contra-indicated by the hemorrhage from the bone, and as the event showed, with accuracy. Mr. Abernethy admits, however, that in aged persons, and in those, in whom the circulation has been rendered languid by the accident, the mode of distinction, which he has pointed out, will be less conclusive.

Pott remarks, that "if the extravasation be of blood, and that blood be in a fluid state, small in quantity, and lying between the skull and dura mater, immediately under or near to the place perforated, it may happily be all discharged by such perforation, and the patient's life may thereby be saved; of which many instances are producible. But if the event does not prove so fortunate, if the extravasation be so large or so situated that the operation proves insufficient, yet the symptoms having been urgent, general evacuation having been used ineffectually, and a wound or bruise of the scalp having pointed out the part which most probably received the blow, although the removal of that part of the scalp (a simple incision ought to have been said) should not detect any injury done to the bone, yet the symptoms still subsisting, I cannot help thinking, that perforation of the cranium is in these circumstances so fully warranted, that the omission of it may truly be called a neglect of having done that which might have proved serviceable, and, *rebus sic stantibus,* can do no harm. It is very true, that no man can beforehand tell whether such operation will prove beneficial or not, because he cannot know the precise nature, degree, or situation of the mischief; but, this uncertainty properly considered, is so far from being a dissuasive from the attempt, that it is really a strong incitement to make it; it being fully as impossible to know, that the extravasated fluid does *not* lie between the skull and dura mater, and that under the part stricken, as that it *does* ; and if the latter should be the case, and the operation be not performed, one, and most probably the only means of relief, will have been omitted."

When there is no interval of sense, between the blow, and the coming on of perilous symptoms, it is frequently impossible to determine, whether the mischief be owing to the largeness and suddenness of the extravasation, to the violence of the shock, which the brain has received, or to both these causes at once, which, unfortunately, is too often the case. In this latter complication, indeed, trephining will frequently be of no avail, even though it serve for the entire removal of all pressure off the brain; for, the patient cannot recover from the violence of the concussion, and never regains his senses. This is no reason, however, why the chance of the operation doing good should not be taken when there are evident symptoms of pressure. Let us, in these darkened cases, call to mind the sentiments of Pott, who says: "No man, who is at all acquainted with this subject, will ever venture to pronounce or promise success from the use of the trephine, even in the most apparently slight cases; he knows that honestly he cannot; it is enough that it has often been successful where and when every other means have failed. The true and just consideration is this: does the operation of perforating the cranium in such case add at all to that degree of hazard which the patient is in before it is performed? or can he in many instances do well without it? If it does add to the patient's hazard, that is certainly a very good reason for laying it aside, or for using it very cautiously; but, if it does not, and the only objection made to it, is, that it frequently fails of being successful, surely it cannot be right to disuse that, which has often been, not only salutary, but the *causa sine quâ non* of preservation, merely, because it is also often unsuccessful, that is, because it is not infallible."

Giving vent to the confined blood "may produce a cure, or it may prove only a temporary relief, according to the different circumstances of different cases. The disappearance, and even the alleviation of the most pressing symptoms is undoubtedly a favourable circumstance, but is not to be depended upon as absolutely portending a good event. Either a bloody, or limpid extravasation may be formed, or forming between the meninges, or upon, or within the brain, and may prove as certainly pernicious in future, as the more external effusion would have done, had it not been discharged; or the dura mater may have been so damaged by the violence of the blow as to inflame and suppurate, and thereby destroy the patient.

"If the disease lies between the dura and pia mater, mere perforation of the skull can do nothing; and, therefore, if the symptoms are pressing, there is no remedy but division of the outer of these membranes. The division of the dura mater is an operation, which I have several times seen done by others, and have often done myself; I have seen it, and found it now and then successful; and, from those instances of success, am satisfied of the propriety, and necessity of its being sometimes done." He next states, however, his sentiment, that wounding the dura mater is itself attended with dangerous consequences. Mr. Abernethy's opinion of such operation has already been given. It is also disapproved of by Sir Astley Cooper, who says, that if blood be not found between the dura mater and skull, do not puncture the dura mater to seek for it; which would be of no use, as the blood is coagulated, and could not escape, being seated under the pia mater, or in the brain itself. (*Lectures, &c. p.* 289.)

"Upon the removal of a piece of bone by means of the trephine; if the operation has been performed over the part where the disease is situated, and the extravasation be of the fluid kind, and between the cranium and dura mater; such fluid, whether it be blood, water, or both, is immediately seen, and is partly discharged by such opening; if, on the other hand, the extravasation be of blood in a coagulated or grumous state, it is either loose or in some degree adherent to dura mater; if the former of these be the case, it is either totally or partially discharged at the time of, or soon after, the operation, according to the quantity or extent of the mischief; if the latter, the perforation discovers, but does not immediately discharge it." Mr. Pott then lays it down as a rule, that a large extravasation must necessarily require a more free removal of bone than a small one; and a grumous or coagulated extravasation, a still more free use of the instrument.

In the treatment of pressure from extravasation, Sir Astley Cooper joins the generality of surgeons in recommending free depletion, in order to prevent inflammation; the bowels, he says, are to be opened and the patient kept very quiet: "If there be a bruise, indicating the spot, at which the injury has been sustained, you may trephine, *after every other means has been tried ineffectually*. If a fracture exists, and the symptoms do not yield to depletion, you will trephine to seek the extravasation." (*Lectures*, *p.* 288.)

All cases of pressure on the brain are attended with hazard of inflammation of this organ, and its membranes. The danger must be averted as much as possible, by applying cold washes to the head, and employing free and repeated bleeding, leeches, antimonials, saline purgatives, and other antiphlogistic means. After the depleting method has been continued some time, blisters may be applied to the head, and the cold wash omitted.

CONCUSSION, OR COMMOTION OF THE BRAIN.

It is observed by Mr. Pott, that "very alarming symptoms, followed sometimes by the most fatal consequences, are found to attend great violence offered to the head; and, upon the strictest examination both of the living and the dead, neither fissure, fracture, nor extravasation of any kind can be discovered. The same symptoms, and the same event, are met with, when the head has received no injury at all *ab externo*, but has only been violently shaken; nay, when only the body, or general frame, has seemed to have sustained the whole violence." And he afterwards remarks, that "the symptoms attending a concussion are generally in proportion to the degree of violence, which the brain itself has sustained, and which, indeed, is cognizable only by the symptoms. If the concussion be very great, all sense and power of motion are immediately abolished, and death follows soon; but, between this degree, and that slight confusion (or stunning, as it is called) which attends most violences, done to the head, there are many stages." But, besides the foregoing description of concussion, which seems rather to consist in a lesion of function, than in any visible disorganization, Sir Astley Cooper has found the more violent degrees of it attended with laceration of the brain, and slight extravasation. (*Lectures*, *&c. p.* 262.) The latter, however, are rather to be considered as compound cases, than as instances of pure concussion.

Mr. Abernethy, I think, has removed a good deal of the perplexity of this subject by dividing concussion into three stages. In fact, without discriminating them, the various descriptions of the symptoms, as given by different writers, cannot be at all reconciled.

"The *first* is, that state of insensibility and derangement of the bodily powers, which immediately succeeds the accident. While it lasts, the patient scarcely feels any injury that may be inflicted on him. His breathing is difficult, but in general without stertor; his pulse intermits, and his extremities are cold. But such a state cannot last long; it goes off gradually, and is succeeded by another, which I consider as the *second* stage of concussion. In this, the pulse and respiration become better, and, though not regularly performed, are sufficient to maintain life, and to diffuse warmth over the extreme parts of the body. The feeling of the patient is now so far restored, that he is sensible if his skin be pinched: but he lies stupid and inattentive to slight external impressions. As the effects of concussion diminish, he becomes capable of replying to questions put to him in a loud tone of voice, especially when they refer to his chief suffering at the time, as pain in the head, &c.; otherwise, he answers incoherently, and as if his attention was occupied by something else. As long as the stupor remains, the inflammation of the brain seems to be moderate; but as the former abates, the latter seldom fails to increase; and this constitutes the *third* stage, which is the most important of the series of effects proceeding from concussion.

"These several stages vary considerably in their degree and duration; but more or less of each will be found to take place in every instance where the brain has been violently shaken. Whether they bear any certain proportion to each other or not, I do not know. Indeed, this will depend upon such a variety of circumstances in the constitution, the injury, and the after-treatment, that it must be difficult to determine.

"With regard to the treatment of concussion, it would appear, that in the first stage very little can be done; and, perhaps, what little is done, had better be omitted, as the brain and nerves are probably insensible to any stimulants that can be employed. From a loose, and, I think, fallacious analogy between the insensibility in fainting, and that which occurs in concussion, the more powerful stimulants, such as wine, brandy, and volatile alkali, are commonly had recourse to, as soon as the patient can be got to swallow. The same reasoning which led to the employment of these remedies in the *first* stage, in order to recall sensibility, has given a kind of sanction to their repetition in the *second*, with a view to continue and increase it.

"But here the practice becomes more pernicious and less defensible. The circumstance of the brain having so far recovered its powers, as to carry on the animal functions in a degree sufficient to maintain life, is surely a strong argument, that it will continue to do so, without the aid of means which probably tend to exhaust parts already weakened, by the violent action they induce.

"And it seems probable, that these stimulating liquors will aggravate that inflammation which must sooner or later ensue." (*Essay on Injuries of the Head*, *p.* 59.)

In most cases of concussion, the patient vomits after the accident. In the beginning, a torpor exists in the intestinal canal, and considerable difficulty in procuring an evacuation; but afterwards, the feces are sometimes involuntarily discharged; and the bladder becomes distended, so as to require the catheter; but after a time, the urine also comes away involuntarily. There is sometimes bleeding at the nose, and a part of the blood which drops into the throat, is vomited up. The pupils of the eyes are generally natural; but, if changed, both are a little dilated, or sometimes only one. According to Sir Astley Cooper, the pulse, although natural, when the patient is undisturbed, scarcely ever fails to be quickened by any exertion made by the patient to rise: and the carotids sometime pulsate with great force; but, the latter symptom is generally not noticed till after a few hours. The mind, as this experienced surgeon remarks, is variously affected, according to the degree of injury, which the patient has sustained. In some cases, there is a total loss of mental power; in others, the patient is capable, though with difficulty, of being roused to make a rational answer, but immediately sinks again into coma. Sometimes the memory is lost, while, in other instances, it is only partially impaired. A total forgetfulness of any foreign language is a common effect of concussion. It frequently happens, that the patient, when roused, will be perfectly sensible, and answer questions rationally; but, if left undisturbed, the mind appears to be occupied by some particular circumstance, (often an incoherent one,) of which he is constantly talking. Patients recollect nothing about the mode, in which their accidents took place. If the injury has been occasioned by a fall from a horse, they can only remember mounting and riding to some distance, but not that the animal ran away, or threw them; nor, however, perfectly they may recover in other respects, do they ever have any recollection of the kind of accident. The change, produced by injuries of the brain, is remarked to be somewhat similar to the effects of age; the patient loses impressions of a recent date, and is sensible of those which he received in his earlier years. But, as Sir Astley correctly explains, the degree of injury sustained by the brain varies considerably in different cases. Some patients are only stunned, or deprived of sense for a moment; others recover in a few hours; some remain in a great degree insensible for fifteen or twenty days. Some recover entirely; others have afterwards an imperfect memory. A partial loss of sense will be produced in the function of one eye, or deafness in one ear; and so of volition, the squinting, caused by an injury of the brain, being sometimes permanent. In some cases, the degree of fatuity; in some, great irritability; in others, vertigo, and tendency to severe headache from the slightest excitement, will remain. In one example, seen by Sir Astley Cooper, a remarkable irritability of the stomach, and disposition to vomit, were the permanent consequences of a concussion of the brain. In particular instances, the faculty of readily uttering the proper words for expressing ideas is lost and never regained, and wrong terms are used. Often the judgment remains enfeebled. (*Lectures*, *Vol.* 1, *p.* 254, &c.) Many of the observations in the foregoing statement, coincide with the accounts given of the subject in the writings of Bichat and Desault.

The following passage, extracted from a writer, who has already been of material assistance to us on this subject, cannot be too deeply impressed on the memory of every surgical practitioner.

" To distinguish between an extravasation and commotion, by the symptoms only, is frequently a very difficult matter, sometimes an impossible one. The similarity of the effects in some cases, and the very small space of time which may intervene between the going off of the one and accession of the other, render this a very nice exercise of the judgment. The first stunning or deprivation of sense, whether total or partial, may be from either, and no man can tell from which; but when these first symptoms have been removed, or have spontaneously disappeared; if such patient is again oppressed with drowsiness, or stupidity, or total or partial loss of sense, it then becomes most probable, that the first complaints were from commotion, and that the latter are from extravasation; and the greater the distance of time between the two, the greater is the probability not only that an extravasation is the cause, but that the extravasation is of the limpid kind, made gradatim, and within the brain. (*Pott.*)

" When there is no reason to apprehend any other injury, and commotion seems to be the sole disease, plentiful evacuation by phlebotomy and lenient cathartics, a dark room, the most perfect quietude, and a very low regimen, are the only means in our power: and are sometimes successful." (*Pott.*) When the patient is at all sensible, every thing likely to irritate the mind is to be avoided. (*A. Cooper, Lectures, &c. p.* 279, *Vol.* 1.)

With these means should also be associated the constant application to the head of cloths dipped in very cold water, or Schmucker's frigorific lotion. When the effects of the violence are not necessarily fatal in a very short time after the accident, the great danger, which is to be guarded against, is certainly inflammation of the brain. Hence the necessity of freely employing the lancet, and antiphlogistic means. The discrimination, which Mr. Abernethy introduced into the views of the present subject, by his division of concussion into three stages, has led also to more rational and successful practice. For, though bleeding is now generally allowed to be the great means of relief in concussion, it is not rashly practised at the beginning of many cases, when the pulse can hardly be felt, when the circulation scarcely goes on, and every action in the system is nearly annihilated. But the state of the pulse and circulation is closely watched, and the surgeon bleeds in sufficient time and quantity, and often enough, to prevent that immoderate frequency and hardness, which the pulse always has a tendency in these cases to assume immediately the first shock of the accident begins to abate. " Bleeding," as Sir Astley Cooper correctly notices, " may be carried to excess. You must, in the repetition of bleeding, regulate your conduct by the symptoms; observe, whether there be any hardness in your patient's pulse, and whether he complains of pain in the head, if he have still the power of complaining. Watch your patient with the greatest possible anxiety; visit him at least three times a day: and, if you find any hardness of the pulse supervening, after the first copious bleeding, take away a tea-cup full of blood; but, do not go on bleeding him largely; for you would, by this means, reduce the strength too much, and prevent the reparative process of nature." Sir Astley admits, however, that it is frequently necessary to take away blood after the first bleeding; but he directs this to be generally done in small quantities. He acknowledges, also, that it is sometimes necessary to take away large quantities in repeated bleedings. (*P.* 271.) The recovery of many cases, which have fallen under my own observation, I have imputed to the frequent and even copious abstraction of blood, by means of the lancet, leeches, and cupping; at the same time, I know, that this practice is often carried beyond all moderation, without due attention to those circumstances, which I have mentioned as the proper guide.

With respect to emetics, I have no confidence myself in their usefulness in cases of concussion, and much doubt even their safety, especially when the disorder is complicated with extravasation, (*A. Cooper, Lectures, &c. Vol.* 1, *p.* 276.) a point, often incapable of positive decision.

Purgative and antimonial medicines should be prescribed. Blisters on the head and nape of the neck are of use after bleeding has been duly practised, and the bowels emptied.

As bleeding from the arm cannot be employed in young children, Sir A. Cooper recommends the exhibition of calomel, with acescent drinks so as to purge them; and leeches, or opening the jugular vein.

For the relief of certain symptoms, frequently remaining after concussion, as pain in the head, giddiness, diminution of sight, and deafness, Sir A. Cooper directs the head to be washed with spirit of wine and water, or the use of the shower-bath. Sometimes he orders the ung. canthar. to be rubbed on the head, and pil. hydrarg. and extr. colocynth. to be given. In cases of nervous debility of an organ, electricity is sometimes useful; and occasionally, in long-continued pains of the head, he forms an issue in the scalp, benefit sometimes resulting even from slight exfoliations. (*Lectures, Vol.* 1, *p.* 280.) These measures are infinitely more prudent, than the old custom of trephining.

I cannot conclude this article without adverting to the great propensity to relapse, after patients have long appeared out of every danger from wounds of the head, the bad symptoms sometimes coming on again, and proving fatal, many years after the original injury, as is exemplified in a case related in a work of high character. (See *Schmucker's Vermischte Schriften. B.* 1, *p.* 247.)

Hippocrates, de Capitis Vulneribus, 12*mo. Lutetiæ,* 1578. *Jac. Berengarius, de Fracturâ Cranii, Bologna,* 1513. *James Yonge, Wounds of the Brain proved curable, not only by the opinion and experience of many of the best authors, but the remarkable history of a child cured of two very large depressions, with the loss of a great part of the skull; a portion of the brain also issuing through a penetrating wound of the dura and pia mater.* 12*mo. Lond.* 1682. *J. J. Wepfer, Observationes Medico-practicæ de Affectibus Capitis internis et externis, Scaphusii,* 1727. *Murray, An post gravem ab ictu vel casu capitis percussionem, non juvante etiam iterata terebratione, dura meninx incisione aperienda? Lutet. Paris,* 1736. (*Haller, Disp. Chir.* 1, 97.) *R. C. Wagner, De Contrafissura, Jenæ,* 1708. (*Haller, Disp. Chir.* 1, 15.) *J. C. Teubeler, De Vulneribus Cerebri non semper lethalibus, Halæ,* 1760. *J. Chr. Camerarius Diss. Inaug. exhibens rarissimam sanationem Cerebri quassati cum notabili substantiæ deperditione, Tubing,* 1719. *Alex. Camerarius et Th. Fr. Faber De Apostemate Piæ Matris, Tubing.* 1722. *J. A. Conradi, De Vulnere fronti inflicto, Lugd.* 1722. *M. E. Boretius, et J. G. Arnoldt, De Epilepsia ex Depresso Cranio, Regiomont,* 1724. *G. A. Langguth, Programma de Sinus, Frontalis Vulnere sine terebratione curando, Wittemb.* 1748. *Chopart, Mémoire sur les lésions de la Tête par contrecoup,* 8*vo. Paris,* 1771. *J. La Fosse, De Cerebri Affectibus a causis externis evidentibus, Monsp.* 1763. *A. J. Van Hulst, De Cerebri ejusque membranarum inflammatione et suppuratione occulta, Ghidlenop,* 1784. *P. J. Primelius, De Utilitate Incisionis integumentorum Capitis in Læsionibus Capitis, &c. Aelthre,* 1788. *Bordenave, in Mém. de l'Acad. de Chirurgie, T.* 2; *Le Dran, Traité des Opérations de Chirurgie. J. L. Petit, Traité des Mal. Chir. T.* 1. *Dease, Obs. on Wounds of the Head,* 8*vo. Lond.* 1776. *Pott on Injuries of the Head from External Violence; Hill's Cases in Surgery; O'Halloran on the different Disorders arising from External Injuries of the Head,* 8*vo. Dublin,* 1793. *Some Cases in Desault's Parisian Chirurgical Journal; Mémoire sur les Plaies de Tête, in Œuvres Chir. de Desault, par Bichat, T.* 2; *Lassus, Pathologie Chirurgicale, T.* 2, *p.* 252, *&c. Edit.* 1809. *Schmucker's Wahrnehmungen, B.* 1; *and Vermischte Chir. Schriften, B.* 1 *and* 3, 8*vo. Berlin,* 1785. *Richerand, Nosographie Chir. T.* 2, *p.* 230 *et seq. Edit.* 4. *J. Abernethy, on Injuries of the Head, in his Surgical Works, Vol.* 2, *Ed.* 1811; *Larrey, in Mém. de Chir. Militaire, T.* 2, 3, *et* 4, 8*vo. Paris,* 1812—1817; *Dr. Hennen, Principles of Military Surgery, Ed.* 2, 8*vo. Edinb.* 1820. *The three last works, and those of Le Dran, Petit, Desault and Bichat, Dease, O'Halloran, Pott, and Schmucker, deserve particular attention. Also Dr. J. Thomson's Report of Observations made in the military hospitals in Belgium; Edinb.* 1816. *Sir Astley Cooper, Lectures on the Principles, &c. of Surgery, Vol.* 1, 1824. *See also the article Trephine.*

HEMERALOPIA. According to M. Dujardin, this term is derived from ἡμέρα, the day, ἀλαος, blind, and ὤψ, the eye, and its right signification is therefore inferred to be *diurna cæcitudo,* or *day-blindness.* (See *Journal de Méd. T.* 19, *p.* 348.) In the same sense, Dr. Hillary (*Obs. on the Diseases of Barbadoes, p.* 298. *Edit.* 2.), and Dr. Heberden (*Med. Trans. Vol.* 1, *Art.* 5.), have employed the term.

Hemeralopia then, which is of very rare occurrence, stands in opposition to the *nyctalopia* of the ancients, or *night-blindness.* Numerous modern writers, however, have used these terms in the contrary sense; considering the hemeralopia, as denoting sight during the day, and blindness in the night; and nyctalopia as expressing night-seeing, owl-sight, as the French call it, and blindness during the day-time.

Hemeralopia, in the meaning of day-blindness, is a very uncommon affection. Dr. Hillary never met with but two examples. He mentions a report, however, that there are a people in Siam, in the East Indies, and also in Africa, who are subject to the disease of being blind in the day-time, and seeing well by night. (*Mod. Univ. Hist. Vol.* 7.)

According to Sauvages, hemeralopia, (in his nomenclature called *amblyopia crepuscularis*) was in some degree epidemic in the neighbourhood of Montpellier, in the villages in damp situations, adjoining rivers, and it particularly affected the soldiers, who slept in the open damp air. They were cured, he says, by blistering, together with emetics and cathartics, and other evacuants. (*Nosol. Method. Class* 6, *Gen.* 3, *Spec.* 1.)

See some ingenious observations on the subject in *Dr. Rees's Cyclopædia, Art. Hemeralopia*, and by Mr. Bampfield, in *Med. Chir. Trans. Vol.* 5, *p.* 34, *&c.*

Scarpa, with the generality of modern writers, has considered hemeralopia as an affection, in which the patient sees very well in the day, but not in the night-time.

The abolition of eye-sight by night (observes Mr. Bampfield) has occurred in all ages, and is a common disease of seamen in the East and West Indies, Mediterranean, and in all hot and tropical countries and latitudes, and affects more or less the natives likewise of those regions of the globe. It also occurs frequently among soldiers in the East and West Indies; but, he has been informed, that it is by no means so prevalent amongst them as sailors. It is not an uncommon complaint of the Lascars, employed in the East India Company's ships, trading between India and Europe. It has very rarely indeed affected the officers of his Majesty's, or of the East India Company's ships. Celsus has remarked, that women and virgins, whose menstrual returns are regular, are exempt from this disease (*lib.* 6, *cap.* 6.), and it may be observed, that the inhabitants of cold latitudes are less subject to hemeralopia in their own climate, than the natives of tropical countries are in theirs; but, more so, when they visit the tropics. (*Med. Chir. Trans. Vol.* 5, *p.* 38.)

" *Hemeralopia*, or *nocturnal blindness* (says Scarpa), is properly nothing but a kind of imperfect periodical amaurosis, most commonly sympathetic with the stomach. Its paroxysms come on towards the evening, and disappear in the morning. The disease is endemic in some countries, and epidemic, at certain seasons of the year, in others.

" At sunset, objects appear to persons affected with the complaint, as if covered with an ash-coloured veil, which gradually changes into a dense cloud, which intervenes between the eyes, and surrounding objects. Patients with hemeralopia have the pupil, both in the day and night-time, more dilated, and less moveable, than it usually is in healthy eyes. The majority of them, however, have the pupil more or less moveable in the day-time, and always expanded and motionless at night. When brought into a room faintly lighted by a candle, where all the by-standers can see tolerably well, they cannot discern at all, or in a very feeble manner, scarcely any one object: or they only find themselves able to distinguish light from darkness: and at moonlight their sight is still worse. At day-break they recover their sight, which continues perfect all the rest of the day, till sunset." (*Cap.* 19, *p.* 322, *Edit. 8vo.*)

According to Mr. Bampfield, the disease always affects both eyes at the same time. " In general, (says this gentleman) the nocturnal blindness is at first partial, the patient is enabled to see objects a short time after sunset, and perhaps will be able to see a little by clear moonlight. At this period of the complaint, he is capable of seeing distinctly by bright candlelight. The nocturnal sight, however, becomes daily more impaired and imperfect, and, after a few days, the patient is unable to discriminate the largest objects after sunset, or by moonlight, &c.; and, finally, after a longer lapse of time, he cannot perceive any object distinctly by the brightest candlelight. If the patient is permitted to remain in this state of disease, the sight will become weak by daylight, the rays of the sun will be too powerful to be endured, whether they are direct, or reflected; lippitude is sometimes induced; myopism, or shortness of sight, succeeds; and, in progress of time, vision becomes so impaired and imperfect, that apprehensions of a total loss of sight are entertained; and this dreadful consequence has been known to ensue, where the complaint has been totally neglected, or left to nature, or where ineffectual remedies have been employed." (*Bontius*, *p.* 73.)

" It has been remarked by some, that the patients are capable of seeing distinctly, at all periods of the complaint, with the aid of a strong artificial light; but, in *bad* cases of hemeralopia, in my practice, the patients positively denied the existence of the sense of distinct sight by very clear candlelight." (*Bampfield in Medico-Chir. Trans. Vol.* 5, *p.* 39, 40.)

The duration of the disease, when left to itself, is generally from two weeks to three, or six months. Experience has not proved, that the disposition to the complaint depends upon any particular colour of the iris, as several writers have conjectured; nor upon the largeness of the eyes, as alleged by Hippocrates. (*Lib.* 6, *sec.* 7.)

In idiopathic cases, the health does not in general suffer, and, except in the worst stage, the eye is not altered in appearance. But, in cases of long duration, the pupil, according to Mr. Bampfield, " is often contracted, and the eyes and actions of the patient evince marks of painful irritation, if the eyes are exposed to a vivid light; or if he looks upward. But, if they meet the direct rays of the sun, which in the tropics are always powerful, or a strong glaring reflection of them, pain and temporary blindness are induced, from which the patient recovers, by closing his eyelids for a time to exclude the rays of light, and retiring to the shade. The pupil of the eye is considerably dilated, both by day and night, in the proportion of about one case in twelve, and at night the pupil is often dilated, and does not perform its expansions and contractions, when exposed to the moon, or artificial light. The cases, attended with dilated pupil, were generally those of long duration, &c.

"Europeans, who have been once affected with hemeralopia, in tropical climates, are particularly liable to a recurrence of this disease, as long as they remain in them." (*Bampfield, op. cit. p.* 42, 43.)

In two examples, described by Dr. Andrew Smith, the pupils were observed to contract and dilate regularly in the day-time, according to the quantity of light; but, after sunset, they seemed a little more dilated, than natural, and contracted but sluggishly upon exposure to light, while the eyes themselves seemed devoid of their usual energy and vivacity. (See *Edinb. Med. and Surgical Journ. No.* 74, *p.* 22.)

The remote causes of idiopathic hemeralopia are not well ascertained. Sleeping with the face exposed to the brilliancy of daylight, the vivid reflection of the sun's rays from the sandy shores of hot countries, and bright moonlight, have been enumerated as causes. Dr. Pye thinks the disorder intermittent. (*Med. Obs. and Inquiries, Vol.* 1, *art.* 13.) But, as Mr. Bampfield properly observes, though the complaint is certainly periodical, there is nothing in its character tending to prove, that it is influenced by the same causes as intermittent fever. The latter gentleman conjectures, "that too much light suddenly transmitted to the retina, or for a long period acting on it, may afterwards render it unsusceptible of being stimulated to action, by the weaker, or smaller quantities of light, transmitted to it by night." (*P.* 44.) The same sentiment is adopted by Dr. Smith. (*Edinb. Med. Journ. No.* 74, *p.* 23.) Amongst other objections to this explanation, however, it might be remarked, that the patients do not always see, though the light be good; and Mr. Bampfield's own "patients positively denied the existence of distinct sight by very clear candlelight." Besides, if the disease were entirely caused by the sudden, or long operation of vivid light, one would conclude, that all persons subjected to that cause, ought to have the effect produced, which is far from being the case.

When the tongue is white, and the patient has headach and bilious complaints, M. Lassus thinks the cause of the disease is in the stomach and primæ viæ. The same author likewise states, that hemeralopia attacks debilitated persons, subject to catarrhal affections, residing in damp situations, and living on indigestible food. From the combination of such causes, (says he) the disorder was epidemic in the vicinity of Montpellier (*Sauvage, Nosolog. Method. T.* 2, *p,* 732); at Belle-Isle sur Mer (*Recueil d'Observ. de Médecine des Hôpitaux Militaires, par Richard, T.* 2, *p.* 573); and hence, it is endemic in watery situations, where the nights are cold and damp. They who expose themselves to this humidity, (says M. Lassus), or who navigate along the eastern coasts of Africa, who traverse the Mozambic canal, or sail along the coasts of Malabar and Coromandel, are sometimes attacked by it. (See *Pathologie Chir. T.* 2, *p.* 542, 543.) Hemeralopia sometimes occurs as a symptom of the scurvy. This fact was noticed by Mr. Telford, in Sir G. Blane's Treatise on Diseases of Seamen, and it is likewise confirmed by Mr. Bampfield, who remarks that hemeralopia should be referred to the same causes as scurvy, "when the subject of it has for a long period subsisted on a salted diet at sea, &c. and if any other scorbutic symptom be present, such as spongy gums, ecchymoses, saline smell of the secretions, ulcers, with liver-like fungus, &c." (*Medico-Chir. Trans. Vol.* 5, *p.* 45.)

This disease (according to Scarpa) may commonly be completely cured, and oftentimes in a very short time, by treating it on the same plan by which the imperfect amaurosis is remedied; (see *Amaurosis;*) viz. by employing emetics, the resolvent powders, and pills and a blister on nape of the neck; and topically, the vapours of ammonia: lastly, by prescribing towards the end of the treatment, bark conjoined with valerian. In cases, in which the disease has been preceded by plethora, and suppressed perspiration, bleeding and sudorifics are also indicated. (*Cap.* 19, *p.* 322, 333.)

Scarpa supports this statement by the relation of three cases, in which he cured the disease by such treatment. These patients were all unhealthy, and evidently labouring under disorder of the gastric organs.

One hundred cases, however, of idiopathic, and two hundred of symptomatic hemeralopia, occurred in the practice of Mr. Bampfield, in different parts of the globe, but chiefly in the East Indies. All these cases perfectly recovered: and hence, we may infer, that, under proper treatment, a favourable prognosis may always be given.

Celsus has stated, that persons who have been for some time affected with amaurosis, have regained their sight on being attacked by a diarrhœa. This seems to Scarpa to be corroborated by the case, related by Dr. Pye. (*Med. Obs. and Inq. Vol.* 1.) Scarpa entertains no doubt, that, many similar facts, showing the influence of what he terms morbific gastric stimuli over the organ of sight might be found in the records of medicine, and proving the great utility of a spontaneous looseness of the bowels in the cure of imperfect amaurosis.

But, says Scarpa, even if such examples of incomplete amaurosis being dissipated in consequence of spontaneous vomiting, or copious evacuations from the bowels, produced entirely by nature, were rare, and noticed by few, we now have many cases evincing the successful cure of this disease by means of such evacuations, artificially produced by emetics, and purgative medicines. Of this, the accurate observations of Schmucker and Richter furnish us with numerous satisfactory proofs, and, it is added, that our confidence in the above method of curing the imperfect and periodical amaurosis, must increase, when we take notice, that the most respectable practitioners of past times, have, in the majority of cases, cured this disease only by means of emetics, and opening medicines, though, in their writings, they may have imputed the success of the treatment to other causes, or the efficacy of other remedies, which were also prescribed.

Scarpa, after several valuable remarks on amaurosis in general, refers to the *Mercure de*

France, for February, 1756, where there is an account of the cures performed by Fournier, by means of bleeding and emetics.

Night-blindness is sometimes congenital, and therefore constitutional, and altogether beyond the reach of any curative measure. It is said sometimes to be hereditary, and the writer of the article *Nyctalopia* in Dr. Rees's Cyclopædia was acquainted with an instance, in which it occurred to two children of the same family. A case of congenital nyctalopia, which had continued many years without change, and independently of any disease, is related by Dr. Parham. (See *Med. Obs. and Inquiries*, *Vol.* 1, *p.* 122, *note.*)

Pellier (*Recueil de Mém. et Obs. sur l'Œil. Obs.* 132.) cured hemeralopia by repeated doses of tartar-emetic, a seton in the nape of the neck, and cooling, aperient beverages.

The method of treatment, which Mr. Bampfield adopted, is certainly quite simple. "A succession of blisters to the temples (says he) of the size of a crown, or half crown piece, applied tolerably close to the external canthus of the eye, has succeeded in every case of idiopathic hemeralopia, which I have seen, &c. The first application of blisters commonly enables the patient to see dimly by candlelight, or perceive objects, without the power of discriminating what they are. In some slight cases, that admitted of easy cure, the first application has succeeded perfectly. The second application of blisters commonly enables the patient to see by candlelight distinctly, perhaps by bright moonlight, and even half an hour after sunset, or the sight is restored for short periods during the night, and is again abolished. The second application very often effects a perfect recovery. The third, fourth, or fifth applications in succession, generally produce a complete recovery, where the first, or second have failed; but, some rare instances of very obstinate hemeralopia have required even ten successive blisters to each temple; or, instead of using them in succession, a perpetual vesicatory has been formed on each temple, and maintained until a cure has been accomplished, an event, which has generally followed in a fortnight." (*Bampfield in Medico-Chir. Trans. Vol.* 5, *p.* 47, 48.) In some cases, shades over the eyes were worn during the treatment, and a certain time after the cure. The patients were also often directed to bathe their eyes with cold water two or three times a day.

Mr. Bampfield also knew of instances, in which electricity was successfully employed, as a topical stimulus to the eye. He also informs us, that a spontaneous cure sometimes followed the eruption of boils on the head, or face, or the formation of abscesses on these parts, or in the ears.

Although blisters will generally effect a cure, there were particular cases in which Mr. Bampfield administered cathartics, such as calomel and the neutral salts. In these examples, the patient had bilious complaints, indicated by a yellow state of the tongue and skin, headach and pain about the præcordia; or symptoms of indigestion, white tongue, loss of appetite, pain and flatulence of the stomach, &c.

The patients treated by Dr. Smith, were put into a ward moderately lighted, and their bowels emptied by a gentle cathartic. A blister was then applied to each temple, and kept open with savine cerate. A little of a solution of the oxymuriate of mercury, in the proportion of two grains to an ounce of water, was dropped into the eyes twice a day. The purgatives were repeated on the third day, and the quantity of light, to which the patients were exposed, was afterwards gradually increased. (See *Edinb. Med. Journ. No.* 74, *p.* 24.)

In the scorbutic hemeralopia, the application of blisters is to be deferred, until the state of the constitution is amended, by giving lemon and lime juice, and fresh animal and vegetable food; because the hemeralopia often gradually ceases, as the scurvy is cured; and before this last event, the blister might produce a scorbutic ulcer. Mr. Bampfield estimates, that about one-third of the cases of scorbutic hemeralopia resist the efficacy of the antiscorbutic regimen and medicines; and consequently must ultimately be treated as idiopathic cases.

The frequent recurrence of this disease during the patient's continuance in a tropical, or hot climate, naturally suggests the propriety of recommending him to return to his native climate, by which change the tendency to a relapse is in general completely removed. (*Bampfield, in Medico-Chir. Trans. Vol.* 5, *p.* 53.)

Consult *Celsus de re Medica, Cap.* 6, *lib.* 6. *Galeni Op. Lib. de Oculis, pars* 4, *cap.* 11. 22. *Ætii Sermo Septimus, cap.* 48-52-46. *Paul. Æginæ, Lib.* 3, *cap.* 48. *Actuarius, De Method. Med. lib.* 4, *cap.* 11. *Rhases, De Ægritud. Ocul. cap.* 4. *Avicenna, Lib.* 3, *fen.* 3, *tractat.* 4. *Fabricii Hildani, Centur.* 1, *Obs.* 24; *centur.* 5, *obs.* 13. *Platner, Praxis, Med. C. A. Bergen et J. C. Weise, De Nyctalopia seu Cæcitate Nocturna; Haller, Disp. ad Morb. &c.* 359. *Journal de Médecine, et de Chirurgie ann.* 1756, *T.* 4. *Medical Observations and Inquiries, Vol.* 1. *Recueil d'Observations de Médecine des Hôpitaux Militaires, par Richard, T.* 2. *Duport, Mémoire sur la Goutte Sereine Nocturne épidémique, ou Nyctalopie. Observations on Tropical Nyctalopia by Mr. J. Forbes, in Edinb. Medical and Surgical Journal, No.* 28, *p.* 417, *et seq. Richter's Anfangsgrunde der Wundarzneykunst, B.* 3, *p.* 483, *et seq. Schmucker's Chirurgische Schriften, Band* 2. *Saggio di Osservazioni e d'Esperienze Sulle Principali Malattie degli Occhi di Antonio Scarpa, p.* 322, *et seq. Edit.* 8vo. *Venezia,* 1802. *Lassus Pathologie Chirurgicale, T.* 2, *p.* 539, *Edit.* 2. *Rees's Cyclopædia, art. Nyctalopia. A Practical Essay on Hemeralopia, or Night-blindness commonly called Nyctalopia, by R. W. Bampfield, in Medico-Chirurgical Trans. Vol.* 5, *p.* 32, *et seq. A. Simpson on Hemeralopia,* 8vo. *Glasgow,* 1819; *C. H. Weller, A Manual of the Diseases of the Eye, transl. by Dr. Monteath; Vol.* 2, *p.* 142, 8vo. *Glasgow,* 1821; *Dr. A. Smith, in Edinb. Med. and Surgical Journ. No.* 74.

HEMIOPIA. (from ἥμισυς, half, and ὤψ, the eye.) A certain disorder of the eye, in which the patient cannot see the whole of any object, which he is looking at, but only a part of it. Sometimes, he sees the middle, but not the circumference, sometimes the circumference, but not the centre; while, on other occasions, it is only the upper, or lower half, which is discerned. Sometimes objects are seen thus imperfectly, whether distant, or near; sometimes, only when they are near, and not at a great distance.

The causes of hemiopia are divided by Richter into four kinds.

To the first belong opacities of the cornea and crystalline lens, especially, such as destroy the transparency of only a certain portion of these parts.

The cure of this species of hemiopia depends upon the removal of the partial opacity from which it originates. (See *Cataract*, and *Cornea, Opacities of.*)

Under certain circumstances, persons, whose upper eye-lid cannot be properly raised, are affected with hemiopia. They can only discern the lower half of an object, which is near and of large size, unless they go farther from it, draw their heads backward, or turn their eyes downward. The pupil, in particular instances, becomes drawn away from the middle of the iris. This may also be a cause of hemiopia: it is a case, that does not admit of a cure. The affection may likewise proceed from a separation of the iris from the margin of the cornea by external violence, or other causes. Here the cure is equally impracticable.

The foregoing species of hemiopia are merely effects of other diseases. The fourth and last kind is the most important, being generally regarded as an independent disorder. Sometimes, it appears rather to be the effect of a sudden and transient iritation, producing a morbid sensibility in the optic nerve.

The causes of this sort of case, if we can credit Richter, are mostly seated in the abdominal viscera. When the affection is more durable, forming what has been termed *amaurosis dimidiata*, the same treatment is indicated, as in *Amaurosis*, in which, indeed, it often terminates. (*Richter*, *Anfansgr. der Wundarzn. B.* 3, *Kap.* 17.)

HEMORRHAGE. (from αἱμα, blood, and ῥηγνυμι, to break out.) *Bleeding.*

This is doubtless one of the most important subjects in Surgery. The fear of hemorrhage retarded the improvement of our profession for ages: the ancients, ignorant how to stop bleeding, were afraid to cut out the most trivial tumor, or they did so with terror. They generally performed slowly and imperfectly, by means of burning irons, or ligatures, the same operations, which the moderns execute quickly and safely with a knife. If the old surgeons ventured to amputate a limb, they only did so, after it had mortified, by dividing the dead parts, and so great was their apprehension of hemorrhage, that they only dared to cut parts which could no longer bleed. (*John Bell's Principles of Surgery, Vol.* 1, *p.* 142.) But not only as a consequence of surgery, is hemorrhage to be feared; it is also one of the most alarming accidents, which surgery is called upon to relieve. "*Un sentiment naturel attache à l'idée de perdre son sang; un terreur machinale, dont l'enfant qui commence à parler, et l'homme le plus décidé, sont également susceptibles. On ne peut point dire, que cette peur soit chimérique. Si l'on comptoit ceux, qui perdent la vie dans une bataille, on verroit, que les trois quarts ont péri par quelque hemorrhagie; et dans les grandes opérations de chirurgie cet accident est presque toujours le plus formidable.*" (*Morand. Mém. de l'Acad. Royale de Chirurgie, Vol.* 5. 8*vo.*)

As the blood circulates in the arteries with much greater impetus and rapidity, than in the veins, it necessarily follows, that their wounds are generally attended with much more hemorrhage, than those of the latter vessels, and that such hemorrhage is more difficult to suppress. However, as the blood also flows through veins, of great magnitude, with great velocity, bleedings from them are frequently highly dangerous, and sometimes unavoidably fatal. When an artery is wounded, the blood is of a bright scarlet colour, and gushes from the vessel *per saltum*, in a very rapid manner. The blood issues from a vein in an even unbroken stream, and is of a dark purple red colour. It is of great practical use to remember these distinguishing differences, between arterial and venous hemorrhage, because, though in both cases the oozing of blood may be equal in quantity, yet, in the latter instance, the surgeon is often justified in bringing the sides of a wound together, without taking farther means to suppress the bleeding, while it would not be proper to adopt the same conduct, were there an equal discharge of arterial blood.

Dr. Jones has favoured the world with a matchless work on the present subject; and as one grand object of this Dictionary is to present a careful account of the principal modern improvements in surgical science, I shall first endeavour to make the reader acquainted with the more accurate doctrines first promulgated by this gentleman relative to the subject of hemorrhage. Afterwards, the surgical means, to be practised in different cases, will be considered.

The sides of the arteries are divisible into three coats. The *internal one* is extremely thin, and smooth. It is elastic, and firm, (considering its delicate structure) in the longitudinal direction, *but so weak in the circular as to be very easily torn by the slightest force applied in that direction.* Its diseases show, that it is vascular, and it is also probably sensible.

The *middle coat* is the thickest, and is composed of muscular fibres, all arranged in a circular manner; they differ, however, from common muscular fibres in being more elastic, by which they alone keep a dead artery open, and of a cylindrical form. As this middle coat has no longitudinal fibres, *the circular fibres are held together by a slender connexion, which yields readily to any force, applied in the circumference of the artery.*

The external coat is remarkable for its whiteness, density, and great elasticity. *When an artery is surrounded with a tight ligature, its middle and internal coats are as completely divided by it, as they could be by a knife, while the external coat remains entire.*

Besides these proper coats, all the arteries, in their natural situations, are connected, by means of fine cellular substance, with surrounding membranous sheaths. *If an artery be divided, the divided parts, owing to their elasticity, recede from each other, and the length of the cellular substance, connecting the artery with the sheath, admits of its retracting a certain way within the sheath.*

Another important fact is: *that when an artery is divided, its truncated extremities contract in a greater, or less degree, and the contraction is generally, if not always, permanent.*

Arteries are furnished with arteries, veins, absorbents, and nerves; *a structure, which makes them susceptible of every change to which living parts are subjected in common; enables them to inflame, when injured, and to pour out coagulating lymph, by which the injury is repaired, or the tube permanently closed.* (See *Jones on Hemorrhage.*)

Petit, the surgeon, in 1731, first endeavoured to explain the means, which nature employs for the suppression of hemorrhage. He thought that bleeding from a divided artery is stopped by the formation of a coagulum of blood, which is situated partly *within*, and partly *without* the vessel. The clot, he says, afterwards adheres to the inside of the artery, to its orifice, and to the suroundiug parts; and, he adds, that when hemorrhage is stopped by a ligature, a coagulum is formed above the ligature, which only differs in shape, from the one, which takes place when no ligature is employed. His opinion leads him to recommend compression for the support of the coagulum.

In 1736, Morand published additional interesting remarks. He allowed, that a coagulum had some effect in stopping hemorrhage; but, contended, that a corrugation, or plaiting, of the circular fibres of the artery which diminish its canal, and a shortening and consequent thickening of its *longitudinal ones*, which nearly rendered it impervious, had some share in the process. He thought that the cavity of an artery might be obliterated, by the puckering, or corrugation, when *circular pressure, like that of a ligature, is made.*

Morand erred chiefly in his mode of explanation, and in his belief in the existence of longitudinal fibres, which no modern anatomists admit; for, the *contraction*, and *retraction* of divided arteries are indisputable facts, and, as Dr. Jones remarks, this does not affect the truth of his general conclusion, *that the change, produced on a divided artery, contributes with the coagulum to stop the flow of blood.*

Mr. S. Sharp (*2d. Edit. of Operations of Surgery*, 1739,) supported the same doctrine. "The blood-vessels, immediately upon their division, bleed freely and continue bleeding, till they are either stopped by art, or at length contracting, and withdrawing themselves into the wound, their extremities are shut up by coagulated blood."

Pouteau (*Mélanges de Chirurgie*, 1760,) denied, that a coagulum is always found after an artery is divided; and when it is, he thought it only a feeble subsidiary means towards the suppression of hemorrhage. He contended that the retraction of the artery had not been demonstrated, and could not be more effectual, than a coagulum. His theory was, that the swelling of the cellular membrane, at the circumference of the cut extremity of the artery, forms the principal impediment to the flow of blood; and that a ligature is useful in promoting a more immediate and extensive induration of the cellular substance.

Gooch, White, Aikin, and Kirkland, all oppose Petit's doctrine of coagulum. The first blends some of Pouteau's theory with his own, by observing, that "when a small artery is totally divided, its retraction may bring it under the surrounding parts, and with the natural contraction of the diameter of its mouth, assisted by the compressive power of those parts, increased by their growing tumid, the efflux of blood may be stopped"

White was convinced, from what Gooch had suggested, and Kirkland confirmed, that the arteries, by their natural contraction, coalesce, as far as their first ramification.

Dr. Jones admits, that an artery contracts after it has been divided, and his experiments authorize him to say, that the contraction of an artery is an important means, but, certainly not the only, nor even the chief means, by which hemorrhage is stopped. When the artery is above a certain size, the impetuous flow of blood through the wound of the artery would resist the contraction of the vessel in such a degree, that the consequences would be fatal in almost every instance, were it not for the formation of coagulum. (*Jones.*)

Mr. J. Bell thinks, that, when hemorrhage stops of its own accord, it is neither from the retraction of an artery, nor the constriction of its fibres, nor the formation of clots, but by the cellular substance, which surrounds the artery, being injected with blood.

We must refer the reader to Dr. Jones's work for a complete exposure of the inconsistencies and absurdities in Mr. Bell's account of his own theory (See *P.* 25, *&c.*)

Dr. Jones concludes his criticisms on Mr. Bell with observing, that if this gentleman really mean to confine his doctrine of the natural means of suppressing hemorrhage to the injection of the cellular substance, round the artery, with blood, he dwells improperly on one of the attendant circumstances to the exclusion of the retraction and contraction of an artery, and the formation of a distinct clot, all primary parts of the process.

The blood, besides filling the cellular substance round the artery, also fills the cellular substance at the mouth of the artery in a particular manner; for the divided vessel, by its retraction within its cellular sheath, leaves a space of a determinate form, which, when all the circumstances necessary for the suppression of hemorrhage operate, is gradually filled up by a distinct clot. (*Jones.*)

MEANS OF NATURE IN STOPPING BLEEDING FROM DIVIDED ARTERIES.

Dr. Jones has given a faithful and accurate detail of a series of experiments on animals, which demonstrate "that the blood, the action, and even the structure of the arteries, their sheath, and the cellular substance connecting them with it," are concerned in stopping bleeding from a divided artery of moderate size, in the following manner: "An impetuous flow of blood, a sudden and forcible retraction of the artery within its sheath, and a slight contraction of its extremity, are the immediate, and almost simultaneous, effects of its division. The natural impulse, however, with which the blood is driven on, in some measure counteracts the retraction, and resists the contraction of the artery. The blood is effused into the cellular substance, between the artery and its sheath, and passing through that canal of the sheath, which had been formed by the retraction of the artery, flows freely externally, or is extravasated into the surrounding cellular membrane, in proportion to the open, or confined state of the wound. The retracting artery leaves the internal surface of the sheath uneven, by lacerating, or stretching the cellular fibres, that connected them. These fibres entangle the blood, as it flows, and thus the foundation is laid for the formation of a coagulum at the mouth of the artery, and which appears to be completed by the blood, as it passes through this canal of the sheath, gradually adhering and coagulating, around its internal surface, till it completely fills it up from the circumference to the centre." (*Jones, p.* 55.)

The effusion of blood into the surrounding cellular membrane, and between the artery and its sheath; but, in particular, the diminished force of the circulation from loss of blood, and the speedy coagulation of this fluid under these circumstances, most essentially contribute, says Dr. Jones, to the desirable effect.

It appears then, that a coagulum, which Dr. Jones calls the *external* one, situated at the mouth of the artery, and within its sheath, forms the first complete obstacle to the continuance of bleeding, and though it seems externally like a continuation of the artery, yet, on slitting open this vessel, its termination can be plainly observed, with the coagulum shutting up its mouth, and contained in its sheath.

No collateral branch being very near the impervious mouth of the artery, the blood just within it is at rest, and usually forms a slender conical coagulum, which neither fills up the canal of the artery, nor adheres to its sides, except by a small portion of the circumference of its base, near the extremity of the vessel. This coagulum is distinct from the former, and what Dr. Jones calls the *internal* one.

The cut end of the artery next inflames, and the vasa vasorum pour out lymph, which fills up the extremity of the artery, is situated between the internal and external coagula, and is somewhat intermingled with them, or adheres to them, and is firmly united all round to the internal coat of the vessel. Dr. Jones further states, that the permanent suppression of hemorrhage chiefly depends on this coagulum of lymph; but, that the end of the artery is also secured by a gradual contraction, which it undergoes, and by an effusion of lymph between its tunics, and into the surrounding cellular substance; whereby these parts become thickened, and so incorporated with each other, that one cannot be discerned from the other. Should the wound in the integuments not heal by the first intention, the coagulating lymph, soon effused, attaches the artery firmly to the subjacent and lateral parts, gives it a new covering, and entirely excludes it from the outward wound.

The same circumstances are also remarkable in the portion of the vessel, most remote from the heart. Its orifice, however, is usually more contracted, and its external coagulum smaller, than the one, which attaches itself to the other cut end of the artery. (*Jones on Hemorrhage, p.* 56.)

The impervious extremity of the artery, no longer allowing blood to circulate through it, the portion, which lies between it and the first lateral branch gradually contracts, till its cavity is completely obliterated, and its tunics assume a ligamentous appearance. In a few days, the external coagulum, which in the first instance, stopped the hemorrhage, is absorbed, and the coagulating lymph, effused around it, and by which the parts were thickened, is gradually removed, so that they resume again their cellular texture.

At a still later period, the ligamentous portion is reduced to a filamentous state, so that the artery is, as it were, completely annihilated from its cut end to the first lateral branch; but, long before this final change is accomplished, the inosculating branches have become considerably enlarged, so as to establish a free communication, between the disunited parts of the main artery.

When an artery has been divided *at some distance from a lateral branch*, three coagula are formed: one of blood externally, which shuts up its mouth; one of lymph, just within the extremity of its canal; and one of blood, within its cavity, and contiguous to that of lymph. But, *when the artery has been divided near a lateral branch, no internal coagulum of blood is formed.* (*Jones, p.* 63.)

The external coagulum is always formed, when the divided artery is left to nature; not so, however, if art interferes, for, under the application of the ligature, it can never form. If agaric, lycoperdon, or sponge, be used, its formation is doubtful, depending entirely upon the degree of pressure, that is used; but, the internal coagulum of blood will be equally formed, whether the treatment be left to art, or nature, if no collateral branch is near the truncated extremity of the artery; and lastly, effused lymph, which, when in sufficient quantity, forms a distinct coagulum, just at the mouth of the artery, will be always found, if the hemorrhage is permanently suppressed. (*Jones, p.* 74.)

MEANS WHICH NATURE EMPLOYS FOR SUPPRESSING THE HEMORRHAGE FROM PUNCTURED, OR PARTIALLY DIVIDED ARTERIES.

The suppression of hemorrhage by the natural means is sometimes more easily accomplished, when an artery is completely divided, than when merely punctured, or partially divided. Completely dividing a wounded artery was one means practised by the ancients for the stoppage of hemorrhage: the moderns frequently do the same thing, when bleeding from the temporal artery proves troublesome.

Dr. Jones has related many experiments, highly worthy of perusal, and which were undertaken to investigate the present part of the subject of hemorrhage. This gentleman, however, owns, that, in regard to the temporary means, by which the bleeding from a punctured artery is stopped, he has but little to add to what Petit has explained, in his third publication on hemorrhage. (*Mém. de l'Acad. des Sciences*; 1735.) The blood is effused into the cellular substance, between the artery and its sheath, for some distance, both above and below the wounded part; and when the parts are examined, a short time after the hemorrhage has completely stopped, we find a stratum of coagulated blood between the artery and its sheath, extending from a few inches below the wounded part to two, or three inches above it, and somewhat thicker, or more prominent over the wounded part, than elsewhere.

Hence, rather than say the hemorrhage is stopped by a coagulum, it is more correct to say, that it is stopped by a thick lamina of coagulated blood, which, though somewhat thicker at the wounded part, is perfectly continuous with the coagulated blood lying between the artery and its sheath. (*Jones, p.* 113.)

When an artery is punctured, the hemorrhage, immediately following, by filling up the space, between the artery and its sheath, with blood, and consequently, distending the sheath, alters the relative situation of the puncture in the sheath to that in the artery, so that they are not exactly opposite to each other; and, by this means, a layer of blood is confined by the sheath over the puncture in the artery, and, by coagulating there, prevents any further effusion of blood.

But, this coagulated blood, like the external coagulum of a divided artery, affords only a temporary barrier to the hemorrhage: its permanent suppression is effected by a process of reparation, or of obliteration.

Dr. Jones's experiments prove, that an artery, if wounded only to a moderate extent, is capable of reuniting and healing so completely, that, after a certain time, the cicatrization cannot be discovered, either on its internal, or external surface; and that even oblique and transverse wounds (which gape most) when they do not open the artery to a greater extent, than one-fourth of its circumference, are also filled up and healed by an effusion of coagulating lymph from their inflamed lips, so as to occasion but little, or no obstruction to the canal of the artery. The utmost magnitude of a wound, which will still allow the continuity of the canal to be preserved, is difficult to be learned; for, when the wound is large, but yet capable of being united, such a quantity of coagulating lymph is poured out, that the canal of the vessel, at the wounded part, is more or less filled up by it. And when the wound is still larger, the vessel soon becomes either torn, or ulcerated completely across, by which its complete division is accomplished.

Beclard made a series of experiments upon dogs, whose arteries are said not to differ much from those of man, though *the impulse of the heart is not so strong, and the blood is more coagulable;* two circumstances, which should be duly considered in applying any of the inferences drawn from such experiments to the human subject. "In his first experiment, he pricked the femoral artery with a needle; the blood flowed; but, soon stopped. On removing the coagulum it again flowed, but, in a smaller stream; it gradually ceased to bleed, and finally stopped, though the coagulum was again scraped off. On examination of the artery no trace of the cicatrix was found. Several similar experiments had the same result. In experiment 4, he denuded the femoral artery, and made a longitudinal cut in it, from two to three lines. The lips of the wound were seen in contact, during the diastole of the ventricle, and to be separated by a jet of blood during the systole. The blood was stopped by a coagulum; this was removed twice, and each time the bood flowed in a diminished stream, but the animal died. In experiment 6, he made the same incision, but did not detach the sheath from the artery, and the wound was left to nature. The hemorrhage was not great; there was an infiltration of blood into the sheath, the size of an almond, which at the end of some days began to diminish, and disappeared in two or three weeks. On the limb being examined, fifteen days afterwards, a little white ridge was found adhering firmly to the artery, and to the sheath, and completely closing the wound. In the interior, there was a depressed longitudinal cicatrix of the breadth of the fifth of a line. *The canal was regular and pervious* through its whole extent.

"In experiments 7, 8, 9, he made transverse incisions of $\frac{1}{4}$, $\frac{1}{2}$, and $\frac{3}{4}$ of the circumference of the femoral artery, *separated from its sheath:* all the animals died. In experiment 10, he made a transverse incision through $\frac{1}{4}$ of the circumference, *without disturbing the sheath.* The bleeding was stopped by a coagulum, but, on the animal moving, it again flowed, and the dog died. But, in the next experiment of the same kind, the blood was stopped by a coagulum, and the artery was closed by nearly the same process as in the 6th experiment. So complete was the cure, at the end of six weeks, that the external part of the artery did not show any mark of a wound, and the cicatrix was scarcely observable on the interior surface. In his 12th experiment, he cut one-half of the circumference; the animal died; and so did it in several similar experiments. In experiment 13, he cut $\frac{3}{4}$ of the circumference; after the animal was much reduced, the bleeding ceased, and the artery was closed in the same manner that it is when the section is complete.

"From these experiments, he concludes, wounds of the arteries of dogs are cured by nature, when they are only occasioned by a puncture, or a longitudinal incision, whether the artery be denuded or not; but, when arising from transverse incisions, they are always mortal if the artery be laid bare. If the artery retain its sheath, and the wound be $\frac{1}{4}$, or $\frac{3}{4}$ of the circumference, it may be cured by the efforts of nature; but, it is always fatal, if $\frac{1}{2}$ of it be cut through." (See *Quarterly Journ. of Foreign Medicine and Surgery, Vol.* 1, *p.* 26.) The inferences respecting the curability of a wound, extending through $\frac{3}{4}$ of the circumference, and the incurability of one that affects only $\frac{1}{2}$ of the circumference of the vessel, I should presume, must require further examination, notwithstanding an accidental faintness produced by the sudden loss of blood in the first instance may have been the means of saving one or two of the animals on which Beclard made his experiments.

This author thinks it probable, that a puncture, or longitudinal incision, in the artery of a man, may be cured by nature; but, that a transverse wound never cicatrizes properly, but the clot becomes displaced, or, if a cicatrix be formed, it will be distended and torn.

One fact, made out by the same gentleman, is, that, when an artery is deprived of its sheath for an extent greater, than its distance of retraction, the hemorrhage is mortal. I have not yet had time to look over the original paper; but, it appears to me, that it would be desirable to know precisely to what sized arteries the author is referring, when he is making some of the above inferences. The size and condition of each animal, the subject of experiment, should also be particularly specified; as experiments made on the femoral artery of a lady's lap-dog would surely not have the same results, as those performed on the same artery of a large terrier, setter, or Newfoundland dog.

According to Dr. Jones, the lymph, which fills up the wound of an artery, is poured out very freely both from the vessel and the surrounding parts, and it accumulates around the artery, particularly, over the wound, where it forms a more distinct tumor. The exposed surrounding parts at the same time inflame, and pour out coagulating lymph, with which the whole surface of the wound becomes covered, and which completely excludes the artery from the external wound. This lymph granulates, and the wound is filled up and healed in the usual manner. (See *Jones on Hemorrhage*, *p.* 113, *&c.*)

SURGICAL MEANS OF SUPPRESSING HEMORRHAGE.

It must be plain to every one, who understands the course of the circulation, that pressure, made on that portion of a wounded artery, which adjoins the wounds towards the heart, must check the effusion of blood. The current of blood in the veins, running in the opposite direction, requires the pressure to be applied to that side of the wound, which is most remote from the heart. However, on account of the freedom and facility, with which the blood is transmitted through the anastomoses, from the portion of the artery above the point of pressure into the lower continuation of the artery, such pressure will often only check, and not effectually stop the bleeding, unless the part of the vessel directly below the wound be also compressed, or secured. As pressure is the most rational means of impeding hemorrhage, so it is the most effectual; and almost all the plans, employed for this purpose, are only modifications of it. The tourniquet, the ligature, the application of a roller and compresses, even agaric itself, only become useful in the suppression of hemorrhage, on the principle of pressure: the cautery, caustics, and styptics, however, have a different mode of operation.

In order to prevent a wounded person from dying of hemorrhage, Celsus advised the wound to be filled with dry lint, over which was laid a sponge dipped in cold water, and pressed on the part with the hand. If, notwithstanding these means, the hemorrhage should continue, he recommends repeatedly applying fresh lint, wet with vinegar; but he is against the use of corroding escharotic applications, on account of the inflammation, which they produce; or only sanctions the employment of the mildest ones. When the hemorrhage resists these methods, *he advises two ligatures to be applied to the wounded part of the vessel, and then dividing the portion situated between them*:—"*Quod si illa quoque profluvio vincuntur, venæ, quæ sanguinem fundunt, apprehendendæ, circaque id, quod ictum est, duobus locis deligandæ, intercidendæque sunt, ut et in se ipsæ coeant, et nihilominus ora præclusa habeant.*" (*Lib.* 5. *cap.* 26.) When the ligature was impracticable, the wound bled dangerously, and there were no large nerves, nor muscles at the bleeding part. Celsus proposed the actual cautery.

Galen also mentions tying the vessels for the purpose of stopping hemorrhage; and there are some traces of the same information in other authors, who lived before him, as Archigenes, and Rufus. Probably, however, the ligature was little used at these early periods, as may be inferred from the multitude of astringents, caustics, and other applications, which were advised for stopping bleeding, and in which less confidence would have been put, had the use of the ligature been familiarly known. No one can doubt, that if the old surgeons had had many opportunities of seeing the advantages of the ligature, they would soon have used it after amputations; but, so far were they from adopting such practice, that Albucasis, a long while afterwards, refused to amputate at the wrist, lest he should see his patient bleed to death.

Paré is considered as the first who regularly employed the ligature after amputation. His method having been attacked, he modestly defends it in the part of his works, intitled, *Apologie*, where he takes great care to impute the origin of it to the ancients, and cites many of them, who have made mention of it. However, he thinks its utility in amputations of such high consequence, that he ascribes to inspiration of the Deity his first adoption of this practice.

The method, in which the ancients placed most confidence, for stopping hemorrhage after the amputation of a limb, was the cauterization of the cut vessel, and surrounding flesh. The parts, thus affected by the heat, formed an eschar, of greater, or less thickness, which blocked up the opening of the vessel, and hindered the blood from escaping. The separation of the eschar, however, which frequently took place too soon, occasioned a return of the hemorrhage, and rendered it the more dangerous, as its suppression was now more difficult, than before the cautery had been applied. Sometimes, the instrument being too much heated, immediately brought away with it the eschar. At the present time, the cautery is never employed, as a means of suppressing hemorrhage, or, at most, only in a few very unusual cases, in which neither compression, nor the ligature can be made use of. In Great Britain, the cautery may be said to be entirely exploded; but, in France, the best hospital surgeons now and then employ it to stop bleedings from the antrum, and the mouth.

The old surgeons also very commonly applied to bleeding parts pledgets, dipped in boiling turpentine—a practice, that has long been most justly abandoned.

ASTRINGENTS, STYPTICS, &c.

Le Dran, in his treatise on the operations of surgery, says, that a button of vitriol, or alum, applied and properly confined on the extremity of the vessel, is sufficient to stop the hemorrhage in amputations. Heister recommends the application of vitriol, in preference to the ligature, in the amputation of the fore-arm. Great praises have also been conferred on agaric, and sponge, for their styptic properties. Solutions of iron, and all the mineral acids in various forms, have been recommended to the public, as remedies of the same kind, and possessing great efficacy. The ancients, centuries ago, left no application of this nature untried, and the pretended discoveries of new and more effectual styptics in later times, may almost all be met with in their writings. This fact merits particular notice, because the little success, attending their practice, especially, when bleeding from a considerable artery was to be suppressed, clearly proves what little reliance ought to be placed on means of this description. (*Encyclopédie Méthodique; Partie Chir.*) The most which styptics can do, is to stop hemorrhages from small arteries; but, they ought never to be trusted, when large vessels are concerned.

There is no doubt, that cold air has a styptic property; by which expression, I mean, that it promotes the contraction of the vessels; for, no styptics can contribute to make the blood coagulate, though such an erroneous idea is not uncommon. We frequently tie, on the surface of a wound, every artery, that betrays the least disposition to bleed, as long as the wound continues exposed to the air. We bring the opposite sides of this wound into contact, and put the patient to bed. Not an hour elapses, before the renewal of hemorrhage necessitates us to remove the dressings. The wound is again exposed to the air, and again the bleeding ceases. This often happens in the scrotum, after the removal of a testicle, and on the chest, after the removal of a breast. The proper conduct, in such cases, is not to open the wound unnecessarily, but, to apply wet linen to the part so as to produce such an evaporation from its surface, as shall create a sufficient degree of cold to stop the bleeding. As all styptics are more or less irritating, no judicious practitioners apply them to recent wounds. However, for the suppression of hemorrhage from diseased surfaces, where the vessels seem to have lost their natural disposition to contract, these applications are sometimes indicated.

COMPRESSION.

We have already remarked, that all the best means of checking hemorrhage, operate on the principle of pressure; the actual and potential cautery, and some styptics excepted; the two first of which act by forming a slough, which stops up the mouths of the vessels; while the latter operate by promoting their contraction. Let us next consider the various modifications of pressure.

In a dissertation on the manner of stopping hemorrhage, printed in the *Mém. de l'Acad. de Sciences, année* 1731, Petit endeavoured to prove, that different articles praised as infallible specifics, would seldom, or never, have succeeded without compression. Even when caustics were employed, it was usual to bind compresses tightly on the part, so as to resist the impulse of the blood in the artery, and the premature separation of the eschar. Had this precaution not been taken, Petit believes, hemorrhage would almost invariably have followed, and indeed, notwithstanding the pains taken to avert it by suitable compression, it did but too frequently take place on the detachment of the eschar. Petit has noticed, that the end of a finger, gently compressing the mouth of a vessel, is a sufficient means of stopping hemorrhage from it, and that nothing else would be necessary, if the finger and stump could always be kept in this posture. Hence, he endeavoured to obviate these difficulties by inventing a machine which securely and incessantly executed the office of the finger. The instrument was a double tourniquet, which, when applied, compressed, at once, both the extremity of the divided artery and its trunk above the wound. The compression on the end of the vessel was permanent; that on the trunk was made only at the time of dressing the wound, or when it was necessary to relax the other. An engraving and particular description of the instrument are to be found in Petit's memoir.

Surgeons formerly filled the cavities of wounds with lint, or charpie, and then made pressure on the bleeding vessels, by applying compresses and a tight roller, over the part. The practitioners of the present day are too well acquainted with the advantages of not allowing any extraneous substance to intervene between the opposite surfaces of a recent wound, to persist in the above plan. They know, that the sides of the wound may be brought into contact, and that compression may yet be adopted, so as both to restrain particular hemorrhages, and rather promote, than retard, the union of the wound.

When the blood does not issue from any particular vessel, but from numerous small ones, compression is preferable to the ligature. In the employment of the latter, it would be necessary to tie the whole surface of the wound. The sides of the wound are to be brought accurately together, and compresses are then to be placed over the part, and a roller to be applied with sufficient tightness to make effectual pressure, but not so forcibly as to produce any chance of the circulation in the limb being completely stopped.

If, in bleedings from large arteries, compression can ever be prudently tried, it is when these vessels lie immediately over a bone. Bleedings from the radial and temporal arteries are generally cited as cases of this kind, though from the many instances of failure, which I have seen happen where the first of these vessels is concerned, I should be reluctant either to advise, or make such an attempt. Compression is sometimes tried, when the brachial artery is wounded in phlebotomy. Here it is occasionally tried, in preference to the ligature, because the latter cannot be employed without an operation to expose the artery.

When there is a small wound in a large artery, the following plan may be tried: a tourniquet is to be applied, so as to command the flow of blood into the vessel. The edges of the external wound are next to be brought into contact. Then, a compress, shaped like a blunt cone, and which is best formed of a series of compresses, gradually increasing in size, is to be placed with its apex exactly on the situation of the wound in the artery. This *graduated compress*, as it is termed, is then to be bound on the part with a roller.

In this manner, I once healed a wound of the superficial palmar arch, in a young lady in Great Pulteney-street. The outward wound was very small, and though the hemorrhage was profuse, I conceived, that it might be permanently stopped, if compression could be so made as to keep the external wound incessantly and firmly covered for the space of a day or two. At first, I tried a compress of lint, bound on the part with a roller; but this proving ineffectual, I took some pieces of money, from the size of a farthing to that of a half crown, and, wrapping them up in linen, put the smallest one accurately over the wound, so as completely to cover it. Then the others were arranged, and all of them were firmly confined with a roller, and the arm kept as quiet as possible in a sling. They were taken off after three days, and no hemorrhage ensued.

It is to be observed, that the palmar fascia, in this instance, would prevent the compression from operating on the vessel; but the case shows, that this artery, when wounded, is capable of healing, if the blood be completely prevented from getting out of the external wound by the proper application of compression. Were the outer wound too large to admit of this plan, it would probably be the safest practice to cut down, at once, to the ulnar artery, and put a ligature round it, though as this would only certainly stop the bleeding from one end of the vessel in the hand, pressure on the wound would yet be necessary. I have never seen a surgeon succeed in taking up the artery in the hand.

Besides compressing the wounded part of the artery, some surgeons also apply a longitudinal compress over the track of the vessel above the wound, with a view of weakening the flow of blood into it. Whatever good effect it may have in this way, is more than counterbalanced by the difficulty which it must create to the circulation in the arm. If the graduated compress be properly arranged, an effusion of blood cannot possibly happen, and pressure along the course of the artery must at all events be unnecessary. After relaxing the tourniquet, if no blood escape from the artery, the surgeon (supposing it to be the brachial artery wounded) should feel the pulse at the wrist, in order to ascertain, that the compression employed is not so powerful as entirely to impede the circulation in the fore-arm and hand. The arm is to be kept quietly in a sling, and, in forty-eight hours, if no bleeding take place, there will be great reason to expect that the case will do well. In another work, I have given an engraving and description of an instrument, invented by Plenk, for making pressure on the wounded brachial artery, at the bend of the arm, without pressing upon the whole circumference of the limb, and consequently without stopping the circulation. No one, however, would prefer compression when large arteries are injured, except in the kind of cases, to which we have just now adverted, or in those in which the wounded vessel can be firmly compressed against a subjacent bone. Sometimes, the compresses slip off, or the bandages become slack, and a fatal hemorrhage may arise; and a still greater risk is that of mortification from the constricted state of the limb. When the method is tried, the tourniquet should always be left loosely round the limb, ready to be tightened in an instant. Sometimes the external wound heals, while the opening in the artery remains unclosed, and a false aneurism is the consequence.

TOURNIQUET.

When hemorrhage takes place from a large artery in one of the limbs, where the vessel can be conveniently compressed above the wound in it, a tourniquet, judiciously applied, never fails in putting an immediate stop to the bleeding.

Before the invention of this instrument, which did not take place till the latter part of the 17th century, surgery was really a very defective art. No important operation could be undertaken on the extremities, without placing the patient in the most imminent peril; and many wounds were mortal, which, with the aid of this simple contrivance, would not have been attended with the least danger.

The first invention of this instrument has been claimed by different surgeons, and even different nations. But, whoever was the inventor, it was first presented to the public in a form exceedingly simple; so much so, indeed, that it seems extraordinary, that its invention did not happen sooner. A small pad being placed on the principal artery of a limb, a band was applied over it, so as to encircle the limb twice. Then a stick was introduced between the two circles of the band, which was twisted: thus the pad was made completely to stop the flow of blood into the lower part of the vessel.

Although, in the *Armamentarium Chirurgicum* of Scultetus, there is a plate of a machine, invented by this author for compressing the radial artery, by means of a screw, J. L. Petit is universally allowed to be the first, who brought the tourniquet to perfection, by combining the circular band with a screw, so that the greatest pressure may operate on the principal artery.

The advantages of the modern tourniquet are, that its pressure can be regulated with the utmost exactness; that it operates chiefly on the point where the pad is placed, and where the main artery lies; that it does not require the aid of an assistant to keep it tense; that it completely commands the flow of blood into a limb; that it can be relaxed, or tightened in a moment; and that, when there is reason to fear a sudden renewal of hemorrhage, it can be left slackly round the limb, and, in case of need, tightened in an instant. Its utility, however, is confined to the limbs, and as the pressure, necessary to stop the flow of blood through the principal artery, completely prevents the return of blood through the veins, its application cannot be made very long without inducing mortification. It is only of use also in putting a sudden stop to profuse hemorrhages for a time, that is, until the surgeon has put in practice some means, the effect of which is more permanent.

LIGATURE.

The ancients were quite unacquainted with the use of the tourniquet, and though some of their writers have made mention of the ligature, they do not seem to have known how to make proper use of it, nor to have possessed any other certain means of suppressing hemorrhage from wounds. In modern times, it is easily comprehensible, that when any great operation was undertaken, while surgery was so imperfect, there was more likelihood of the patient's life being shortened, than lengthened by what was attempted. Under these circumstances, it is not surprising, that the old practitioners should have taken immense pains to invent a great many topical astringents. But, now that the ligature is known to be a means which is safer, and less painful, than former methods, no longer search need be made for specifics against hemorrhage.

It may, indeed, be set down as a rule in surgery, that whenever large arteries are wounded, no styptic application should ever be employed, but immediate recourse had to the ligature, as being, when properly applied, the most simple and safe of all methods.

In order to qualify the reader to judge of the best mode of applying ligatures to arteries, I shall first explain to him their effect on these vessels, as related by Dr. Jones.

This gentleman learned from Dr. J. Thomson, of Edinburgh, that, in every instance in which a ligature is applied around an artery, without including the surrounding parts, the internal coat of the vessel is torn through by it; and that this fact had been originally noticed by Desault. Dr. Thomson showed to Dr. Jones, on a portion of artery taken from the human subject, that the internal and middle coats are divided by the ligature. (*Jones, p.* 126.)

This led Dr. Jones to make some experiments on the arteries of dogs and horses, tending to the conclusion, that when several ligatures are applied round an artery with sufficient tightness to cut through its internal and middle coats, although the cords be immediately afterwards removed, the vessel will always become impervious at the part which was tied, as far as the first collateral branches, above and below the obstructed part. Dr. Jones thinks it reasonable to expect, that the obstruction produced in the arteries of dogs and horses, in the manner he has related, "might be effected by the same treatment in the arteries of the human subject; and, if it should prove successful, it might be employed in some of the most important cases in surgery. The success of the late important improvements which have been introduced in the operation for aneurism, may perhaps appear to most surgeons to have rendered that operation sufficiently simple and safe; but, if it be possible to produce obstruction in the canal of an artery of the human subject, in the above-mentioned manner, may it not be advantageously employed in the cure of aneurism; inasmuch as nothing need be done to prevent the immediate union of the external wound?" Dr. Jones next questions, whether this mode of obstructing the passage of blood through the arteries may not also be advantageously practised in cases of bronchocele? (*P.* 136.)

Subsequent experimenters, as a late writer observes, have not, however, been equally successful with Dr. Jones in obtaining the obliteration of the cavity of the vessel after this operation. Mr. Hodgson tried the experiment in two instances upon the carotid arteries of dogs: and in neither of them was the cavity of the vessel obliterated. The same experiment has been repeated by several surgeons upon the arteries of dogs and horses; but, in no example, as far as Mr. Hodgson knows, has the complete obliteration of the cavity of the vessel been accomplished. "It appears, however, that an effusion of lymph is an invariable consequence of the operation; the want of union is therefore owing to the opposite sides of the vessel not being retained in a state of contact, so as to allow of their adhesion. (See *Observations on the Application of the Ligature to Arteries, &c. by B. Travers, Vol.* 4, *Med. Chir. Trans.*) The presence of the ligature, in the common mode of its application, effects this object; and for the success of Dr. Jones's experiment, it appeared only necessary, that the opposite sides of the wounded vessel should be retained in contact, until their adhesion is sufficiently accomplished to resist the passage of the blood through the tube. This object might probably be effected by compression; but, the inconveniences attending such a degree of pressure, as shall retain the opposite sides of an artery in contact at the bottom of a recent wound, are too great to permit its employment. It occurred to Mr. Travers, that if a ligature were applied to an artery, and suffered to remain only a few hours, the adhesion of the wounded surfaces would be sufficiently accomplished to ensure the obliteration of the canal; and by the removal of the ligature at this period, the inconveniences attending its stay would be obviated. The danger, produced by the residence of a ligature upon an artery, arises from the irritation, which, as a foreign body, it produces in its coats. Ulceration has never been observed to commence in less than twenty-four hours after the application of a ligature; whilst it is an ascertained fact, that lymph is in a favourable state for organization in less than six hours, in a wound the sides of which are preserved in contact. (*Jones, chap.* 4, *exp.* 1.) If it be sufficient, therefore, to ensure their adhesion, that the wounded coats of an artery be kept in contact by a ligature only three or four hours, ulceration and sloughing may in a great degree be obviated by promoting the immediate adhesion of the wound. Justified by this reasoning, Mr. Travers performed several experiments, by which he ascertained, that if a ligature be kept six, two hours, or even one hour upon the carotid artery of a horse, and then removed, the adhesion was sufficiently advanced to effect the permanent obliteration of the canal. It appeared probable, that the same result would be obtained upon the healthy artery of a human subject. (*Hodgson on the Diseases of Arteries, &c. p.* 228, *et seq.*) Mr. A. C. Hutchison, in the year 1800, tied the brachial arteries of two dogs, and removed the ligatures immediately after their application. In both instances, the complete obliteration of the canal of the artery was the consequence of the operation. (See *Practical Observations in Surgery, p.* 103.) He has also tried this method, as modified by Mr. Travers, in an operation, which he performed for a popliteal aneurism in a sailor, in Nov. 1813. A double ligature was passed under the femoral artery. The ligatures were tied with loops, or slip-knots, about a quarter of an inch of the vessel being left undivided between them. All that now remained of the pulsation in the tumor, was a slight undulatory motion. Nearly six hours having elapsed from the application of the ligatures, the wound was carefully opened, and the ligatures untied and removed, without the slightest disturbance of the vessel. In less than half a minute afterwards, the artery became distended with blood, and the pulsations in the tumor were as strong as they had been before the operation. Mr. Hutchison then applied two fresh ligatures; hemorrhage afterwards came on; amputation was performed, and the patient died. (See *Practical Observations in Surgery, p.* 102, *&c.*) Now, as Mr. Hutchison chose to apply other ligatures, on finding that the pulsation returned, the above case only proves, that the artery is not obliterated in about six hours, and we are left in the dark respecting the grand question, namely, whether the vessel would have become obliterated by the effusion of coagulating lymph and the adhesive inflammation, notwithstanding the return of circulation through it. As for the hemorrhage which occurred, I think it might have been expected, considering the disturbance and irritation, which the artery must have sustained in the proceedings absolutely necessary for the application of not less than four ligatures, and the removal of two of them. According to my ideas, only one ligature ought to have been used, and none of the artery detached. We also have no description of the sort of ligatures which were employed; an essential piece of information in forming a judgment of the merits of the preceding method. The application, removal, and reapplication of ligatures are not consistent with the wise principles inculcated by the late Dr. Jones, and have in more instances than that recorded by Mr. Hutchison, brought on ulceration of the artery and hemorrhage. For further information on the question, concerning the propriety of withdrawing the ligature previously to its detachment, see the article *Aneurism.*

From Dr. Jones's experiments, it appears, that the first effects of a ligature upon an artery are, a complete division of its internal and middle coats, an apposition of its wounded surfaces, and an obstruction to the circulation of the blood through its canal. There must be a small quantity of stagnant blood, just within the extremity of the artery; but this does not, in every instance, immediately form a coagulum, capable of filling up the canal of the artery. In most cases, only a slender coagulum is formed at first, which gradually becomes larger by successive coagulations of the blood; and hence, the coagulum is always at first of a tapering form, with its base at the extremity of the artery. But, as Dr. Jones remarks, the formation of this coagulum is not material; for soon after the ligature has been applied, the end of the artery inflames, and the wounded internal surface of its canal, being kept in close contact by the ligature, adheres, and converts this portion of the artery into an impervious, and, at first, slightly conical sac. It is to the effused lymph that the base of the coagulum adheres, when found to be adherent. Lymph is also effused between the coats of the artery, and among the parts surrounding its extremity. In a little time, the ligature makes the part, on which it is directly applied, ulcerate; and, acting as a tent, a small aperture is formed in the layer of lymph effused over the artery. Through this aperture, a small quantity of pus is discharged, as long as the ligature remains; and, finally, the ligature itself also escapes, and the little cavity, which it has occasioned, granulates and fills up, and the external wound heals, leaving the cellular substance a little beyond the end of the artery, much thickened and indurated. (*Jones, p.* 159, 161.)

In short, when an artery is properly tied, the following are the effects, as enumerated by Dr. Jones:

1. To cut through the internal and middle coats of the artery, and to bring the wounded surfaces into perfect apposition.

2. To occasion a determination of blood to the collateral branches.

3. To allow of the formation of a coagulum of blood just within the artery, provided a collateral branch is not very near the ligature. It merits particular notice, however, that though the nearness of a collateral branch prevents the formation of the coagulum, it cannot always prevent the completion of the adhesive process. In the experiments, made on the arteries of horses and dogs by Mr. Travers, the ligature was purposely applied close to large collateral branches, yet the vessels were safely obliterated. (See *Med. Chir. Trans. Vol. 6, p.* 658, 660.)

4. To excite inflammation on the internal and middle coats of the artery, by having cut them through, and, consequently, to give rise to an effusion of lymph, by which the wounded surfaces are united, and the canal is rendered impervious; to produce a simultaneous inflammation on the corresponding external surface of the artery, by which it becomes very much thickened with effused lymph; and, at the same time, from the exposure and inevitable wounding of the surrounding parts, to occasion inflammation in them, and an effusion of lymph, which covers the artery, and forms the surface of the wound.

5. To produce ulceration in the part of the artery, around which the ligature is immediately applied, viz. its external coat.

6. To produce indirectly a complete obliteration, not only of the canal of the artery, but even of the artery itself, to the collateral branches on both sides of the part which has been tied.

7. To give rise to an enlargement of the collateral branches. (*Jones, p.* 163, 164.)

Every part of an artery is organized in a similar manner to the other soft parts, and its coats are susceptible of the same process of adhesion, ulceration, &c. as the other parts are. Hence, the precautions, taken to secure the adhesion of other parts, should be observed for the same purpose, with regard to an artery. The vessel is put in a state to admit of adhesion by the ligature, which, when properly applied, cuts through its internal and middle coats, keeps their cut surfaces in contact, and affords them an opportunity of uniting by the adhesive inflammation, as other cut surfaces do. The immediate stoppage of the bleeding is merely the incipient and temporary part of what the ligature has to accomplish; it has also to affect the adhesion of the internal and middle coats of the artery, which being the thing, on which the permanent suppression of hemorrhage depends, is the most important. The size and form of the ligature, whether completely flat, or irregular, have not been, as Dr. Jones remarks, sufficiently attended to; nor is the degree of force employed in tying the artery, often considered. Some surgeons, wishing to guard against the ligatures slipping off, tie it with very considerable force; while others, apprehensive lest they should cut through the artery, or occasion too early a separation of the ligature, draw it only sufficiently tight to prevent the escape of any blood. A broad flat ligature is not likely to make such a wound in the internal and middle coats of the artery, as is most favourable to adhesion, because it is scarcely possible to tie it smoothly round the vessel, which is very likely to be thrown into folds, or puckered by it, and consequently, to have an irregular bruised wound made in its middle and internal coats. By covering also a considerable space of the external coat, it may destroy the very vessels which pass on it in their way to the cut surfaces of the inner coats, and thus render them incapable of inflaming. Even supposing the wound to unite, still such a ligature may cover that part of the external coat, which is directly over the newly-united part, and, consequently, as soon as it has produced ulceration through the external coat, it will cause the same effect on the newly-united parts, and, of course, secondary hemorrhage. (*Jones, p.* 168.)

When a ligature is of an irregular form, it is apt to cut through the internal and middle coats of an artery more completely at some parts than others; but these coats must be perfectly cut through, in order to produce an effusion of lymph from the inside of the vessel, which seems to adhere most securely at its cut surfaces.

Also, when the ligature is not applied with sufficient tightness, the inner coats of the artery will not be properly cut through. Dr. Jones thinks, that the ligature being sometimes put on so as to deviate from a circle, has a tendency to produce secondary hemorrhage.

Dr. Jones conceives that ligatures are best, when they are round, and very firm, and, he adds, that though a very slight force is necessary to cut through the internal and middle coats of an artery, it is better to tie the vessel more tightly than is necessary merely to cut through its inner coats, because the cut surfaces will thus be more certainly kept in contact; the separation of the ligature expedited; and the danger of ulceration spreading to the newly-cicatrized part diminished. The external coat will never ulcerate through, before the inner ones have adhered. The limb, however, should be kept in a perfectly quiet state.

I am sincerely glad to find, that so accurate an observer as Dr. Jones, has refuted the idea, that ligatures occasionally slip off the vessels, in consequence of the violent impulse of the blood. In fact, the blood does not continue to be impelled against the extremity of the artery with the same impetuosity with which it circulated through the vessel before it was tied. The blood is immediately determined into the collateral branches, nor is there any pulsation for some way above the ligature.

Dr. Jones much more rationally imputes this occasional accident, either to the clumsiness of the ligature, which prevents its lying compactly and securely round the artery; or to its not having been applied with sufficient tightness; or to its having that very insecure hold of the vessel, which the deviation from the circular application must occasion. (*P.* 173.)

Dr. Jones is of opinion, that in cases of aneurism, in which the artery has only been tied with one ligature, and left undivided, and in which secondary hemorrhage has arisen, that this has most probably been owing, either to a diseased state of the artery; to various contrivances for compressing a large portion of the vessel; to having a loose ligature above the one, which is tied; or, lastly, to not tying the artery sufficiently tight to cut through the internal and middle coats, so as to fit them for adhesion, but, so as to cause a gradual ulceration through them, and of course, bring on hemorrhage, which returns with greater violence, as the ulceration advances. (*P.* 176.)

These reflections must also obviously explain, why Scarpa's practice of using a largish ligature, with the intervention of a piece of cloth between the cord and the vessel, for the express purpose of hindering the inner coats of the vessel from being divided, must be objectionable, because it may be set down as an axiom in all operations, where large arteries are to be tied, that the quantity of extraneous substances in the wound, and particularly of such as are in contact with the artery, should be diminished as much as possible. And, though I may be disposed to go so far with Scarpa as to believe, that the interposition of a piece of cork, or wood is worse, than that of a cylinder of linen, I cannot accede to the proposition, that the latter is free from objection, because it rather acts as a cushion, than as a body likely to bruise. (See *Mém. on the Ligature of Arteries, p.* 44.)

With the differences in the constitutions of man and animals, I know that the results of experiments on the latter can never be looked upon as a positive proof of what would happen from the same experiments performed on the human subject. The stronger, or weaker impulse of the heart, the more or less coagulable nature of the blood, the greater or less degree of general and local irritability; the more or less quick tendency to adhesive inflammation, and ulceration; are circumstances, which must make in different animals the same experiments lead to opposite results. The question, whether a small round ligature, or a larger flat one, with a piece of linen between it and the vessel, be best, must therefore, after all, be decided, not by Dr. Jones's experiments, nor those of Scarpa, or Mislei, but by the practice of surgery on the human body; and that the principles defended in this Dictionary, are on the whole to be preferred, can hardly be questioned by any man, who knows how much less frequent secondary hemorrhage now is in this metropolis, than it was formerly, when those principles were neither observed, nor comprehended. (See *Amputation, Aneurism, Arteries, and Ligature.*)

Dr. Jones seems to consider, that the advantage of the retraction of the *divided* artery within the cellular membrane, is compensated, in the case of the *undivided* artery, by the speedy and profuse effusion of lymph, which takes place over and round the vessel at the tied part, and even covers the ligature itself. Another cause of secondary hemorrhage, is the including of other parts in the ligature, together with the artery; by doing which, the division of the inner coats of the vessel may be prevented.

In the valuable publication of Dr. Jones, to which I have so freely adverted, some secondary hemorrhages are also imputed to the hidden separation, or laceration of the recently united parts of an artery, by premature and extraordinary exertions of the patient. Hence, he strongly insists on keeping a limb, in which a large artery has been tied, perfectly at rest.

I shall conclude these remarks on the ligature with a few practical rules.

1. Always tie a large artery, as separately as possible, but still let the ligature be applied to a part of the vessel, which is close to its natural connexions.

Besides the reasons for this practice, already specified, we may observe, that including other substances in the ligature causes immense pain, and a larger part of a wound to remain disunited. The ligature is also apt to become loose, as soon as the substance between it and the artery sloughs, or ulcerates. Sometimes the ligature, thus applied, forms a circular furrow in the flesh, and remains a tedious time, incapable of a separation.

The blood-vessels being organized like other living parts, the healing of a wounded artery can only take place favourably, when that part of the vessel, which is immediately contiguous to the ligature, continues to receive a due supply of blood through its vasa vasorum, which are ramifications of the collateral arteries. Hence, the disadvantage of putting a ligature round the middle of a portion of an artery, which has been separated from its surrounding connexions; and hence, the utility of making the knot, as closely as possible to that part of the vessel which lies undisturbed among the surrounding flesh.

Small arteries neither allow, nor require, these minute attentions to the mode of tying them.

2. When a divided artery is large, open-mouthed, and quite visible, it is best to take hold of it, and raise its extremity, a little way above the surface of the wound with a pair of forceps. When the vessel is smaller, the tenaculum is the most convenient instrument.

3. While the surgeon holds the vessel in this way, the assistant is to place the noose of the ligature round it, and tie it according to the above directions. In order that the noose may not rise too high, and even above the mouth of the artery, when it is tightened, the ends of the ligature must be drawn as horizontally as possible, which is best done with the thumbs. A knot is next to be made.

4. As ligatures always operate in wounds as extraneous bodies, and one half of each is sufficient for the removal of the noose when detached, the other should always be cut off close to the knot, and taken away.

As we have explained in the article *Amputation*, and as we shall notice again in speaking of the *Ligature*, trials have of late years been made of the practice of cutting off both ends of the ligature close to the knot, with a view of diminishing, as far as possible, the quantity of extraneous substances in the wound. This plan requires the use of very small silk ligatures, in order to be duly judged of. (See *Mr. Lawrence's Obs. in Medico-Chir. Trans. Vol. 6, p. 156, et seq.*)

5. When a large artery is completely divided, two ligatures, one to the upper, the other to the lower part of the vessel, are commonly necessary, in consequence of the anastomosing branches conveying the blood very readily into the part of the artery most remote from the heart, as soon as the first ligature has been applied.

6. When a large artery is only punctured, and compression cannot be judiciously tried, the vessel must be first exposed by an incision, and then a double ligature introduced under it, with the aid of an eye-probe. One ligature is to be tied above, the other below the bleeding orifice; with due attention to the principles explained in this article, and that on *Aneurism.*

7. Ligatures usually come away from the largest artery ever tied, in about a fortnight, and from moderate-sized ones in six or seven days. When they continue attached much beyond the usual period, it is proper to draw them very gently every time the wound is dressed, for the purpose of accelerating their detachment. Great care, however, is requisite in doing this; for, as Dr. Jones remarks, as long as the ligature seems firmly attached, pulling it rather strongly must act, more or less, on the recently cicatrized extremity of the artery, which is not only contiguous to it, but is still united to that portion of the artery, (the external coat) which detains the ligature. (*Jones, p.* 162.)

In particular individuals, there appears to be an extraordinary tendency to profuse hemorrhage from very slight injuries. An instance of this kind was lately recorded by Mr. Blagden, where a fatal hemorrhage arose from the extraction of a tooth. The patient, who was twenty-seven years of age, had had a tooth extracted when a boy, in consequence of which operation, the bleeding continued for twenty-one days, from the socket, before it ceased. A very slight cut on the head was also followed by an alarming bleeding which could not be stopped by pressure, styptics, or the ligature, so that it became necessary to apply the kali purum, which succeeded. On his having another carious tooth taken out, a profuse bleeding followed, which resisted the effect of styptics, caustic, and every means adopted to stop up the socket. The actual cautery was tried in vain. The dangerous condition of the patient seemed to leave no other resource, but that of tying the carotid artery, which was done by Mr. Brodie. But even this proceeding failed to suppress the hemorrhage, which proved fatal. (See *Med. Chir. Trans. Vol.* 8, *p.* 224, *London*, 1817.) On the mode of stopping hemorrhage from the sockets of the teeth, the reader may find some remarks in the *Edinb. Med. and Surg. Journ. No.* 58, *p.* 157.

The hemorrhage from the bites of leeches sometimes proves exceedingly obstinate, and instances of death from this cause have occasionally happened, particularly in children. When common methods fail, the plan has been recently tried of passing a fine sewing needle through the skin on one side of the wound, and then another through the skin on the opposite side, and then twisting some thread round the needles, so as to draw them together, and close the bite. The experiment fully answered. (See *Lond. Med. Repository, January*, 1819, *p*. 23—26.)

For more information, respecting hemorrhage, see *Amputation, Aneurism, Arteries, Ligature,* and *Wounds*.

Consult also *Petit's Memoirs, among those of l'Acad. des Sciences for the years* 1731, 1732—1735. *Morand sur le Changement qui arrive aux Artères coupées,* 1736. *Pouteau, Mélanges de Chirurgie. Gooch's Chirurgical Works, Vol.* 1. *Kirkland's Essay on the Method of suppressing Hemorrhages from divided Arteries,* 8*vo. Lond.* 1763. *White's Cases in Surgery. J. Bell's Principles of Surgery, Vol.* 1. *Partie Chirurgicale de l'Encycl. Méth. Larrey, Mémoires de Chirurgie Militaire, Tom.* 2, *p.* 379. *Pelletan, Clinique Chir. T.* 2, *p.* 240, *&c. Mémoire Elémentaire sur les Hemorrhagies. Richerand, Nosographie Chir. T.* 4. *Sect. sur les Maladies des Artères, p.* 23, *&c. Edit.* 4. *Léveillé, Nouvelle Doctrine Chir. T.* 1, *Chap.* 3 *: and, particularly, Jones on the Process employed by Nature, in suppressing the Hemorrhage from divided and punctured Arteries,* 1805. *Many useful remarks on the subject of hemorrhage will be found in Hodgson's Treatise on the Diseases of Arteries and Veins.* See also *Observations upon the Ligature of Arteries, and the causes of secondary Hemorrhage, &c. by B. Travers, in Med. Chir. Trans. Vol.* 4, *p.* 435, *et seq.* Likewise *Further Observations on the Ligature of Arteries, by the same, in Med. Chir. Trans. Vol.* 6, *p.* 632. *et seq. Lawrence on a New Method of Tying the Arteries in Aneurism, Amputation, &c. in Vol.* 6. *of the Med. Chir. Trans. p.* 156, *&c.; and Crampton in Vol.* 7 *of the same work. Langenbeck, Bibl. B.* 1. *Dr. J. Thomson's Lectures on Inflammation, p.* 250, *&c. and Observations made in the Military Hospitals in Belgium, p.* 42—44. *Scarpa on Aneurism, and particularly his Memoir on the ligature of arteries: this is contained in the Second Edit. of the Transl. by Mr. Wishart. Beclard, Expériences sur les Blessures des Artères. John Cross, A Case of Amputation, with some Experiments and Observations on the securing of Arteries with minute silk ligatures, in Lond. Med. Repository, Vol.* 7, *p.* 353. *The author relates several experiments for the purpose of ascertaining the utility of tying arteries with such ligatures, and cutting the two ends off close to the knot. They were performed on the carotids of dogs and asses. The conclusions are unfavourable to the practice. After one case of amputation, where the method was tried, the stump healed slowly, and for several months small abscesses repeatedly formed.*

HEMORRHOIDS. (from *αἱμα*, blood, and *ῥεω*, to flow.) *Piles*, divided into such as do not bleed, and termed *blind*, and into others subject to occasional hemorrhage, and distinguished by the epithet *open*. The etymological meaning of the word is evidently only a discharge of blood. Surgeons, however, sanctioned by long custom, have generally implied, by the term *hemorrhoids*, either a simple bleeding from the veins of the lower part of the rectum recurring more or less frequently, yet not accompanied with any distinguishable permanent tumors, within, or on the outside of the anus; or else swellings formed by a varicose distention and morbid thickening of those vessels, either with, or without occasional hemorrhage; or lastly, tumors originally produced by effused blood, which is sometimes converted into an organized substance. (*Abernethy, Surgical Works, Vol.* 2, *p.* 234.)

According to Richter, blind hemorrhoids consist of preternatural cysts, or sacs, at the lower extremity of the rectum, from the size of a pea to that of an apple. Sometimes they are distended with blood, and very much swelled; and, at other periods, entirely subside; though, when they have been often considerably swelled, they never quite disappear, but are alternately in a full enlarged state, and empty and flaccid. Indeed, the more frequent and considerable the enlargement has been, the greater is their size. It is generally supposed, that these tumors, or cysts, are varicose expansions of the veins of the rectum; and, probably, says Richter, this may sometimes really be the case; but, the disease is not always of this nature. In particular instances, and, perhaps, in most cases, they arise from an extravasation of blood under the inner coat of the rectum; and then the cyst is altogether formed by this membrane, and not by the vein. The following circumstances furnish proof of what has been here observed. Hemorrhoids are sometimes as large as a walnut, or apple; yet, it is scarcely credible, that a mere varix could attain such a size. When cut away, the bleeding is often very slight, even when they are large. Surely, if the tumors were varices, there would always be profuse hemorrhage. Sometimes the cyst is found quite empty; but, how can a varix be supposed to be in this state? The shape of hemorrhoids is also remarked to be subject to greater variety, than can hardly attend dilatations of veins: thus, they are sometimes oblong, sometimes cylindrical, like a finger, &c. Lastly, when cut away, the sac is plainly seen to consist only of a single membrane. (*Anfangsgr. der Wundarzn. B.* 6, *p.* 395, *Ed.* 2, *Gött.* 1802.)

At the same time, it should be recollected that "the blood sometimes coagulates in the dilated vein, and the swelling becomes hard, inflamed, and very painful. The coagulum is subsequently absorbed, but the thickened coats of the vein, and the surrounding parts form a tumor, which is liable to inflame, and afford great distress." (*Hodgson on Diseases of Arteries, &c. p.* 566.) In short, all surgeons, who consider the disease as varices, admit with Sir E. Home, that in cases of long standing, the contents of hemorrhoidal tumors "coagulate and become solid; their coats increase in thickness, and they resemble pendulous excrescent tumors in other situations in the body." (*On Ulcers, &c.*) Availing himself of the extensive opportunity afforded by his dissecting room, Mr. Kirby has taken some pains to ascertain the nature of these tumors; and he observes, "I cannot say, that they seemed to be formed of a varicose distention of the great hemorrhoidal vein, even in a single instance. In every case of external hemorrhoids, the tumor appeared to be composed of a prolongation of the cellular substance in a state of unusual firmness, surrounded by some veins, and covered by the integuments. The veins were branches of the internal iliac. In every case of internal hemorrhoid, the structure was pretty similar; the veins, however, seemed enlarged, and were branches of the hemorrhoidal." (*On certain severe forms of Hemorrhoidal Excrescence, p.* 40.)

The opinion, that piles are formed of cells filled with blood, is also adopted by Dr. Ribes. The distention of the hemorrhoidal veins with blood, he observes, gives rise to varices; but, if any of their blood is extravasated in the cellular membrane, at the inferior and internal part of the anus, hemorrhoids are the result. If the inferior mesenteric vein be dissected in hemorrhoidal patients, the ramifications of the vessel are seen terminating in these cysts of blood, and, on completely removing the whole, the hemorrhoids appear suspended from the branches of the vein, as grapes from the vine. (See *Révue Méd. T.* 1, *8vo.* 1820.) Montegre, well known as the author of a copious treatise on the present subject, is the only writer who defines a hemorrhoid to be a preternatural determination of blood (*fluxion sanguine*) to the extremity of the rectum, because he conceives, that hemorrhage, swelling, &c. are accidental circumstances, not constantly attending the disease. (See *Dict. des Sciences Méd. T.* 20, *p.* 445.)

Whether the account of some piles being formed of distinct cysts or sacs of blood be correct, or not, there is no doubt, that the tumors sometimes consist of a varicose enlargement of the branches of the hemorrhoidal veins. Were this not the fact, how could cases like the following ever take place? "One of my patients (says M. Delatour) had several of these tumors of very large size, and, at every contraction of the sphincter ani, the blood issued from them *per saltum.*" (*Hist. Phil. Obs.* 212.) Montegre has likewise seen two instances, in which the blood spouted out of the tumors in a continued stream. (*Dict. des Sciences Med. T.* 20, *p.* 453.) And Richerand mentions a merchant who lived to the age of eighty-nine, quite free from infirmity, and whose good health was ascribed to periodical bleedings from piles, during fifty years of his life; the evacuation being very regular, and so profuse, that the blood was thrown some distance, as from a vein opened in phlebotomy. (See *Nosogr. Chir.*) If many piles were not either varices, or cysts in direct communication with the large veins of the rectum, Petit would not have succeeded in taking blood from them by puncture, as he often did in lieu of the ordinary mode of venesection. (*Mal. Chir. T.* 2, *p.* 134.)

Hemorrhoids vary in number, size, form, and situation; some being *external*; others, *internal*; and some hardly larger than a pea, while others exceed a hen's egg in size. Sometimes they bring on very serious complaints, either by bursting and discharging blood so profusely as dangerously to reduce the patient; or by exciting inflammation of the adjacent parts, and causing abscesses and fistulæ; or, lastly, by becoming strangulated by the contraction of the sphincter ani, so as to occasion severe pain. Piles, which bleed but little, are not of much consequence; but those which bleed profusely, cause violent pain, or which induce inflammation, and all its effects, demand the greatest attention. Lieutaud mentions a person, who lost three quarts of blood from some piles in the course of a couple of days; and both Arius, and the celebrated philosopher Copernicus, are said to have bled to death in this manner.

I do not know what credit ought to be given to the extraordinary case cited by Panaroli, in which a Spanish nobleman voided every day for four years a pint of blood from some hemorrhoids, and yet enjoyed perfect health! (See *Obs. Chir. Pentec.* 2, *Obs.* 46.) For other curious facts of this nature, see *Dict. des Sciences Med. T.* 20, *p.* 458.

As Mr. Howship remarks, hemorrhoidal tumors, when connected with inflammation, are very painful. "The patient can then neither walk, ride, nor sit; the only tolerable state being that of rest in the reclined position. Should he, during the continuance of inflammation, be obliged to pass a motion, the distress is extreme. With these symptoms, there is generally more or less feverish heat and restlessness, now and then delirium." (*On Diseases of the Lower Intestines, p.* 208, *Ed.* 3.)

In general, when piles are situated far up the rectum, they are less painful, than when low down, and sometimes the patient is not conscious of having them till he begins to void blood from the rectum. In the former case, the veins or tumors are surrounded by soft and yielding substances, which do not make any painful pressure on them; but, when they are situated towards the anus, they often suffer painful constriction from the action of the sphincter muscle. Mr. Heaviside met with two examples, where hemorrhoidal swellings were attacked with inflammation, and so violently strangulated by the spasmodic action of the sphincter ani, that the parts underwent a spontaneous mortification, and a radical cure was the result. (*J. Howship on Diseases of the Lower Intestines, &c. p,* 210, *Ed.* 3.)

With regard to the cause of hemorrhoids, any thing capable of retarding the return of blood through the hemorrhoidal veins, may occasion the disease. The pressure of the gravid uterus, costiveness, and the frequent retention of hardened feces in the rectum, are very frequent causes. Persons, who lead sedentary lives, are often troubled with the complaint. Hence, women are more subject to piles, than men.

The pressure of an enlarged liver, or of water accumulated in the cavity of the peritonæum, it is said, may occasion piles.

I have adverted to the opinion of Montegre, that hemorrhoids depend upon a determination of blood to the lower part of the rectum; which sentiment is perhaps correct in cases, where the disease arises from irritation in that bowel, or the neighbouring parts.

When these tumors are produced by the pressure of the gravid uterus, no cure can be expected till after delivery, when one generally follows spontaneously. Also, when piles are an effect of dropsy, they cannot get well before the pressure of the fluid in the abdomen has been removed by tapping. Gently laxative medicines, and an horizontal position of the body, commonly alleviate the uneasiness resulting from hemorrhoids. The application of an ointment, composed of equal parts of the powder of oak-galls, and of elder-ointment, or hog's lard, contribute to the same beneficial effect. The application of warm water by means of a bidet, or semicupium, is also frequently productive of great ease. When piles are constricted by the sphincter ani muscle, the pain may often be at once removed, by pushing the swellings up the rectum, and using fomentations, or even the warm bath. Mr. Howship, in cases where the disposition to spasm in the sphincter is connected with high irritability in the bowel, recommends the introduction of a metallic bougie for a certain length of time, the size of the instrument and frequency of repetition of the operation being duly regulated. (*On Diseases of the Lower Intestines, &c. p.* 214, *Ed.* 3.) When the disease is in a state of inflammation, leeches applied to the vicinity of the anus, and puncturing the dilated hemorrhoidal vessels, with a lancet, for the purpose of taking away blood, and the application of cold lotions, are measures occasionally employed to procure ease. The usefulness of leeches was particularly noticed by Schmucker. (*Vermischte Chir. Schriften, B.* 1, *p.* 107.) Petit preferred the lancet.

According to Mr. Howship, when there is "frequent hemorrhage from the veins within the sphincter, with perhaps little or no external tumor, one of the best means of relief is the metallic bougie, regulated by the patient's feelings, and also by the promptitude with which inflammation and consolidation take place." (*On Diseases of the Lower Intestines, &c. p.* 215, *Ed.* 3.)

When the number and size of hemorrhoids are so considerable, as materially to obstruct the discharge of the feces; when they are severely painful, and subject to profuse bleedings; when the patient is disabled from following his usual occupations: and when the above means afford insufficient relief, the surgeon should recommend their removal.

The extirpation of piles with the actual cautery and caustics, as practised by the old surgeons, is now altogether relinquished. The only plan ever followed, in the present state of surgery, is either to cut the tumors off with a pair of scissars or knife, or to apply a tight ligature round their base, so as to cause them to slough away. If possible, the opportunity of doing either of these operations should always be taken when the disease is in a tolerably quiet state.

When piles are to be cut off, and they are not sufficiently visible, the patient must first strain, as at stool, in order to make the swellings more apparent. With the aid of a pair of dissecting forceps, the skin, covering the hemorroids, is then to be separated from them with the knife, but not cut away, and the tumors being taken hold of with a tenaculum, are to be removed. Sabatier states, that saving the skin is very essential; for, any hemorrhage which may arise, can then be more easily suppressed; and, when there are several hemorrhoids to be extirpated, the loss of substance about the anus will be less, and, of course, the patient will not be so liable to a contraction of this part, which is sometimes a very great affliction.

Previously to the performance of any operation, Mr. Abernethy endeavours to bring the bowels into a more regular state, and takes care to clear them with any medicine, found by experience to answer the purpose without inducing a continuance of irritation and purging. "The bowel being everted to the utmost by the efforts used in evacuating the feces, and the parts cleansed by bathing with tepid water, the piles should be taken hold of with a double hook, and removed with a pair of scissars. A protruded and thickened plait of the bowel may be removed in the same way; but, I think it is best to use the bistoury in removing it, because the depth, to which the scissars may cut, is uncertain. The incision, made by the knife, resembles two curved lines, joined at each extremity." The direction of the incision, both for the removal of piles, and that of plaits, he says, should be longitudinal, in the direction of the bowel. When there is a transverse fold of the bowel of considerable extent, he prefers taking away two elliptical portions in the long axis of the rectum. (See *Abernethy's Surgical Works, vol.* 2, *p.* 239.)

As I have explained in the former part of this work, (see *Anus Prolapsus of,*) the late Mr. Hey used to remove these extensive diseased folds, about the verge of the anus, with great success. J. L. Petit used to follow the same practice, (*Mal. Chir. T.* 2, *p.* 134); and more recently, Mr. Kirby. (*Obs. on the Hemorrhoidal Excrescence, Lond.* 1817.)

The late Mr. Ware published some remarks, the tenor of which is to prove, that, when there are several hemorrhoids, the removal of one, or two of the most painful of them, with a pair of scissars, will afford effectual relief.

The excision of piles is occasionally followed by dangerous bleeding, as is exemplified in a case related by Petit. A patient had some hemorrhoids, which were supposed to be external, while they were only temporarily protruded. Almost immediately after they had been cut off, the skin which had supported them, was drawn inward. An internal hemorrhage ensued, which could not be suppressed, and proved fatal in less than five hours. The rectum and colon were found full of black, coagulated blood. Sir E. Home speaks also of some instances within his knowledge, where after the removal of internal piles with the knife, the bleeding endangered life. (*On Ulcers, p.* 365.)

If the bleeding should prove troublesome, and proceed from vessels within the rectum, the best plan would be to distend the gut with a suitable piece of sponge, so as to make pressure on the wound. Cold should also be applied to the sacrum and nates.

The removal of hemorrhoids, with a ligature may generally be done with sufficient safety: but, still it has its inconveniences, though they are not constant. Petit frequently practised this method, without any ill effects. In other instances, he had reason to repent of having adopted it. A woman, for whom he had tied three hemorrhoids with narrow pedicles, which were favourably situated for this operation, did not at first experience a great deal of pain. However, five hours afterwards he was informed, that she suffered violent colic pains, which extended along the colon. She was bled four times, without material relief. At last, Petit cut the ligatures, which could not be loosened, in consequence of their being concealed so deeply in the substance of the swollen parts. The pain very soon subsided. The ligatures had only been applied four-and-twenty hours, but the piles had become black, and the skin covering their bases was cut through. Petit then removed them without the least effusion of blood.

Petit also relates a case, in which a patient, after having had some piles tied, died of symptoms resembling those which take place in cases of strangulated herniæ, notwithstanding the ligatures were cut, as in the foregoing instance. After these two cases, Petit abandoned the practice of tying hemorrhoids. Mr. Kirby has mentioned two cases, proving the ill effects sometimes arising from the ligature of piles: in one of these examples, the patient's life was saved with great difficulty; and, in the other, the operation was followed by tetanus and death. (*Obs. on the Treatment of certain severe Forms of Hemorrhoidal Excrescence, p.* 1-3, *8vo. Lond.* 1817.)

Mr. Howship, who prefers the use of the ligature, observes, that, in performing the operation, it is not necessary to take up all the tumors; but, that if there are five, or six, the tying of two or three of the largest will generally produce such a change in the texture of the rest, as will secure the patient from any return of the disease. After the ligatures are detached, he discontinues the fomentations, and applies cold lotions. (*On Diseases of the Lower Intestines, &c. p.* 216, *Ed.* 3.)

I believe, on the whole, that it is best to remove hemorrhoids with a knife, unless they are situated high up the rectum, where the veins are of large size, and likely to bleed profusely. If a tumor so situated should absolutely require removal, which can rarely happen, a ligature might be put round its base with the aid of a double cannula, as is sometimes done in cases of uterine *Polypi*. When the base of the tumor, however, is large, admits of being brought into view, and the surgeon prefers tying it, he should pass a needle, armed with a strong double ligature, through the root of the hemorrhoid, and tie one part of this ligature firmly over one side of the swelling, and the other over the opposite side. When the base of the tumor is narrow, and the ligature is preferred, the part may be tied at once, without passing a double ligature through its middle.

Old hemorrhoids, which have been repeatedly in a state of inflammation, at length acquire a considerable degree of hardness. The internal membrane of the rectum becomes thickened, loses its natural softness, and forms a kind of cyst, which prevents the tumor from bursting and bleeding. (See *Theden, Progrès de la Chirurgie, sect.* 4, *p.* 73.) In the end, it ulcerates, and pours out a fetid discharge. Its size cannot now be lessened by the use of emollient applications; and its excision is indispensably necessary. (See *Lassus, Pathologie Chir. T.* 1, *p.* 336.)

An opinion has commonly prevailed, that the bleeding from piles is of a salutary, or critical nature; an evacuation, by which some peccant, or morbid matter, is thrown off from the body. Hence, many patients have been advised to submit to all the pain and uneasiness, which the disease occasions, rather than seek a cure. If the fact that some patients lose their health after their piles have been cured, be received as sufficient proof of the disease having had a salutary effect, the doctrine must remain fully established. But, before this inference should be drawn, it ought to be known, whether the frequency of the fact is such as to warrant the conclusion; for, it is not to be supposed, that the removal of piles places the patient altogether beyond the reach of disease and illness; and no one will deny, that such operation frequently leads to improvement of the health. Were a patient to appear to suffer from the cessation of an habitual bleeding from piles, leeches and even cupping-glasses might be applied.

Consult *L'Encyclopédie Méthodique, Partie Chir. Petit, Œuvres Posthumes, T.* 2. *Callisen, Systema Chirurgiæ Hodiernæ, T.* 2, *p.* 105, *Ed.* 1800. *Sabatier, De la Médecine, Operatoire, T.* 2. *Latta's System of Surgery, Vol.* 2. *Ware on the Treatment of Hemorrhoids. Truka de Krzowitz, Historia Hemorhoidum,* 3 *Vol. 8vo. Vindob.* 1794—1795. *Sir J. Earle, Obs. on Hemorrhoidal Excrescences,* 2d *Ed. 8vo. Lond.* 1807. *T. Copeland, Obs. on the Principal Diseases of the Rectum and Anus, 8vo. Lond.* 1814. *Schreger, Chirurgische Versüche, B.* 1, *p.* 253, *&c. Ueber tubuculöse Excrescenz des Afterdarms, 8vo. Nürnberg,* 1811. *John Kirby, Obs. on the Treatment of certain severe Forms of Hemorrhoidal Excrescence, 8vo. Lond.* 1817. *Abernethy on Hemorrhoidal Diseases, in his Surgical Works, Vol.* 2, *p.* 231, *&c. Lassus, Pathologie Chir. T.* 1, *p.* 331, *Ed.* 1809. *Léveillé, Nouvelle Doctrine Chir. T.* 3, *p.* 164. *Richter von der Blinden Guldnen Ader, in Ansfangsgr. der Wundarzneykunst, B.* 6, *p.* 395, *Ed.* 1802. *W. Hey, Pract. Obs. in Surgery, p.* 439, *&c. Ed.* 2, *8vo. Lond.* 1810. *Dict. des Sciences Med. T.* 20, *p.* 441, *&c. 8vo. Paris,* 1817. *Montegre, Des Hemorrhoides, ou Traité Analytique de toutes les Affections Hemorrhoidales, Nouvelle Edit. Paris,* 1819. *J. Howship on Diseases of the Lower Intestines and Anus, Ed.* 3, *8vo. Lond.* 1824. *G. Calvert on Hemorrhoids, &c. 8vo. Lond.* 1824.

HE'RNIA. (from ερνος, a branch, from its protruding forward.) Surgeons understand by the term *hernia*, a tumor, formed by the protrusion of some of the viscera of the abdomen, out of that cavity, into a kind of sac, composed of the portion of peritoneum, which is pushed before them. However, there are certainly cases which will not be comprehended in this definition; either because the parts are not protruded at all, or have no hernial sac, as the reader will learn in the course of this article.

"The brilliant progress, which surgery has made in modern times (says Scarpa) is, properly speaking, only the result of pathological anatomy; that is to say, of exact comparisons of the natural state of our organs with their different diseases, which may depend upon an alteration of texture, a derangement of functions, a solution of continuity, or a change of situation. It is from morbid anatomy, that the most rational curative methods, with which modern surgery is enriched, are deduced as so many corollaries; methods, to which we are also indebted for the perfection of operations.

"There are indeed a certain number of surgical operations, for the prompt and safe execution of which, mere anatomical knowledge will suffice; but, in many others, the surgeon cannot promise himself success, even though he be well acquainted with anatomy, unless he has particularly studied the numerous changes of position, and alterations of texture, of which the parts, upon which he is about to operate, are susceptible. If he has not the requisite information upon all these points, false appearances may deceive his judgment, and make him commit mistakes, sometimes of a very serious and irreparable kind.

"In order to have a convincing proof of this truth, it will be sufficient to take a view of the different species of herniæ, and their numerous complications. Assuredly, no anatomist would believe, that the intestine cœcum, naturally fixed in the right ilium, and the urinary bladder, situated at the bottom of the pelvis, could undergo, without being torn, so considerable a displacement as to protrude through the abdominal ring, and descend even into the scrotum; that the same intestine, the cœcum, could pass from the right iliac region to the umbilicus, protrude at this opening, and form an umbilical hernia; that the right colon could have been found protruded from the abdomen at the left abdominal ring, and the left colon through the right one; that the liver, spleen, and ovary could sometimes form the contents of umbilical, inguinal, and femoral herniæ; that the cœcum could engage itself within the colon, and even protrude at the anus; that the stomach could be forced through the diaphragm, and form a hernia within the chest; that the omentum, or intestine, or both these parts together, could sometimes escape from the belly through the foramen ovale, or sacro-ischiatic notch, of the pelvis; that a noose of small intestine, after being engaged in the abdominal ring, or under the femoral arch, could suffer the most violent strangulation, without the course of the intestinal matter being intercepted; lastly, that, in certain circumstances, the intestine and omentum could be in immediate contact with the testicle, within the tunica vaginalis, without the least laceration of this latter membrane. These and several other analagous facts, says Scarpa, are so surprising, that they would yet be regarded as incredible, had they not been proved by numerous observations on individuals affected with hernia: their possibility (repeats this experienced professor) would not even have been suspected either by the anatomist, or physiologist." (See *Scarpa, Traité des Hernies, Pref.*)

The parts of the body, where herniæ most frequently make their appearance, are the groin, the navel, the labia pudendi, and the upper and forepart of the thigh: they do also occur at every point of the anterior part of the abdomen; and there are several less common instances, in which hernial tumors present themselves at the foramen ovale; in the perinæum; in the vagina; at the ischiatic notch, &c.

The parts, which, by being thrust forth from the cavity, in which they ought naturally to remain, mostly produce herniæ, are either a portion of the omentum, or a part of the intestinal canal, or both together. But the stomach, the liver, spleen, uterus, ovaries, bladder, &c. have been known to form the contents of some hernial tumors. The small intestine is more frequently protruded than the large, and the ileum more frequently than the jejunum, in consequence of its greater proximity to the ring and crural arch. A part only of the diameter of the tube is sometimes included in a hernia; any larger quantity may descend from a single fold to the whole moveable portion of the canal. (See *Lawrence on Ruptures, p.* 5, *Ed.* 4.)

From these two circumstances of situation and contents, are derived all the different appellations, by which herniæ are distinguished. If a portion of intestine alone forms the contents of the tumor, the case is called *enterocele;* if a piece of omentum only, *epiplocele;* and if both intestine and omentum contribute to the formation of the tumor, it is called an *entero-epiplocele.* When the contents of a hernia protrude at the abdominal ring, but only pass as low as the groin, or labium pudendi, the case receives the name of *bubonocele,* or *inguinal hernia*; but, if the parts descend into the scrotum, it is called an *oschcocele* or *scrotal hernia.* The *crural,* or *femoral hernia,* is the name given to that which takes place below Poupart's ligament. When the bowels protrude at the navel, the case is named an *exomphalos,* or *umbilical hernia;* and *ventral* is the epithet given to the swelling, when it occurs at any other promiscuous part of the front of the abdomen. The *congenital rupture* is a very particular case, in which the protruded viscera are not covered with a common hernial sac of peritoneum, but are lodged in the cavity of the tunica vaginalis, in contact with the testicle, and, as must be obvious, it is not named, like herniæ in general, from its situation, or contents, but from the circumstance of its existing from the time of birth.

When the protruded bowels lie quietly in the sac, and admit of being readily put back into the abdomen, the case is termed a *reducible hernia;* and, when they suffer no constriction, yet cannot be put back, owing to adhesions, or their large size in relation to the aperture, through which they have to pass, the hernia is termed *irreducible.* An *incarcerated* or *strangulated hernia,* signifies one, which not only cannot be reduced, but suffers constriction; so that, if a piece of intestine be protruded, the pressure, to which it is subjected, stops the passage of its contents towards the anus, excites inflammation of the bowel, and brings on a train of alarming, and often fatal, consequences.

The causes of herniæ are either *predisposing* or *exciting.* Amongst the former, writers mention a preternaturally large size of the openings, at which the bowels are liable to protrude; a weakness and relaxation of the margins of these apertures; a preternatural laxity of the peritoneum; an unusually long mesentery, or omentum, &c. With regard to the abdominal ring, the transverse tendinous fibres, which naturally cross and strengthen its upper and outer part, are much weaker in some subjects than others. No idea seems more prevalent in books, than, that taking a good deal of oil with our food, is conducive to the formation of hernial diseases. Some of the alleged predisposing causes, may justly excite scepticism; but, several circumstances tend to prove, that a natural deficiency of resistance, in any part of the parietes of the abdomen, promotes the occurrence of hernia. Hence, persons who have had the peritoneum wounded, are very liable to the present disease; (*Richerand, Nosogr. Chir. T.* 3, *p.* 317; *Schmucker, Vermischte. Chir. Schriften, B.* 1, *p.* 197,) and men are much more liable, than women, to inguinal hernia, evidently from the larger size of the abdominal ring; while, in women, as there is a larger space for the protrusion of the viscera, below Poupart's ligament, they are more exposed, than men, to femoral herniæ.

With regard to the *exciting* causes, our knowledge is involved in less doubt. The grand cause of this kind, is the powerful action of the abdominal muscles and diaphragm on the viscera. In feats of agility, such as jumping, &c. the pressure which the contents of the abdomen must often encounter, sufficiently accounts for their protruding at any part, where the abdominal parietes do not make adequate resistance. The same consideration explains, why herniæ very often take place in lifting and carrying heavy weights, running, vomiting, straining at stool, parturition, &c. and in people who inhabit mountainous countries.

The diminution of the capacity of the abdomen, by the action of the abdominal muscles and diaphragm, in many occasional exertions, must take place in every body, by reason of the common habits and necessities of life. But, as only a certain number of persons meet with the disease, it is fair to infer, that, either the exciting causes must operate with greater force in them, than in the generality of people, or else that their abdominal parietes have not been capable of the ordinary degree of resistance. Many patients, who meet with herniæ, in making violent efforts and exertions, may be in the former circumstance; while others, whose viscera protrude from such trivial things as coughing, sneezing, crying, &c. must be considered, as being under the influence of some predisposing cause. A gentleman, who has gained great honour by a most valuable treatise on hernia, remarks, that, "herniæ, which originate in predisposition, generally come on gradually, and almost imperceptibly; while those which are produced by bodily exertions, are formed suddenly, and by the immediate action of the exciting cause. The occurrence of the complaint is often indicated, in the first instance, by a fulness combined with a sense of weakness, about the abdominal ring. The swelling is increased by any action of the respiratory muscles, and disappears on pressure, and in the recumbent position of the body. It gradually finds its way through the tendon of the external oblique muscle, into the groin, and afterwards into the scrotum. When a hernia takes place suddenly, it is generally attended with a sensation of something giving way at the part and with pain." (*Lawrence on Ruptures, p.* 42, *Edit.* 4.)

Upon the subject of the immediate cause of herniæ, it is observed by Scarpa, that several distinguished modern surgeons, as for instance, Warton, (*Adenograph. cap.* 11,) Benevoli, (*Dissertazioni Chirurgische*, 1,) Rossius, (*Acta Nat. cur. T.* 2, *Obs.* 178,) Brendel, (*de herniarum natalibus*,) and Morgagni, (*de sed. et caus. morb. epist.* 43, *art.* 13,) consider a relaxation and elongation of the mesentery as the principal cause of herniæ in general, and of the bubonocele in particular. Hence, say they, the whole mass of intestines, or only a portion of an intestine, descends against the inner orifice of the inguinal ring, presses against this opening, and gradually makes its way out of the abdomen. In examining this pathological point without prejudice, it is incontestable, says Scarpa, that an intestine cannot be moved beyond its natural limits, unless that part of the mesentery, which retains and fixes the bowel in its proper place, be at the same time elongated. But, it does not follow from this, that a relaxation of the mesentery must precede the displacement of the intestine. It appears to Scarpa much more probable, that these two events are simultaneous, and depend upon one and the same cause.

"In the healthy state, the abdomen, considered altogether, is submitted to two opposite forces, which reciprocally balance each other. One is the pressure of the viscera against the abdominal parietes; the other is the reaction of these same parietes upon the viscera, which they contain. If these two forces were in perfect equilibrium in all individuals, and under all the circumstances of life, we should not be in the least subject to herniæ. If, when the equilibrium has been broken, every point of the parietes of the belly were to yield equally to the impulse of the viscera, an increase of the volume of the whole abdomen would be the consequence; but, a true hernia would never happen. The cavity of the abdomen is always completely full. The containing and contained parts react upon, and reciprocally compress, one another. It is by the effect of this moderate, but equal and unremitting pressure, that all the viscera mutually support each other. Without it, the ligaments of the liver, those of the spleen, and the various membranous bands of the intestines in general, would only be feeble means for fixing such parts in their respective situations. But, there are certain points of the abdominal parietes which naturally present much less resistance than others, and which react with much less power against the pressure made from within outwards by the abdominal viscera. Such is particularly the part, which extends from the pubes to the anterior superior spinous process of the ilium. This relative weakness of some points of the abdominal parietes is very marked in certain individuals, in consequence of a defect of organization. It may also be increased by internal or external causes which are as various as they are numerous. When, in one of these cases, the pressure made by the viscera is unusually increased, as happens in a violent effort, a defect in the equilibrium between the two forces above mentioned is occasioned; that is to say, the reaction of the abdominal parietes is no longer proportioned, at least at certain points, to the force of the impulse of the viscera. The conjoined powers of the abdominal muscles, diaphragm, and levator ani, are then directed and concentrated against the most feeble point of the abdomen, towards which they propel the nearest viscus, or that, which, from its moveableness, is the most liable to displacement. If such viscus should happen to be the noose of an intestine, it is evident, that the power, which tends to make it protrude from the belly, must at the same time act upon the corresponding portion of the mesentery; and the intestine, in passing through the parietes of the abdomen, drags the mesentery after it, and makes this membrane yield and become elongated. When the displaced viscera meet with little resistance on the part of the parietes of the abdomen, the hernia is quickly formed, and the elongation of the mesentery occurs with equal celerity. We have an example of this in the inguinal congenital hernia; in this case, the intestine is, in some measure, precipitated into a sac previously prepared for its reception. On the contrary, in the ordinary inguinal hernia, a totally different disposition of the parts renders the progress of the disease much slower. In most instances, the hernia is not formed immediately the equilibrium between the impulse of the viscera and the reaction of the abdominal parietes, is broken. But in the groin, a slight elevation is first observed, in the direction from the anterior superior spinous process of the ilium towards the inguinal ring. Some time afterwards, when the intestine has made its appearance on the outside of the ring, the enlargement of the hernia, and the elongation of the mesentery, make much more rapid, though always simultaneous progress."

"Numerous practical observations, (says Scarpa,) concur in proving, that we must not search for the immediate cause of herniæ in the relaxation of the mesentery, but rather in a want of equilibrium between the pressure of the viscera and the resistance of one or several points of the abdominal parietes. Indeed, herniæ are seen occurring from the slightest causes in infants, in whom the neck of the tunica vaginalis is not speedily obliterated, and in individuals, who, from being fat, have all on a sudden become extremely thin. Such women as have had children, are more subject to the disease than others. Persons also of both sexes, who carry considerable burdens, or who play upon wind instruments, or who have suffered a forcible contusion of the abdomen, are particularly exposed to the disorder, even though there is not the least reason for suspecting in them a relaxation of the mesentery. Vaginal herniæ which arise after difficult labours, afford another proof of the same truth; their cause is owing to a laxity and weakness of the parietes of the vagina, which, not being capable of making any further resistance to the pressure of the viscera, situated in the cavity of the pelvis, at length suffer these parts to protrude.

"With respect to the second proposition, that during the formation of a hernia, the combined force of all the abdominal muscles is, as it were, directed and concentrated against the most feeble point of the parietes, we see a proof of it in a fact that occurs to our observation every day. In order to convince ourselves of this, we need only notice what happens in individuals afflicted with herniæ: if they cough, or sneeze, or make the slightest effort, they instantly find the size of the swelling increased, and hasten to support the part with their hand. During the slightest efforts, which render the herniæ larger, it is also indisputable, that the mesentery is elongated in the same proportion as the intestine protrudes. All the viscera have such a tendency to be displaced and carried towards the weakest point of the parietes of the abdomen, that even those, which are naturally the most distant from it, and are the most firmly fixed by the folds of the mesentery, may in their turn descend into the herniæ. Anatomical knowledge alone would never have led us to have a suspicion of the possibility of these occurrences. Sandifort and Paletta have found, in an umbilical hernia, the cœcum, with a portion of the ileum and colon. (*Obs. Pathol. cap.* 4, *and Nova Gubernaculi Testis Descriptio.*) Mauchart, Camper, and Bose, have met with the cœcum in an inguinal hernia of the left side. (*De Hern. Incarc. in Halleri Disput. Chirurg. Tom.* 3. *Demonstrat. Anat. Patholog. lib.* 2, *p.* 18, *et Animadvers. de Hern. Inguin. p.* 5.) Lassus has seen the left colon protrude at the right inguinal ring. (*Médecine Opératoire, T.* 1, *p.* 173.) If it be proved by all these facts, that such viscera, as are the most closely united to the great sac of the peritoneum and neighbouring parts, are nevertheless liable to form herniæ; and if such displacements cannot happen without a considerable elongation of the membranous bands fixing these bowels in their natural situation, how can we refuse to admit, that a noose of intestine, pushed by degrees through the inguinal ring, drags along with it the corresponding portion of the mesentery? In order to explain this event, there is no necessity for supposing a partial relaxation of the mesentery." (*Traité Pratique des Hernies, par A. Scarpa, trad. de l'Italien, p.* 37—43.)

The same causes, which first produced the complaint, or others of an analogous nature, as Mr. Lawrence has noticed, are constantly tending to promote its increase. The tumour becomes larger, in proportion as the pressure against the hernial sac is stronger, and more frequent. Hence, the great size, which it often attains in persons constantly pursuing laborious occupations. Its increase will also be in proportion to the less considerable resistance of the parts, in which it is situated. Hence the magnitude of scrotal ruptures, and the generally small size of a femoral hernia. The size of a hernia is likewise in part dependent upon the largeness and weakness of the opening, through which the protrusion happens. Hence, inguinal ruptures are usually much larger than those called femoral, or crural. The looseness of the cellular connexion of the peritoneum, is another cause of the disposition of a hernia to attain a considerable magnitude; while the shortness and closeness of the same uniting medium, operate in particular cases as a check to the enlargement of the tumor, as is exemplified in herniæ of the linea alba, which are generally small. When the sac, after it has passed the parietes of the abdomen, is situated among cellular, or adipous substance, it expands equally in all directions, and forms a nearly spherical tumor, being however generally rather flattened, as in umbilical and crural herniæ. If it protrude through a canal, it is nearly cylindrical, as in incipient inguinal herniæ, and even in those, which have passed the ring, and are still confined by the sheath of the spermatic cord. The fundus of the sac enlarges as it descends into the scrotum, and thus, in almost all scrotal cases, the swelling becomes pyriform. Irregularities of shape often take place from the extension of the membrane in directions presenting the least resistance. At the first moment of the occurrence of a hernia, of sudden formation, the protruded peritoneum is unconnected to the parts, amongst which it lies; but, adhesions take place so quickly, that the sac is found universally connected to the contiguous parts, even in a rupture of two or three days' standing. These adhesions prevent the return of the sac into the abdomen, when the contents of the swelling are replaced. The peritoneum, which immediately surrounds the protruded viscera, generally retains the same thin and delicate structure, which characterizes that membrane in its natural situation. It is covered by other investments, varying in thickness and structure, according to the part in which the swelling is formed, and the size and duration of the tumour, &c. (See *Lawrence on Ruptures, p.* 18, *&c. Ed.* 4.)

Many interesting circumstances, in relation to hernial sacs, have been satisfactorily explained by Cloquet: and some of them are noticed in Mr. Lawrence's work. "If the causes, which have produced the hernia, continue to operate, and further descent of the peritoneum be prevented by its strong adhesion to the tendinous opening, the sac becomes thin by distention. It may give way partially by a kind of laceration, and thus become irregular in figure, presenting an appearance of small cysts, or secondary cavities. On the contrary, when the neck does not adhere so strongly, and the mouth of the sac forms a thickened ring, the renewed action of pressure may make the ring descend, and a fresh one will form at the new mouth of the sac. This process may be again repeated; and thus the sac presents one or more constrictions, by which the protruded parts may be compressed, and even strangulated. Inguinal and scrotal ruptures are almost the only cases, in which this occurrence can take place. When a hernia passes through a canal, a thickened ring may be formed at both orifices of the canal. If a hernial sac has been formed, and its mouth become thickened, a new protrusion may take place by the side of it: this may occur again; and thus, we may have sacs composed of two lateral cavities, or consisting of two or more secondary openings into one principal protrusion; or, the original serous cavity may be contracted, and form a small appendix to the subsequent protrusion." (See *Lawrence on Ruptures, p.* 26, and *Cloquet's Recherches sur les Causes, &c. des Hernies.*)

Herniæ are more frequent on the right, than on the left side of the body. This fact, as Mr. Lawrence has remarked, does not depend on any disparity in size, between the apertures of the two sides, but must be referred to the employment of the right side in those offices of life, which require the most powerful exertion. (On *Ruptures, p.* 33, *Ed.* 4.) This subject has been particularly considered by Cloquet. (See *Recherches sur les Causes et l'Anatomie des Hernies Abdominales, p.* 10, *&c.* 4*to. Paris,* 1819.)

The general symptoms of a hernia, which is reducible, and free from strangulation, are, an indolent tumor at some point of the abdomen, most frequently descending out of the abdominal ring, or from just below Poupart's ligament, or else out of the navel; but, occasionally, from various other situations, as will be presently explained. The swelling often originates suddenly, except in the circumstances above related, and it is subject to a change of size, being smaller when the patient lies down on his back, and larger when he stands up, or holds his breath. It frequently diminishes when pressed, and grows large again when the pressure is removed. Its size and tension often increase after a meal, or when the patient is flatulent. In consequence of the unnatural situation of the bowels, many patients with hernia are occasionally troubled with colic, constipation, and vomiting. Sometimes, however, the functions of the viscera seem to suffer little or no interruption.

Sometimes the contained parts may be known by the symptoms. But, as Mr. Lawrence justly remarks, this discrimination is often difficult, and even impossible, when the hernia is old, large, and very tense; for, in cases of this description, the viscera experience considerable changes in their figure and state, while the thickened hernial sac prevents an accurate examination by the hand. (*On Ruptures, p.* 46, *Ed.* 4.)

If the case be an *enterocele,* and the portion of intestine be small, the tumor is small in proportion; but, though small, if the gut be distended with wind, inflamed, or have any degree of stricture made on it, it will be tense, resist the impression of the finger, and give pain upon being handled. On the contrary, if there be no stricture, and the intestine suffer no degree of inflammation, let the prolapsed piece be of what length it may, and the tumor of whatever size, the tension will be little, and no pain will attend the handling of it; upon the patient's coughing, it will feel as if it were blown into; and, in general, it will be found very easily returnable. (*Pott.*) A guggling noise is often made when the bowel is ascending. An enterocele is also generally characterised by the uniformity of its surface, and its elasticity.

If the hernia be an *epiplocele,* or one of the omental kind, the tumor has a more flabby, and a more unequal feel; it is in general perfectly indolent, is more compressible, and, (if in the scrotum) is more oblong, and less round, than the swelling occasioned in the same situation by an intestinal hernia; and, if the quantity be large, and the patient adult, it is, in some measure, distinguishable by its greater weight. In very young subjects, the contents of a hernia are generally intestine, and but very seldom omentum. (*A. Cooper, Lancet, Vol.* 2, *p.* 111.)

If the case be an *entero-epiplocele,* that is, one consisting of both intestine and omentum, the characteristic marks will be less clear, than in either of the simple cases; but, the disease may easily be distinguished from every other one, by any body in the habit of making the examination. (*Pott, p.* 28.)

As the smooth slippery surface of the intestine generally makes its reduction easier, than that of the omentum, we may infer, with Mr. Lawrence, "that, if a portion of the contents slip up quickly and with noise, leaving behind something which is less easily reduced, the case is probably an entero-epiplocele." (*Op. cit. Ed.* 4, *p.* 47.)

On the subject of prognosis, Mr. Pott remarks, that the age and constitution of the subject, the date of the disease, its being free, or not free from stricture, or inflammation, the symptoms which attend it, and the probability or improbability of its being returnable, necessarily produce much variety.

If the subject be an infant, the case is not often attended with much difficulty or hazard, the reduction being easy as well as the descent; and though from neglect, or inattention, the bowel may fall down again, yet, it is as easily replaced, and mischief seldom produced: Mr. Pott says seldom, because he has seen an infant, one year old, die of a strangulated hernia, which had not been down two days, with all the symptoms of mortified intestine. For other examples of strangulated hernia in very young infants, refer to *Gooch's Chir. Works*, *Vol.* 2, *p.* 33; *Lawrence on Ruptures*, *p.* 77, *Edit.* 4; *Edinb. Med. and Surgical Journal*, *Vol.* 3, *p.* 470, &c.

"If the patient be adult, and in the vigour of life, the consequences of neglect, or of maltreatment, are more to be feared than at any other time, for reasons too obvious to need relating. The great and principal mischief to be apprehended, in an intestinal hernia, is an inflammation of the gut, and an obstruction to the passage of the aliment and fæces through it; which inflammation and obstruction are generally produced by a stricture made on the intestine. In very old people, the symptoms do not usually make such rapid progress, both on account of the laxity of their frame, and their more languid circulation; and also because their ruptures are most frequently of ancient date, and the passage a good deal dilated; but then, on the other hand, it should also be remembered, that they are by no means exempt from inflammatory symptoms; and that if such should come on, the infirmity of old age is no favourable circumstance in the treatment, which may become necessary." (*Pott.*)

If the disease be recent, and the patient young, immediate reduction, and constant care to prevent another protrusion, are the only means whereby it is possible to obtain a perfect cure.

"If the disease be of long standing, has been neglected, or suffered to be frequently down, and has given little or no trouble, the aperture in the abdominal muscle, and the neck of the hernial sac, may both be presumed to be large; which circumstances in general render immediate reduction less necessary and less difficult, and also frustrate all rational expectation of a perfect cure. On the contrary, if the rupture be recent, or, though old, has generally been kept up, its immediate reduction is more absolutely necessary, as the risk of stricture is greater from the supposed smallness of the aperture, and narrowness of the sac. If the rupture be very large and ancient, the patient far advanced in life, the intestine not bound by any degree of stricture, but does its office in the scrotum regularly, and no other inconvenience be found to attend it, but what proceeds from its weight, it will in general be better not to attempt reduction, as it will, in these circumstances, most probably prove fruitless, and the handling the parts in the attempt, may so bruise and injure them as to do mischief."

With respect to the correctness of the advice here delivered, some doubt may be entertained, because, though it would certainly not be right to protract the attempts at reduction, so as to do mischief, it must be equally wrong to make no trial, whether the hernia is reducible or not; and, if reducible, I should say, that it ought to be reduced without delay, and a truss applied. This opinion, however, seems to agree with the injunctions delivered by Pott in another place, as will be seen in the next section of this article.

With regard to the contents of a hernia, Mr. Pott observes, that "if it be a portion of omentum only, and has been gradually formed, it seldom occasions any bad symptoms, though its weight will sometimes render it very troublesome. But, if it be produced suddenly, by effort or violence, that is, if a considerable piece of the caul by accident slip down at once, it will sometimes prove painful, and cause very disagreeable complaints; the connexion between the omentum, stomach, duodenum, &c. being such as to render the sudden descent of a large piece of the first sometimes productive of nausea, vomiting, colic, and all the disagreeable symptoms arising from the derangement of these viscera. When the piece of caul is engaged in such a degree of stricture as to prevent the circulation of blood through it, it will sometimes, by becoming gangrenous, be the occasion of very bad symptoms, and even of death, as I have more than once seen: and thus, as a mere omental hernia, it may sometimes be subject to great hazard. But even though it should never be liable to the just mentioned evil, that is, though the portion of the caul should remain uninjured in the scrotum, yet it renders the patient constantly liable to hazard from another quarter; it makes it every moment possible for a piece of intestine to slip into the same sac, and thereby add to the case all the trouble and all the danger arising from an intestinal rupture. It is by no means an uncommon thing for a piece of gut to be added to a rupture, which had for many years been merely omental, and for that piece to be strangulated, and require immediate help.

"An old omental hernia is often rendered not reducible, more by an alteration made in the state of the prolapsed piece of caul, than by its quantity. It is very common for that part of the omentum, which passes through the neck of the sac, to be compressed into a hard, smooth, body, and lose all appearance of caul, while what is below in the scrotum is loose and expanded, and enjoys its natural texture; in this case, reduction is often impossible, from the mere figure of the part: and I have so often seen this, both in the living and the dead, that I am satisfied, that for one omental rupture, rendered irreducible by adhesions, many more become so from the cause above-mentioned.

"In the sac of old omental ruptures that have been long down, and only suspended by a bag-truss, it is no very uncommon thing to have a pretty considerable quantity of fluid collected: this, in different states and circumstances of the disease, is of different colour and consistence, and seldom so much in quantity as to occasion any particular attention to it; but, on the other hand, it sometimes is so much in quantity as to become an additional disease to the original one. I have more than once been obliged to let it out, in order to remove the inconvenience arising from its weight, and the distention of the scrotum, which I have also seen become gangrenous by the neglect of this operation.

"If the hernia be of the intestinal kind merely, and the portion of gut be small, the risk is greater, strangulation being more likely to happen in this case, and more productive of mischief, when it has happened: for the smaller the portion of gut is which is engaged, the tighter the tendon binds, and the more hazardous is the consequence. I have seen a fatal gangrene, in a bubonocele, which had not been formed forty-eight hours, and in which the piece of intestine was little more than half an inch."

Another observation made by Pott is, that "if the hernia be caused by a portion of the intestine ilium only, it is in general more easily reducible, than if a part of the colon has descended with it, which will also require more address and more patience in the attempt. The reduction of a mere intestinal hernia too (*cæteris paribus*) will always remain more practicable, than that of a mere omental one, after it has attained to a certain size and state, as the part contained within the former is liable to less alteration of form than that within the latter: which alteration has already been mentioned as no infrequent hinderance of the return of an old caul-rupture.

"Not that the parts within a mere intestinal hernia are absolutely exempt from such an alteration as may render their return into the belly impracticable, even where there is no stricture; for, (says Pott,) I have seen that part of the mesentery, which has lain long in the neck of the sac of an old rupture, so considerably hardened and thickened, as to prove an insuperable obstacle to its reduction."

Upon the whole, this author infers, that an intestinal rupture is subject to worse symptoms, and a greater degree of hazard, than an omental one, though the latter is, by no means, so void of either as it was formerly supposed to be; that bad symptoms are more likely to attend a recent rupture, than one of ancient date; that the descent of a very small piece of intestine is more hazardous than that of a larger; and that the hernia, which consists of gut only, is in general attended with worse circumstances, than that which is made up of both gut and caul. (See also *Lawrence on Ruptures, p.* 75, 76, *Ed.* 4.)

Mr. Hey coincides with Pott, in thinking the prognosis more unfavourable when the tumor is small. "I think it is not a bad general rule, that the smaller the hernia, the less hope there is of reducing it by the taxis. Long-continued efforts to reduce a prolapsed intestine, are most likely to succeed in old and large hernias, when no adhesions have taken place." (*Pract. Observ. in Surgery, p.* 203.)

It is correctly remarked by Mr. Lawrence, that "the danger is greatest, when a rupture is incarcerated at the moment of its formation. Herniæ, which arise spontaneously, and, merely from predisposing weakness, seldom become strangulated: the stricture, in such cases, is never close, nor are the symptoms violent, because the parts concerned are weak and relaxed.

"The opening through which the parts protrude is narrower in some situations than in others; the progress of the case will therefore be more rapid, and the danger of the patient more urgent. The aperture is generally very small in femoral hernia; this kind of rupture in men, and the bubonocele in women, have a particularly narrow entrance. On the same grounds, femoral, inguinal, and umbilical, ruptures are more dangerous, than the ventral, perineal, or vaginal kinds. (*Treatise on Ruptures, p.* 75, *Ed.* 4.)

TREATMENT OF A HERNIA CAPABLE OF EASY AND IMMEDIATE REDUCTION, AND NOT ATTENDED WITH ANY TROUBLESOME OR BAD SYMPTOMS.

"This case," says Pott, "is very frequently met with in infants, and sometimes in adults, and is too often neglected in both. In the former, as the descent seldom happens but when the infant strains to cry, and the gut is either easily put up, or returns *suâ sponte*, as soon as the child becomes quiet, it often is either totally unattended to, or an attempt made to restrain it only by a bandage made of cloth, or dimity, and which being ineffectual for such purpose, lays the foundation for future trouble and mischief.

"This is, in great measure, owing to a common opinion, that a young infant cannot wear a steel truss; a generally prevailing error, and which ought to be corrected. There is no age at which such truss may not be worn, or ought not to be applied; it is, when well made, and properly put on, not only perfectly safe and easy, but the only kind of bandage that can be depended upon; and as a radical cure depends greatly on the thinness of the hernial sac, and its being capable of being so compressed as possibly to unite, and thereby entirely close the passage from the belly, it must therefore appear to every one who will give himself the trouble of thinking on the subject, that the fewer times the parts have made a descent, and the smaller and finer the elongation of the peritoneum is, the greater the probability of such cure must be.

"The same method of acting must, for the same reasons, be good in every age, in which a radical cure may reasonably be expected; that is, the prolapsed parts cannot be too soon returned, nor too carefully prevented from falling down again: every new descent rendering a cure both more distant and more uncertain.

"As soon as the parts are returned, the truss should be immediately put on, and worn without remission, care being taken, especially if the patient be an infant, to keep the parts upon which it presses constantly washed, to prevent galling.

"It can hardly be necessary to say, that the surgeon should be careful to see that the truss fits, as his success and reputation depend on such care. A truss which does not press enough, is worse than none at all, as it occasions loss of time, and deceives the patient, or his friends; and one which presses too much, or on an improper part, gives pain and trouble, by producing an inflammation and swelling of the spermatic chord, and sometimes of the testicle.

"In adults, whose ruptures are of long standing, and accustomed to frequent descent, the hernial sac is generally firm and thick, and the aperture in the tendon of the abdominal muscle large; the freedom and ease with which the parts return into the belly when the patient is in a supine posture, and the little pain which attends a rupture of this kind, often render the persons who labour under it careless: but all such should be informed, that they are in constant danger of such alteration in their complaint, as may put them into great hazard, and perhaps destroy them. The passage from the belly being open, the quantity of intestine in the hernial sac is always liable to be increased, and when down, to be bound by a stricture. An inflammation of that portion of the gut which is down, or such obstruction in it as may distend and enlarge it, may at all times produce such complaints as may put the life of the patient in imminent danger;

and therefore, notwithstanding this kind of hernia may have been borne for a great length of time, without having proved either troublesome or hazardous, yet as it is always possible to become so, and that very suddenly, it can never be prudent or safe to neglect it.

"Even though the rupture should be of the omental kind, (which considered abstractedly is not subject to that degree or kind of danger to which the intestinal is liable) yet it may be secondarily, or by accident, the cause of all the same mischief; for while it keeps the mouth of the hernial sac open, it renders the descent of a piece of intestine always possible, and consequently always likely to produce the mischief which may proceed from thence.

"They who labour under a hernia thus circumstanced, that is, whose ruptures have been generally down while they have been in an erect posture, and which have either gone up of themselves, or have been easily put up in a supine one, should be particularly careful to have their truss well made, and properly fitted for the mouth of the sac, and the opening in the tendon being both large and lax, and the parts having been used to descend through them, if the pad of the truss be not placed right, and there be not a due degree of elasticity in the spring, a piece of intestine will, in some posture, slip down behind it, and render the truss productive of that very kind of mischief which it ought to prevent." (See *Truss.*)

Mr. Pott then comments upon the importance of having the parts completely reduced before the truss is applied, and upon the danger that may be incurred by laying such bandage aside after it has been worn some time; since the partial closure of the ring, whereby the descent of the gut is rendered less easy, will also make the reduction more difficult, if a piece should happen to slip down; and hence he insists, that a truss "should be long and unremittingly worn by all those, whose time of life makes the expectations of a perfect cure reasonable, many of the ruptures of adults being owing to the negligent manner, in which children at school are suffered to wear their trusses."

Besides, the danger of strangulation, and the loss of all chances of a radical cure, when a reducible hernia is neglected, and allowed to remain down, there are other motives for keeping up the tumor, with a truss, and preventing its increase of size. The vast size, to which neglected herniæ sometimes increase, not only prohibits all active exertion, but, by involving, in the male, the integuments of the penis, incapacitates the subject from the act of copulation, and gives rise to excoriation from the discharge of the urine over the swelling. Probably too, the testis may be affected by the pressure of a very large scrotal hernia. (*Morgagni de Caus. et Sed. Ep.* 33, *Art.* 12; *Schmucker Vermischte Chir. Schriften*, *B.* 3, *p.* 195.) Disorders of the intestinal functions invariably attend these large ruptures, and increase in frequency and violence in proportion to the size of the swelling, and age of the patient. All the moveable viscera of the abdomen gradually find their way into the hernial sac, if a rupture be entirely neglected. (*Lawrence on Ruptures*, *p.* 80. *Edit.* 4.)

TREATMENT OF IRREDUCIBLE HERNIÆ, FREE FROM INFLAMMATION, AND UNATTENDED WITH TROUBLESOME OR DANGEROUS SYMPTOMS.

Mr. Pott, and all the best writers on ruptures, ascribe the incapacity of reduction, in most cases, either to the largeness of the quantity of the contents, an alteration made in their form and texture, or to adhesions, which they have contracted with each other or their containing bag. The reduction is also sometimes prevented by transverse membranous bands within the sac.

Mr. Pott was also aware, that ruptures are sometimes rendered difficult to be reduced, by the cœcum being contained in the hernial sac. Of this fact, he was as much convinced as the nature of such kind of things would permit; that is, by observations made both on the living and the dead. This statement, made by Pott many years back, deserves particular notice, because its truth is confirmed by the modern observations of Scarpa, whose very important explanations of the cause of the difficulty of reduction, may be seen in the second vol. of the First Lines of Surgery.

Mr. Pott has adverted to the kind of impediment to reduction, produced by the thickening of the neck of the sac, when the hernia is long neglected, and suffered to remain in the scrotum, without any bandage to support its weight.

The same author reckons an alteration produced by time, and constant, though gentle, pressure, in the form and consistence, or texture of the omentum, as no infrequent cause, why neglected omental ruptures become irreducible.

When a portion of omentum "has been suffered to remain for a great length of time in the scrotum, without having ever been returned into the belly, it often happens, that, although that part of it, which is in the lower part of the hernial sac, preserves its natural soft, adipose, expansile state, yet all that part which passes through what is called the neck of the sac is, by constant pressure, formed into a hard, firm, incompressible, carnous kind of body, incapable of being expanded, and taking the form of the passage in which it is confined, exactly filling that passage, and rendering it impossible to push up the loose part which fills the scrotum.

"The same reason for incapacity of reduction is also sometimes met with in ruptures of the intestinal kind, from an alteration produced on that part of the mesentery which has been suffered to lie quiet for a great length of time in the neck of an old hernial sac.

"The other impediment, which I mentioned to the return of old ruptures, is the connexion and adhesion of the parts, either with each other, or with the bag containing them. This is common to both the intestinal and omental hernia, and is produced by slight inflammations of the parts, which have been permitted to lie long in contact with each other, or perhaps in many cases from the mere contact only. These adhesions are more or less firm in different cases, but even the slightest will almost always be found an invincible objection to the reduction of the adherent parts, by the hand only.

"Many, or perhaps most, of these irreducible ruptures, become so by mere time and neglect, and might at first have been returned: but when they are got into this state, they are capable of no relief from surgery but the application of a suspensory bag, to take off, or lessen the inconvenience arising from the weight of the scrotum.

"People in this situation should be particularly careful not to make any attempts beyond their strength, nor aim at feats of agility; they should take care to suspend the loaded scrotum, and to keep it out of the way of all harm from pressure, bruise, &c. When the tumor is very large, a soft quilted bolster should be worn at the bottom of the suspensory to prevent excoriation, and the scrotum should be frequently washed for the same reason; a loss of skin in this part, and in such circumstances, being sometimes of the utmost importance. They ought also to be particularly attentive to the office of the intestinal canal, to see that they do not by any irregularity of diet disorder it, and keep themselves from being costive." Mr. Pott observes, however, that the quiet, inoffensive state of this kind of hernia is by no means to be depended upon; many things may happen to it, by which it may be so altered, as to become hazardous, and even fatal: an inflammation of that part of the gut which is down, any obstruction to the passage of the aliment or feces through it, a stricture made by the abdominal tendon, either on what has been long down, or on a new portion which may at any time be added to it, are always capable of so altering the state of the case, as to put the life of the patient into danger.

"Indeed the hazard, arising from a stricture made on a piece of intestine contained in the sac of an old irreducible hernia, is in one respect greater, than that attending one that has been found at times reducible; since from the nature of the case it will hardly admit of any attempt toward relief, but the operation, which in these circumstances must necessarily be accompanied with additional difficulty.

"Among the ruptures, which have been thought not reducible, and treated as such, there have been some which, upon more judicious and more patient attempts, have been found capable of reduction.

"When this is suspected to be the case, the proper method is by absolute rest, in a supine posture, for a considerable length of time, by great abstinence, and the use of evacuants, so as to lessen the size of the parts in the hernial sac, and render them capable of passing back again into the belly." (*Pott on Ruptures.*)

Fabricius Hildanus gives an account of a man, who was radically cured of a rupture, of twenty years' date, by six months' confinement to bed. (*Cent.* 5, *Obs.* 54.)

Le Dran and Arnaud relate instances of monstrous bubonoceles, which disappeared entirely, after the patients had been long confined to bed, and rendered much emaciated by tedious illnesses. Some of the moderns have imitated this operation of nature, and by frequent bleedings, and repeated purges, have sometimes so far reduced the size of the hernia, that it has been returned into the abdomen. Mr. Hey has several times succeeded in this way. (*P.* 219.) But, the practice cannot prove successful, when the viscera adhere to the sac, or to the peritoneum, just within the abdomen. The greatest objection to this method of cure, is the want of an absolute criterion for distinguishing, when the parts do, or do not adhere to the hernial sac, and, in advanced years, though one were sure that the viscera were free from the sac, the possibility of hurting the body by the necessary evacuations, is also another objection. (*Sharp's Critical Enquiry*, *p.* 15.)

Were the plan to be thought worthy of trial, keeping up a constant pressure on the tumor, by means of a suspensory bandage, made to lace in front, would be proper for promoting the absorption of the thickened parts in the hernial sac. Sir A. Cooper has reduced such herniæ, after applying ice to them; the good effects of which he imputes to its producing a contraction of the scrotum, and thus a strong and permanent compression of the tumor. Mr. Earle informed me of a method of keeping up a general pressure on the swelling, by means of a bladder containing quicksilver, the quantity of which can be regulated, according to circumstances.

Whenever any attempts of this kind succeed, a truss should be immediately put on, and worn without remission.

However, there are instances on record, where the capacity of the abdomen had become so adapted to the diminished quantity of the viscera, that when the contents of the hernia were reduced, serious complaints arose from their introduction into the belly. Schmucker met with several such cases, in which he was obliged to take off the truss again. Petit has known the reduction of a hernia of this kind prove fatal, the parts not descending again, when the truss was removed, the nausea and vomiting continuing, and peritonitis taking place. (*Chirurgische Wahrnehmungen*, *Vol.* 2, *p.* 243. *Traité des Maladies Chir.*, *T.* 2, *p.* 392.)

Mr. Pott remarks, that "an omental rupture, which has been so long in the scrotum as to have become irreducible, is very seldom attended with any bad symptoms, considered abstractedly; but, it is constantly capable of being the occasion of an intestinal hernia, and all its consequences; neither is that all, for the omentum, either so altered in form and texture, or so connected as to be incapable of reduction, may by accident inflame, and either become gangrenous, or suppurate, and the occasion of a great deal of trouble." In a few instances, epiploceles produce very bad symptoms indeed; cases of which are to be found in Garengeot, Dionis, &c.

Sometimes, in old cases of entero-epiplocele, the intestine is reducible, but the omentum is not; in which case some writers advise keeping up the piece of bowel with a truss, the pad of which must be so contrived as not to press on the omentum. Mr. Pott, however, considers this method not often practicable, and, should such a truss be used, he recommends great caution in its construction and application, lest a small piece of gut slip down, and, being pressed on by the truss, produce fatal mischief.

"Irreducible herniæ must of course be exposed to all the consequences of external injury and violence; hence, various cases are recorded, in which the bowels have been burst by blows, falls," &c. (*Lawrence on Ruptures*, *p.* 131, *Edit.* 4.)

For examples of such accidents, Mr. Lawrence refers to *A. Cooper on Hernia*, *Part* 2, *Pref. p. 2; and to Travers's Enq. into the Process of Nature, &c. p. 37.* A case is also quoted from Scarpa, *p.* 310, where a violent exertion caused a sudden return of a hernia which had been long regarded as cured. The viscera lay in the tunica vaginalis, which was burst to the extent of an inch.

SYMPTOMS AND TREATMENT OF A STRANGULATED, OR AN INCARCERATED, HERNIA.—MEANS TO BE TRIED BEFORE AN OPERATION.

"Difficulty of reduction (says Pott) may be owing to several causes. The size of the piece of omentum, or the inflamed state of it; the quantity of intestine and mesentery, an inflammation of the gut, or its distention by feces, or wind: or the smallness of the aperture of the tendon, through which the hernia passes. But, to whatever cause it be owing, if the prolapsed body cannot be immediately replaced, and the patient suffers pain, or is prevented thereby from going to stool, it is called an *incarcerated hernia*, *a strangulated hernia*, or *a hernia with stricture.*

"The symptoms are a swelling in the groin, or scrotum, resisting the impression of the fingers: if the hernia be of the intestinal kind, it is generally painful to the touch, and the pain is increased by coughing, sneezing, or standing upright. These are the very first symptoms, and, if they are not relieved, are soon followed by others, viz. a sickness at the stomach, a frequent retching, or inclination to vomit, a stoppage of all discharge per anum, attended with a frequent, hard pulse, and some degree of fever."

A patient, thus circumstanced, is in some danger, and demands immediate assistance. A stricture, made on the prolapsed part of the gut, by the aperture, through which it passes, is the immediate cause of all the bad symptoms, and of course, the removal of such stricture is the only thing which can bring relief. This object can only be accomplished by returning the bowel back into the abdomen, or dividing the parts, which form the stricture. The former plan is always the most desirable, when practicable.

We next proceed to notice the various measures to be adopted for the relief of a strangulated hernia, so as to obtain the best chance of doing away the necessity of an operation. After treating of the merits of each plan, a few remarks will be offered on the order, in which the means should be put in practice.

Taxis.—This is the term applied to the operation of reducing a hernia with the hand. It is much promoted by the position of the body; which Winslow thought should be placed on an inclined plane, and the thighs bent towards the trunk. Sir A. Cooper advises the same practice, observing, that this posture, by relaxing the fascia of the thigh, relaxes also the aperture, through which the hernia passes. Every degree of tension, and relaxation of the femoral fascia, must undoubtedly be attended with a corresponding change in the abdominal ring. But, flexion of the thigh, besides relaxing this fascia, also relaxes the abdominal, internal iliac, and psoas muscles. In cases of inguinal hernia, the pressure made on the tumor by the hands of the surgeon, should always be directed upwards and outwards, along the course of the spermatic cord; and Sir A. Cooper advises it to be continued from a quarter to half an hour. (*On Inguinal and Congenital Hernia.*)

As the femoral hernia passes downwards, and then forwards, the pressure must be directed first backwards, and then upwards. In umbilical and ventral herniæ, it is to be made straight backwards. No violence should ever be used; for, besides being unavailing, it greatly aggravates the inflamed state of the contents of the hernial sac, and has been known even to burst the intestine. (See *Cooper on Inguinal Hernia, &c. p.* 23.)

Besides bending the thigh, care should also be taken to rotate it inwards, which will have great effect in relaxing the femoral fascia, and tendon of the external oblique muscle. Suspension of the patient over the shoulders of an assistant has been thought to facilitate reduction: "I have tried it often, (says Mr. Hey), but have not found it to be of such superior efficacy, as some authors have represented." (*P.* 144.)

The manœuvre of gently pulling the intestine downwards, or a little way further out of the ring, previously to the attempt to reduce the hernia, has been suggested. (See *Balfour's New Mode of the Taxis, in Med. and Phys. Journ. Nov.* 1824.) The plan, I believe, is not entirely new, and it is noticed by Mr. Lawrence; who says, that it will sometimes succeed, when the difficulty of reduction is owing to an accumulation of fecal matter.

The return of a piece of intestine is generally preceded by a peculiar noise, caused by the passage of air through the stricture. It recedes at first gradually, and then slips up suddenly. The omentum goes up slowly to the very last portion, which must be actually pushed through the opening. If the taxis should not succeed at first, it will often do so after the warm bath, bleeding, or cold applications. Small herniæ, being attended with the closest stricture, are the most difficult to reduce, and, for the same reason, crural ruptures do not so often yield to the taxis, as inguinal herniæ in the male subject. The taxis becomes less likely to succeed, the longer the inflamed viscera have been down, because adhesions are liable to form. Mr. Lawrence observes, (*p.* 63.) "When the rupture becomes painful, we are no longer justified in persevering in attempts at reduction by the hand. A sufficient pressure cannot now be endured; and the force which is employed only tends to increase the inflammation, and accelerate the approach of gangrene. *At this period, the operation is required, and should be performed without delay.*" Desault even proscribed the taxis altogether in the inflammatory strangulation, until the previous use of other means had produced a change in the state of the swelling.

That the taxis is frequently abused, and the cause of serious mischief, is a truth which cannot be doubted. "Strangulated herniæ, (says Scarpa) very frequently mortify from the negligence of the patients, and their repugnance to submit to an operation; and, perhaps, still more frequently from the effect of the taxis, unskilfully exercised by uninformed surgeons, who are determined, at any price whatsoever, to accomplish the speedy reduction of the viscera. The majority of them make no distinction between the *acute* and the *chronic* strangulation. In both cases, no sooner are the symptoms of strangulation evinced, than they begin to handle the swelling roughly, and to push the viscera with all their force, in order to make them return into the abdomen; whilst, when the strangulation is *acute*, and the patient young and strong, the taxis ought never to be practised, before all the means proper for diminishing the strength, calming spasm, and relaxing the parts, which are to be reduced, have been employed for a certain time. These means, we know, are bleedings, fomentations, emollient glysters, and especially, the warm bath, which, next to bleeding, holds the first rank. At this school of surgery, I have frequently had opportunities of observing the salutary effect of this treatment. My pupils have, more than once, seen herniæ, which had been painfully handled without any good, reduced, as it were, spontaneously, after a bleeding, or whilst the patient was in the bath. If, what I have said upon the subject of the *acute* strangulation, and the treatment that it requires, were generally known by surgeons, I think, that operations for strangulated herniæ would be less frequent. Things are different, with regard to the *chronic* strangulation of old large herniæ, in feeble, or aged persons; for, in these cases, it is of great importance to support the patient's strength. Bleeding, the warm bath, and other weakening means, should also be avoided, which, in producing a general atony, might bring on gangrene of the intestine, either during the strangulation, or after the reduction of the viscera. It is ascertained, that these kinds of strangulation are almost always occasioned by an accumulation of fecal matter, or an extraordinary quantity of air in the hernia. Nothing is more efficacious than cold applications, for promoting the action of the bowel on the matter, which distends it, or for lessening the volume of the air. They produce a corrugation of all the scrotum, and contractions of the cremaster, which alone sometimes suffice for reducing the viscera, in a much better manner, than could be done by the hands of the most experienced surgeon." (*Scarpa*, *Traité des Hernies*, *p.* 244—247.)

Bleeding.—The inflammation, which attacks the protruded viscera, and spreads thence over the whole abdomen, and the temporary weakness and often fainting, which the sudden loss of blood induces, and which is a peculiarly favourable opportunity for reducing the herniæ by the hand, are the reasons in favour of bleeding. Sharp, Pott, B. Bell, Sabatier, Richter, Callisen, and Scarpa, names which can never be surpassed in respectability, are all subscribed in favour of bleeding. Wilmer, Alanson, and Sir A. Cooper, have published against the practice. Mr. Hey has related two cases, which strongly evince the manner, in which bleeding facilitates the return of a hernia: the protruded viscera, in one instance, went up spontaneously, on blood being taken away; in the other, the taxis succeeded immediately afterwards, though the previous attempt had been made in vain. (*P.* 125, 126.) Mr. Hey's experience, however, leads him to concur so far with Wilmer and Alanson, as to declare, that bleeding has generally failed to procure a reduction of the strangulated intestine, though he is persuaded that, in many cases, it may be used with advantage. But he cannot agree with Wilmer, that it generally renders the subsequent operation more dangerous. (*P.* 126.)—The majority of candid practitioners, I believe, will allow, that bleeding is always proper, when the hernia is small and recent; the abdomen tense and painful; and the patient young, strong, and plethoric.

Purgative Medicines.—My experience, (says Mr. Hey,) leads me to condemn almost universally the use of purgatives, while an intestine remains firmly strangulated. In the entero-epiplocele, when the intestine has retired, and the omentum remains strangulated; or in a simple strangulation of the omentum, where the intestine has not been prolapsed, purgatives are of great utility. So likewise in very large and old hernias, where there is reason to doubt, whether the disease is not to be considered as a morbid affection of the intestinal canal, rather than the effect of strangulation, purgatives may be as useful as in the simple ileus without hernia. While the intestine remains firmly strangulated, they usually increase the vomiting, and add to the distress of the patient. If they are to be tried at any time with hope of success, the trial would appear to have the greatest advantage when the vomiting has been removed by means of an opiate; yet I have repeatedly given them in vain during such an interval of relief. (*Practical Observations in Surgery*, *p.* 128.)

Purgatives are supposed to operate by exciting the peristaltic action of the intestine, and thereby extricating it from the stricture. Besides the above eminent surgeon, Pott and Richter have joined in their general condemnation, and, to all appearances, with very great reason. Purgative glysters certainly have not the objection of increasing the irritation; but, their efficacy is not deserving of much confidence. Mr. Hey says, that he has never seen one case, in which either purgative, or emollient glysters produced a return of a strangulated hernia. Such injections will empty the large intestines; but, they do no more. It is common also for a natural evacuation to be the immediate consequence of strangulation. (*P.* 131.)

Warm Bath.—" Many instances (says Hey) are upon record of the good effect of warm bathing in procuring the reduction of a strangulated hernia. I have often seen it useful; but I have also often seen it fail. Whenever it is used in this disease, the patient should be placed, if possible, in a horizontal position. Gentle efforts with the hand to reduce the prolapsed part are perhaps attended with less danger, and with greater prospect of success, while the patient lies in the bath, than in any other position. The free use of opiates coincides with that of warm bathing, and under some circumstances, these means deserve to be tried in conjunction." (*P.* 132.)

Cold Bath, and Cold Applications.—The cold bath, and dashing of cold water on the patient, are little to be depended on, though success has sometimes been obtained in this manner. (*Petit*, *Traité des Chir.* *T.* 2, *p.* 325; *Hey*, *p.* 136.)

Wilmer strongly recommended the application of cold to the tumor itself, and this plan has acquired the approbation of the most celebrated modern surgeons. It is generally tried in conjunction with the effect of tobacco glysters, which will be presently noticed. Cold applications, in the form of ice, were indeed particularly recommended by B. Bell. The best way is to pound the ice, tie it up in a bladder, and place it on the rupture. When ice cannot be procured, Sir A. Cooper employs a mixture of equal parts of nitre and muriate of ammonia. To one pint of water, in a bladder, ten ounces of the mixed salts are to be added. "If, after four hours, (says this distinguished surgeon) the symptoms become mitigated, and the tumor lessens, this remedy may be persevered in for some time longer; but, if they continue with unabated violence, and the tumor resist every attempt at reduction, no farther trial should be made of the application." (*On Inguinal and Congenital Hernia.*) When ice is not at hand, æther sometimes proves a good substitute, when allowed to evaporate from the surface of the swelling.

Care must be taken, that the cold be not so applied as to freeze the scrotum, and bring on sloughing. (*A. Cooper*, *p.* 15.)

Opiates.—Mr. Hey met with several cases, in which opiates, given freely, (in athletic persons after bleeding) procured a reduction of strangulated hernia.

He cannot say, however, that this remedy is generally successful; but, it has the advantage of removing, for a time, the pain and vomiting usually attendant on strangulation, even though it prove ultimately inefficacious. Opiates should be given in large doses, when it is wished to try their effect in procuring reduction; and whenever the symptoms of strangulation return, after having been removed by opiates, the operation should be performed without delay. (*P.* 134, 135.)

Tobacco Glysters.—For this purpose, some surgeons prefer a decoction of tobacco, made by infusing, or boiling, one dram of the plant, for ten minutes, in a pint of water; others employ the smoke, which is prepared, and introduced into the rectum, by means of an apparatus sold at almost every surgical instrument maker's. Perhaps, both methods are equally efficacious; but, as one requires an apparatus, while the other does not, and is equally proper, the decoction may be entitled to most recommendation. The machine for the smoke is also frequently out of order. Next to the operation, tobacco glysters are the most certain means of bringing about the reduction of the strangulated parts. Besides exciting the action of the intestines, they exert a peculiar depressing influence on the whole system, reducing the pulse, and causing nausea and sickness, cold sweats and fainting, under which circumstances, the parts often recede spontaneously, or may be easily reduced. Sir A. Cooper prudently advises injecting half the above quantity at first; for, he has seen two drams, and even one, when used as an infusion, and introduced at once, prove fatal. (*P.* 24.) The rest should be injected presently, when it appears that the tobacco does not operate with the extraordinary violence, with which it does in a few particular constitutions.

A case, published by Mr. C. Bell, looks to me very much like an example of the occasional poisonous effects of the tobacco clyster, though not reported as such by the author. At least, no particulars of any fatal mischief either in the tumor, or abdomen, are detailed, and it is remarked of the patient; "His strength held up until the tobacco clyster was administered to him, after which, he very suddenly fell low, and sunk." (*Surgical Obs., Part* 2, *p.* 189.) The smoke proved fatal in an instance witnessed by Desault, (*Œuvres de Chir. T.* 2, *p.* 344,) and an infusion of ʒij. to ℥viij. of water seemed to produce sudden mortal effects in another example on record. (*Edinb. Med. and Surgical Journ. Vol.* 9, *p.* 159.)

Poultices and Fomentations have not the confidence of any experienced, or intelligent surgeon. Whoever, in these urgent cases, wastes time, in trying the effects of such applications, merits censure for his credulity, ignorance, and unfitness to undertake the treatment of a rapid disease, in which, as Pott remarks, if we do not get forward, we generally go backward; and whatever does no good, if it be at all depended upon, certainly does harm, by occasioning an irretrievable loss of time.

OF THE ORDER, IN WHICH THE PRECEDING METHODS AND REMEDIES SHOULD BE TRIED, AND OF THE TIME, WHEN THE OPERATION SHOULD NOT BE DELAYED.

In the treatment of a strangulated hernia, a surgeon cannot be too deeply impressed with the danger of spending time in the trial of methods of inferior efficacy, or of such as are evinced to be ineffectual in the cases before them.

The rapidity, with which gangrenous mischief sometimes arises, and the patient loses his life, has been proved in a multitude of unfortunate examples, and should operate as a warning to all practitioners against the danger of deferring the operation too long. In the course of my reading, however, I have not met with so remarkable an instance of the sudden mortification, and rapidly fatal termination of a hernia, as the following case recorded by Baron Larrey, in speaking of the fatiguing and forced marches performed by the French soldiers in Egypt. These marches, he says, brought on in one case, "a hernia which formed suddenly, and became at the same time strangulated. The man was immediately brought to my ambulance; but, a spontaneous gangrene, which had all on a sudden attacked the intestine, and extended to the other abdominal viscera, caused the patient's death in the space of two hours, and made it impossible for me to do the operation for him. This is the second example, that I have been acquainted with, in which the effects of the accident were thus rapid." (*Larrey, in Mém. de Chirurgie Militaire, T.* 1, *p.* 196.)

The taxis is generally among the first things to be tried, and Sir A. Cooper thinks the attempts should be continued for a quarter, or half an hour. When these have been ineffectual, the patient, if the circumstances do not forbid, should be immediately bled, and have a large opening made in the vein, so that the suddenness of the evacuation may be most likely to bring on fainting, The taxis should then be tried again.

When the strangulation is very *acute*, and the patient young and strong, perhaps, it may be most advisable to follow the advice delivered by Scarpa and Desault, which is to bleed the patient, and put him in the warm bath, before the taxis is attempted at all.

If bleeding alone has been practised, and the manual efforts at reduction should not now succeed, the warm bath may be employed, *provided it can be got ready in a very short time*, but none should ever be lost in waiting for it to be prepared. When the bath is used, the taxis may be attempted, as the patient lies in the water; a situation, in which I have succeeded in reducing several herniæ.

Certainly not more than one hour should ever be allotted for putting in practice the first attempts at reduction, bleeding, and the warm bath.

The plan should be, while the trial of one thing is going on, another should be preparing; so when the preceding measures have been tried in vain, the application of a bladder filled with ice, or the solution of nitre and muriate of ammonia, and the injection of tobacco, in the form of smoke, or decoction, should never be delayed for want of due previous preparation of all the requisites. Both these measures should be practised at the same time, immediately after the failure of the taxis, bleeding and the warm bath. Sir A. Cooper computes, that four hours are enough for the trial of the tobacco glyster, together with cold applications.

In omental herniæ, the necessity for operating may frequently be obviated, by the good effects of bleeding, purgative medicines, and glysters, and leeches applied to the tumor. Mr. Lawrence has justly observed, that "when, as it very frequently happens, the aid of the surgeon is not required, until the complaint has lasted for some time, a trial of the tobacco, together with the topical use of cold, should be immediately resorted to, as circumstances will not admit of delay in the previous use of less powerful remedies." (*P.* 148, *Edit.* 3.)

Every man who has seen much of herniæ, will immediately recognise the propriety of the following sentiments of the experienced Mr. Hey.

"I can scarcely press in too strong terms the necessity of an early recourse to the operation, as the most effectual method of preserving life in this dangerous disease. If Mr. Pott's opinion be true, that the operation, when performed in a proper manner, and in due time, does not prove the cause of death oftener than perhaps once in fifty times; it would undoubtedly preserve the lives of many, to perform it almost as soon as the disease commenced, without increasing the danger by spending much time in the use of means, which cannot be depended upon for a cure.

"I have twice seen this disease prove fatal in about twenty-four hours. In such cases, it is evident there is little time for delay. A surgeon, who is competent to perform the operation, is not perhaps consulted till the intestine is on the point of being mortified, or is actually in a state of mortification. The dilemma into which he is then cast, is painful indeed. But, when the fullest opportunity is afforded him of using the best mode of treatment, I am satisfied that his success will be the greatest when the operation is not long delayed. This at least, has been my own experience. When I first entered upon the profession of Surgery in the year 1759, the operation for the strangulated hernia had not been performed by any of the surgeons in Leeds. My seniors in the profession were very kind in affording me their assistance, or calling me into consultation when such cases occurred; but we considered the operation as the last resource, and as improper until the danger appeared imminent. By this dilatory mode of practice, I lost three patients in five, upon whom the operation was performed. Having more experience of the urgency of the disease, I made it my custom, when called to a patient who had laboured two or three days under the disease, to wait only about two hours, that I might try the effect of bleeding (if this evacuation was not forbidden by some peculiar circumstances of the case) and the tobacco glyster. In this mode of practice, I lost about two patients in nine, upon whom I operated. This comparison is drawn from cases nearly similar, leaving out of the account those cases in which a gangrene of the intestine had taken place.

"I have now, at the time of writing this, performed the operation thirty-five times; and have often had occasion to lament, that I had performed it too late, but never, that I had performed it too soon. There are some cases so urgent, that it is not advisable to lose any time in the trial of means to produce a reduction. The delay of a few hours may cut off all hope of success, when a speedy operation might have saved the life of the patient." (*P.* 141, *&c.*)

To determine the exact moment, when to give up the trial of the preceding measures, and to have immediate recourse to the operation, is certainly difficult; but, no one can doubt that it is generally better to operate too early, than too late.

All directions must be general ones, liable to many exceptions: in rapid cases, little or no time should be allotted to the trial of any plan, and the operation should be done, without the least delay. In other instances, we have full time to try the effects of every thing at all likely to succeed. The symptoms, which ought to guide us, in having recourse to the operation, arise from an attack of inflammation in that part of the intestine contained in the hernial sac, and from its spreading into the abdominal cavity. It is in proportion to their violence, that we ought to urge the performance of the operation. Sir A. Cooper considers pain on pressing the belly, and tension, as the symptoms, which point out its immediate necessity. He adds, "indeed, there is scarcely any period of the symptoms, which should forbid the operation; for, even if mortification has actually begun, the operation may be the means of saving life, by promoting the ready separation of gangrenous parts." (*On Inguinal and Congenital Hernia, p.* 27.)

Whenever the surgeon has succeeded in reducing the parts, without having recourse to the knife, if the symptoms of pain, inflammation, &c. ran high before such reduction, they will not always cease immediately afterwards. As they probably depend on the reduced bowel having been inflamed by the stricture, the body should be kept open, and the diet and regimen should be low and sparing, whilst the least degree of pain and tension remain; in short, till all complaint is absolutely removed from the abdomen, and the intestines do their office freely, and without trouble. (*Pott.*)

PROGRESS OF THE SYMPTOMS OF A STRANGULATED HERNIA.

The earliest symptoms have been already related, viz. "tumor in the groin, or scrotum, attended with pain, not only in the part, but all over the belly, and creating a sickness and inclination to vomit, suppression of stools, and some degree of fever. These are the first symptoms, and, if they are not appeased by the return of the intestine, that is, if the attempts, made for this purpose, do not succeed; the sickness becomes more troublesome, the vomiting more frequent, the pain more intense, the tension of the belly greater, the fever higher, and a general restlessness comes on, which is very terrible to bear. When this is the state of the patient, no time is to be lost; a very little delay is now of the utmost consequence, and if the one single remedy, which the disease is now capable of, be not administered immediately, it will generally baffle every other attempt. This remedy is the operation, whereby the parts engaged in the stricture may be set free. If this be not now performed, the vomiting is soon exchanged for a convulsive hiccough, and a frequent gulping up of bilious matter; the tension of the belly, the restlessness, and fever having been considerably increased for a few hours, the patient suddenly becomes perfectly easy, the belly subsides, the pulse from having been hard, full, and frequent, becomes low, languid, and generally interrupted; and the skin, especially that of the limbs, cold and moist; the eyes have now a languor and a glassiness, a lack lustre not easily to be described; the tumor of the part disappears, and the skin covering it, sometimes changes its natural colour for a livid hue; but whether it keeps or loses its colour, it has an emphysematous feel, a crepitus to the touch, which will easily be conceived by all who have attended to it, but is not so easy to convey an idea of by words: this crepitus is the too sure indicator of gangrenous mischief within. In this state, the gut either goes up spontaneously, or is returned with the smallest degree of pressure; a discharge is made by stool, and the patient is generally much pleased at the ease he finds; but this pleasure is of short duration, for the hiccough and the old sweats continuing and increasing, with the addition of spasmodic rigors and subsultus tendinum, the tragedy soon finishes." (*Pott.*)

According to Sir Astley Cooper, one of the earliest symptoms of a strangulated hernia, is pain about the diaphragm, followed by continual eructation. The patient is next troubled with vomiting and costiveness. He feels a great inclination to have stools, but cannot succeed in his attempts to expel the feces. There is somepain in the swelling, and a great deal at the part where the stricture is situated. Afterwards the abdomen becomes considerably distended with air, such distention not arising at first from inflammation, but from the cause here mentioned, as is proved by pressure on the abdomen not giving at first any pain. The vomiting becomes more frequent, and feculent matter is ejected from the stomach; into which it is brought by what is called the antiperistaltic action of the bowels. A clyster will sometimes bring away a portion of feculent matter, but the quantity will be extremely small. While the abdomen is in this tense state, but unaccompanied with pain, and while there is frequent vomiting of the feces, the pulse is hard, frequent, and very distinct; but, in the next stage of the symptoms, when the abdomen is not only tense, but painful on being touched, the pulse is extremely small and frequent. The vomiting and eructation continue, and the patient is pale and covered with a cold perspiration. The tumor becomes very tense, hard, and in general a little inflamed on the surface of the skin. With respect to the hiccough which now succeeds, and which has usually been considered as a sign of the presence of gangrene, Sir Astley Cooper declares, that it is now known not to be so, patients having had it for many hours, and yet recovered after the operation. Hiccough sometimes continues several days, after the latter proceeding, and in this case, bleeding does more good than any other measure. (See *Lancet*, *Vol.* 2, *p.* 120.)

ANATOMY OF INGUINAL HERNIA.

This subject must necessarily precede the account of the operation, which would otherwise be unintelligible. It is chiefly in the anatomical information, relative to hernia, and in the mode of operating, that modern surgeons have a decided superiority over their predecessors; for, before Gimbernat, Camper, Hey, Lawrence, Cooper, Scarpa, Hesselbach, Langenbeck, and Cloquet, published their several works on hernia, the anatomy of the disease was only imperfectly understood.

The tendinous fibres of the aponeurosis of the external oblique muscle, as they run downwards and forwards towards the pubes, separate from each other so as to leave a triangular opening, called the abdominal ring, which is usually more capacious in the male than the female subject. The upper and inner pillar (as it is termed) of this aperture is inserted into the symphysis of the pubes, and is the weakest of the two; the lower and outer one, which is the strongest, is chiefly a continuation of Poupart's ligament, (*Hesselbach, über den Ursprung, &c. der Leisten- und-Schenkelbrüche, p.* 4,) and is fixed into the angle and crista of the same bone. Some tendinous fibres cross the upper and outer angle of the ring, so as to diminish the triangular appearance of the whole aperture: these are said to be very strong in old herniæ. The anterior and thicker layer of the aponeurosis of the internal oblique muscle joins the tendon of the external oblique; the posterior and thinner one joins that of the transversalis; but the lower portion of this tendon, together with the corresponding part of the transversalis, goes wholly in front of the rectus muscle. Thus, the inferior border of the obliquus internus and transversalis, which originates from the upper part of Poupart's ligament, lies behind the outer pillar of the abdominal ring. Sir A. Cooper first noticed, that a thin fascia proceeds from the inner edge of Poupart's ligament, and spreads over the posterior surface of the transversalis. This fascia forms the only partition between the peritoneum and the outer opening of the abdominal ring, and were it not for its existence, inguinal herniæ would probably be much more frequent. The partition in question, however, is said by Scarpa to be formed by the aponeuroses of the internal oblique and transverse muscles; while Hesselbach, who has named the small smooth point, situated directly behind the outer opening of the abdominal ring, its *crural surface*, distinctly states, that it is formed by delicate fleshy and tendinous fibres of the internal oblique muscle; (*Ueber den Ursprung, &c. de Leistein-und-Schenkelbruche, p. 4,*) and, that behind them, is the weakest part of what he names the *internal inguinal ligament*, in the rear of which is the peritoneum, with the intervention of a very loose cellular substance. (*Op. cit. p. 26.*) The *internal inguinal ligament*, of Hesselbach, is therefore clearly the same thing as the above fascia pointed out by Sir A. Cooper. This point of the abdomen is one of the three weak places on the inside of the inguinal region, where herniæ are liable to occur; yet, weak as it appears to be, it is not the most common situation of such tumors. A computation has been made that, in a hundred cases of inguinal hernia, not ten occur at the point here specified. (*H. J. Brünninghausen, Unterricht über die Brüche, &c. Wurzb.* 1811.) Mr. Lawrence observes, that if we trace the fascia transversalis from the crural arch upwards, we shall find it divided immediately into two portions, an internal and external, which leave between them a considerable interval just in the middle of the crural arch. The former of these, which is the strongest, and most decidedly fibrous, is connected by its inner edge to the outer margin of the rectus, and to the inferior margin of the tendon of the obliquus internus and transversus; and both are gradually lost above, between the peritoneum and transversus. (*On Ruptures, Ed. 4, p.* 179.)

The spermatic vessels, joined by the vas deferens, run in front of the epigastric artery, very near the place of its origin. They then pass through the above fascia, go under the edge of the internal oblique and transverse muscles, and next obliquely downwards, and forwards, between the above fascia, and aponeuroses of the external oblique muscle to the opening of the ring. When arrived on the smooth surface, immediately behind the ring, they describe an obtuse angle, and pass forwards and downwards into the scrotum. (*Hesselbach, Op. cit. p.* 5.)

Thus we see, that the spermatic cord, before it actually emerges at what is named the abdominal ring, runs through a kind of canal, to which the epithet *inguinal* is often applied. This oblique passage of the cord, through the abdominal parietes, was well known to, and elegantly delineated by Albinus; Gimbernat makes distinct mention of it in his *Account of a new Method of Operating for Femoral Hernia, p.* 19, 32; but Sir A. Cooper has the merit of having given the earliest correct account of the inguinal canal, in reference to hernia; a subject rendered complete by the more recent elucidations of Hesselbach, Scarpa, and Langenbeck.

The abdominal ring is then only the outer opening of the canal or passage, through which the spermatic cord passes before it emerges. The inner one, at which the viscera first protrude in the most common cases of inguinal hernia, is situated about an inch and a half from the abdominal ring, in the direction towards the anterior superior spinous process of the ilium; or, according to Hesselbach, the inguinal canal is almost an inch and a half in length, the average distance of the outer pillar of the abdominal ring, from the inner pillar of what he terms the posterior ring, being about sixteen lines. (*Op. cit. p.* 14.) This inner opening is rather nearer the pubes, than the ilium, and its upper border is formed by the lower edge of the internal oblique and transverse muscles, which can be plainly felt with the finger, introduced upward and outward into the abdominal ring.

"The precise point, at which the hernia most commonly begins, (says Scarpa,) is that which corresponds, in the fœtus, to the communication of the tunica vaginalis with the peritoneum, and, in the adult, to the passage of the spermatic cord under the transverse muscle. In the sound state, the peritoneum presents at this part a small funnel-like depression, the depth of which increases in proportion as the spermatic cord is pulled from above downwards. It is this small pouch, this sort of digital appendage, whose progressive augmentation constitutes the hernial sac. Resting upon the anterior surface of the spermatic cord, it first makes its appearance under the inferior edge of the transverse muscle; thence it extends itself in the separation of the inferior fleshy fibres of the internal oblique muscle, always following the spermatic cord, in front of which it is situated; and after having in this manner passed through the whole of the canal, which extends from the iliac region to the pubes, it lastly protrudes at its external orifice, which is the inguinal (or abdominal) ring, properly so called. In all this track, the hernial sac, as well as the spermatic cord, is situated above the femoral arch, the direction of which it follows. The canal which it traverses, is of a conical shape, the apex of which is towards the flank, and the base at the external orifice of the ring." (*Scarpa, Traité des Hernies, p.* 44, 45.)

The epigastric artery runs behind the spermatic cord, along the inner margin of the internal opening of the above canal, then upwards and inwards, so as to pass at the distance of half an inch, or an inch from the upper extremity of the outer opening, or abdominal ring.

In common cases of inguinal hernia, the viscera, protruded at the inner opening of the inguinal canal, lie over the spermatic cord, and form a tumor on the outside of the abdominal ring.

When the viscera have entered the above described digital pouch of the peritoneum, but do not protrude through the abdominal ring, the case is sometimes termed an *incomplete inguinal hernia*; and *complete* when they pass out of that opening. The viscera may continue for a long while quite within the inguinal canal, and even become strangulated there; sometimes, also, they are prevented from passing further towards the ring by some kind of impediment; and, in this circumstance, if the hernial sac have any addition made to its contents, it may expand between the external and internal oblique muscles, as Hesselbach had an opportunity of seeing in the body of a female. (*Ueber den Ursprung, &c. der. Leisten-und Schenkelbrüche, p.* 28.) The stricture may take place either at the internal or external opening of the inguinal canal. In recent and small herniæ, according to Sir A. Cooper, the strangulation is most frequently situated at the inner opening; in large old ruptures, at the abdominal ring. Even when the parts completely protrude out of the latter opening, the strangulation may exist at the inner one: but, there may occasionally be two strictures, viz. one at each opening. (See *Lawrence on Ruptures, p.* 183, *Edit.* 3.)

The hernial sac descends through the abdominal ring over the spermatic cord, and is covered by a fascia, sent off from the tendon of the external oblique muscle. Beneath this fascia, the cremaster muscle is also situated over the sac, which, after it has descended a certain way, lies on the tunica vaginalis, as well as the spermatic cord.

As the epigastric artery naturally runs first behind the spermatic cord, and then along the inner margin of the internal opening of the ring, and as the viscera are protruded over the cord, they must be situated on the outer side of the artery, which runs first behind the neck of the sac, and then on its inner side. Hence, the inner margin of the sac, when inspected on the side towards the abdomen, seems to be formed, as it were, by the track of the vessel. (See *Lawrence, p.* 179.) That this is the ordinary situation of the epigastric artery, in relation to the inguinal hernia, is confirmed by the concurrent testimonies of Camper, Chopart, Desault, Sabatier, Sir A. Cooper, Hesselbach, Scarpa, &c. and by preparations to be seen in almost every museum.

In recent inguinal herniæ, the internal and external openings of the ring are at some distance from each other, the first being situated obliquely upwards and outwards in relation to the former; but, the pressure of the protruded viscera, gradually forces the internal opening more towards the pubes, and nearer to the abdominal ring, so as to render the posterior side of the neck of the hernial sac, and of the inguinal canal, very short. (*Hesselbach, p.* 29.) Thus, in large herniæ of long standing, the opening into the abdomen is almost direct, and the epigastric artery becomes situated nearer the pubes, than in the natural state.

Though such is the ordinary direction, in which a bubonocele protrudes, there are occasional varieties. In one of these, the viscera, instead of descending through the canal of the ring, are at once thrust through the abdominal ring itself, and the opening into the belly is then direct; the hernial sac, instead of passing on the external side of the spermatic vessels, as is usual, now lies on their inner, or pubic side; and the epigastric artery, which is commonly situated behind, now pursues its course, in front of the sac, at its usual distance from the upper and outer angle of the abdominal ring.

The following is Scarpa's description of the displacement of the epigastric artery in the greater number of cases of inguinal hernia: "This artery, which, in the natural state, runs about ten lines from the abdominal ring, has its situation and direction so changed, in subjects affected with hernia, that it crosses the posterior part of the neck of the hernial sac, and is pushed from the outer to the inner side of the abdominal ring. In order to comprehend the reason of this displacement, it is necessary to recollect what I have elsewhere said of the formation of inguinal hernia, and of the manner, in which the spermatic cord crosses the epigastric artery. The hernia begins to form at the very place, where the spermatic cord passes under the inferior margin of the transverse muscle; and this place is rather nearer the flank, than that where the epigastric artery passes towards the rectus muscle. In its progressive extension, the hernial sac constantly follows the same track as the spermatic cord, since it is situated upon its anterior surface. As has been already explained, this cord crosses the epigastric artery; consequently, the hernial sac must necessarily pass with the cord above this artery; before protruding from the canal of the abdominal ring. At the same time, the internal orifice of the hernia becoming larger, and the inguinal canal shortened by the approximation of its two orifices to each other, it follows, that, at the period, when the hernia begins to make its appearance in the groin, the epigastric artery is unavoidably situated behind the neck of the hernial sac, and is pushed from the outer to the inner side of the ring. Let us suppose a piece of string to be passed from the inside of the abdomen into the scrotum, all through the inguinal canal, and the middle of the hernia; and that this string is pulled so as to bring the internal orifice of the hernia, which is situated beyond the point where the spermatic cord crosses the epigastric artery; this artery will immediately be found to be carried from the outer to the inner side of the neck of the hernial sac. The same thing happens from the effect of the enlargement of the hernia. The removal of the epigastric artery, from one side of the ring to the other, (says Scarpa) is a phenomenon, which may be regarded as almost constant in the inguinal hernia. I have examined the bodies of a great number of subjects, affected with this species of hernia; and it has been only in a very few, that I met with the epigastric artery retaining its natural situation on the outer side of the abdominal ring. In investigating the reason of this exception, I have observed, in all the individuals who presented it, a very remarkable weakness and flaccidity of that part of the abdominal parietes, which extends from the flank to the pubes. In all *the displaced viscera had passed through the aponeurosis of the transverse and internal oblique muscles*; not in the vicinity of the ilium, as is commonly the case, but, *at a little distance from the pubes*, giving to the upper pillar of the ring a curvature that is extraordinary, and disproportioned to the smallness of the hernia. I observed, also, that the neck of the hernial sac did not pass in an oblique direction, from the flank to the pubes, but, that it protruded from the abdomen almost in a direct line from behind forwards. In short, in these individuals, the small cul-de-sac of the peritoneum, which constitutes the origin of the hernial sac, had not begun to be formed under the edge of the transverse muscle, at the point where the spermatic cord runs outward; but, *it had passed through the aponeurosis of the internal oblique* *and transverse muscles, at a little distance from the pubes, and within the point at which the spermatic cord crosses the epigastric artery.* The small hernial sac, having at this part come into contact with and united to the spermatic cord, protrudes at the external orifice of the inguinal canal, without displacing the epigastric artery from its natural situation.

"This species of hernia, properly speaking, is a mixture of the ventral and inguinal. It resembles the former, inasmuch as the hernial sac pierces the aponeurosis of the transverse and internal oblique muscles; the latter, inasmuch as is passes out at the abdominal ring, conjointly with the spermatic cord." (*Scarpa, Traité des Hernies, p.* 68, *&c.*)

Hesselbach particularly adverts to a *triangular space* to be seen on the inside of the inguinal region: the upper boundary of it is formed by the outer edge of the rectus muscle; the lower by the horizontal branch of the os pubis; and, the external shortest boundary by the crural vein and epigastric artery. Now, says he, when it is considered, that this artery, ascends obliquely inwards, between the inner opening of the ring, and the above triangular space, one cannot fail to know on which side of the neck of the sac the artery must lie in the two species of inguinal, as well as the crural, hernia; for, in those herniæ, which originate in the above triangular space, this artery lies at the outer side of the neck of the hernial sac; while, in every hernia, that takes place through the inner opening of the inguinal canal, the same vessel is situated at the inner side of the neck of the sac. To one species of bubonocele, Hesselbach applies the epithet *external;* and to the other, *internal;* according to the situation of the point at which they first protrude. By Sir A. Cooper, they are named *oblique* and *direct*, which are also very proper terms. The external inguinal hernia is much more frequent, than the internal, and is said to occur oftener on the right than the left side of the body; a circumstance coinciding with another observation, viz. that, in children, the tunica vaginalis remains longer open on the right than the left side.

The circumstance of there being two forms of inguinal hernia formerly caused considerable perplexity: surgeons knew, that the epigastric artery lay sometimes at the inner, sometimes at the outer, side of the neck of the hernial sac, but knew not how to account for this variation. Hence arose the very different opinions about the proper method of dividing the ring when the hernia was strangulated; some authors directing the incision to be made obliquely inwards and upwards; and others, upwards and outwards. But, as a modern writer has judiciously remarked, had they paid greater attention to the direction of the swelling, formed by the neck and body of the hernial sac in the groin, and to the position of the spermatic cord, which is as inconstant as that of the epigastric artery; and had they dissected the parts in the diseased, as well as healthy, state, they could not fail soon to have suspected, that every inguinal hernia does not originate exactly at one and the same point. Though the internal bubonocele was occasionally noticed by surgeons many years ago, and Mr. Cline in particular saw an example of it in the year 1777, and always mentioned it in his subsequent lectures, yet the earliest satisfactory history of the differences of the two forms of inguinal hernia was given by Sir A. Cooper, in his great work on ruptures; and the tract, in which Hesselbach pointed out the nature of the internal bubonocele in a very particular manner, I believe, is the next publication in which the subject is explained. (*Anat. Chir. Abhandlung über den Ursprung der Leistenbruche, Wurzb.* 1806: *and Neueste Anat. Pathol. Untersuchungen über den Ursprung, &c. der Leisten-und-Schenkelbrüche,* 4*to. Wurzb.* 1814, *p.* 18, 26, 28, *&c.*) According to the latter author, since each form of inguinal hernia also, presents characteristic appearances externally, the surgeon can have no difficulty in determining the species of hernia; which discrimination must be highly important in the taxis, the application of a truss, and especially the operation. The sac of the external scrotal hernia can only pass down within the expansion of the cremaster as far as this part is separate from the cord and tunica vaginalis. Hence, the testis, covered by its tunica vaginalis, lies under the lowest part of the hernial sac, while the vessels of the spermatic cord, in a more or less separated form, are situated behind the posterior part of the sac; viz. the spermatic veins externally, and the vas deferens internally, and the artery in the middle. Should the hernia descend still further, the testis, being included as well as the sac within the tendinous expansion of the cremaster, it cannot glide out of the way, but must be pressed still further downwards by the sac, so as to continue invariably under its fundus, but sometimes inclined a little behind it. (*Hesselbach, p.* 34.) And, as the same author justly observes, the position of the spermatic cord and testis, and the oblique direction of the swelling in the external species, are the two strongest characters, by which every case of inguinal hernia may be discriminated. I know of only one case, in which the cord was behind the sac, as in the common external bubonocele, and it was seen by Mr. Lawrence. (*On Ruptures, p.* 210, *Ed.* 4.)

Although the spermatic cord, in the external bubonocele, commonly lies behind, or under, the hernial sac, there are cases in which the vas deferens is found on the outer side of it, while the rest of the spermatic cord lies, as it usually does, on the inner side, or rather under it. (*Cooper.*) Le Dran, Schmucker, and Blizard, found the whole cord situated in front of the sac. Sometimes the vas deferens runs on the front and inner part, and the rest of the cord on the back and external part of the swelling. (*Camper, Hey.*) The cord has been known to be before, and the vas deferens behind, the sac. (*Camper, A. Cooper.*)

Upon this part of the subject, the reader may deem the following passage interesting. "While the hernia is of moderate size (says Scarpa) the surrounding cellular substance is not very greatly compressed, and no change is observed in the situation of the spermatic vessels. The artery and veins of this name always form, with the vas deferens, one single cord, which is intimately adherent to the posterior surface of the hernial sac. But, in proportion as the tumor increases in size, the cellular substance, which immediately surrounds it and unites it to the spermatic cord, is more and more distended and compressed. At length, at a certain period, the distension is carried to such a pitch, that the spermatic vessels are separated from one another, and change their position with respect to the hernial sac. This kind of gradual unravelling of the spermatic cord is quite similar to that, which would be produced by pulling the surrounding cellular substance in two opposite directions. Such is the reason, why, in scrotal hernia of large size, the spermatic artery, the vas deferens, and the spermatic veins are found separated upon the posterior surface of the sac. All these vessels, instead of being conjoined in one cord, are divided by interspaces, which are sometimes very considerable. Ordinarily, the vas deferens is less separated from the spermatic artery, than from the vein of this name. In some subjects, Camper has seen it situated on one side of the sac, and the artery and veins on the other. (*Icones Herniarum, Tab.* 5, *L. O. Tab.* 8. 1, 2.) The displacement and splitting of the spermatic cord take place equally in adults and in children affected with large scrotal hernia. (*Camper, loco cit.*) In general, towards the upper part and neck of the hernia, the vessels are not much separated; but, as they proceed downwards, they diverge more and more. Sometimes, when the hernia is very old and bulky, they are no longer found at the posterior part, but rather at the sides, and even on the front surface of the sac; they show themselves through the cremaster muscle, which covers them, and form a kind of vascular train, which arrests the hand of the operator at the moment, when he is about to open the hernial sac. Le Dran relates, that, in operating upon a large scrotal hernia, he found the spermatic cord on the anterior surface of the hernial sac. (*Operations de Chir. p.* 127.) This fact has been the cause of numerous conjectures, and has appeared altogether inconceivable to such surgeons, as have not been acquainted with the changes, to which the spermatic cord is exposed, in cases of large scrotal herniæ. Lassus could not (*Med. Operat. T.* 1, *p.* 152,) conceive the possibility of the occurrence). The observation of Le Dran is not the less true and exact: it exemplifies a very important fact, of which it is easy to give a true explanation, when the state of the spermatic cord, in ordinary inguinal herniæ, and in those which have obtained a considerable size, has been comparatively examined. In the first, the spermatic cord, quite entire, is always found situated on the posterior surface of the hernial sac; but, in the second, the spermatic vessels are so separated from one another, that they sometimes extend over the sides and even the fore part of the hernial sac." (*Scarpa, Traité des Hernies, p.* 61, *&c.*)

The hernial sac is commonly described as an elongation of the peritonæum. When more minutely examined, however, it is found, in cases of inguinal hernia, to consist of the portion of peritonæum, pushed out with the viscera; of a layer of cellular substance on the outside of this, which becomes more or less thickened by the pressure of the rupture in different cases; of a fascia, sent off from the tendon of the external oblique muscle; and of the cremaster muscle, which latter parts form the exterior covering, which consisting of several layers, often leads the operator to fancy that he has opened the cavity of the sac, when, in reality, he has not.

It is observed by Professor Scarpa, that "the cremaster muscle, in cases of old large scrotal herniæ, acquires a thickness, which is really surprising. Its fibres, which are naturally very thin, become from four to six times more considerable. Being spread over the neck and body of the hernial sac, they sometimes present a remarkable consistence, and a yellowish colour. Such alteration, however, does not prevent the muscular texture from being discovered, and Haller was not mistaken about it." (*Opusc. Patholog. p.* 317.) Pathology furnishes us with several examples of similar changes of organization. In certain cases, the muscular coat of the bladder, that of the stomach and intestines, and even the exceedingly delicate fleshy fibres of the ligaments of the colon, are found to have become yellow, and much thickened.

In old scrotal herniæ (says Scarpa) it is not unusual to find an intimate adhesion of the fibres of the cremaster muscle to the edges of the abdominal ring. This may depend on the pressure, which the contents of the hernia make on those edges, and perhaps it may also depend on the union of the cremaster muscle with the prolongation of the aponeurosis of the fascia lata, which is continued from the margins of the ring to the groin and scrotum. Howsoever it may be, certain it is, that in old large scrotal herniæ, there is much difficulty in introducing a probe between the fleshy fibres of the cremaster and the margin of the abdominal ring: and that, on the contrary, in recent herniæ, a probe passes as easily between the edges of the ring and the cremaster, as between this muscle and the hernial sac.

"Few authors (according to Scarpa) have spoken of the sheath, formed by the cremaster muscle, in which are enclosed the hernial sac, the spermatic cord, and the tunica vaginalis of the testicle. Sharp (in *Critical Enquiry*) and Monro, the father, (*Anat. and Chirug. Works, p.* 558,) were the first to dwell upon this important pathological point. Monro had seen the cremaster muscle covering the hernial sac; but, he did not believe, that the same thing occurred in all individuals affected with inguinal hernia. In this respect he was mistaken: for, this disposition of the cremaster muscle is one of the essential characters of the disease. Petit has not omitted to describe the relations, which exist between the cremaster and the hernial sac. (*Œuvres Posthum. T.* 1, *p.* 288.) On this subject, he even relates an interesting fact, from which it results, that, in certain cases, this muscle may by its contractions alone cause a reduction of the hernia. Gunz explains, with tolerable perspicuity, how the cremaster and its aponeurosis form one of the coverings of the inguinal and scrotal hernia. (*Libellus de Herniis, p.* 50) Morgagni once saw its fleshy fibres extended over the hernial sac; (*De Sed. et Caus. Morb. epist.* 34, *art.* 9; *epist.* 31, *art.* 15,) and Neubaver positively assures us, that he made the same remark upon the dead body of a man affected with an entero-epiplocele. (*Dissert. de Epiplo-oscheocele.*) After these facts, so positively and accurately observed, I cannot comprehend (says Scarpa) how in our time Pott, Richter, and several other authors should have passed over in silence, or only mentioned vaguely, this point, so important in the history of the inguinal and scrotal hernia." (*Scarpa, Traité des Hernies, p.* 48—50.)

When surgeons speak of a hernial sac being usually thicker and stronger, in proportion to the magnitude and duration of the hernia, their language is not at all correct; for, in fact, the peritoneal investment of the hernia is seldom, or never, thus altered. I can declare (says Scarpa) after numerous observations, that, in the majority of cases, the hernial sac, strictly so called, is not perceptibly thickened, and that in general it does not differ from other parts of the peritonæum, however large and old the scrotal hernia may be. (*Traité des Hernies, p.* 53.)

In a very enormous hernia, the pressure of the contents is so great, that instead of thickening the sac, it renders it thinner, and even makes it ulcerate. The protruded viscera have been met with immediately beneath the integuments, when the sac has been burst by a blow. (*Cooper, J. L. Petit.*)

The outer surface of the peritonæal part of the hernial sac, is always most closely adherent to the other more external covering, by means of cellular substance. This connexion is formed so soon, after the first occurrence of a hernia, that any hopes of returning a hernial sac into the abdomen have generally been considered as chimerical. There must, however, be a certain space of time, before adhesions form, though it is, no doubt, exceedingly short.

Upon this point, Scarpa does not adopt the opinion that has commonly prevailed.

There is no doubt, he observes, that in recent and small inguinal herniæ, the intestine, strangulated by the neck of the hernial sac, has been known, in more instances than one, to have been reduced by the taxis, and carried with it the whole of the sac into the abdomen. Observations, not less authentic, inform us, that, after the operation for hernia, when the viscera could not be reduced on account of their adhesions to the sac, they have been seen, notwithstanding such adhesions, to get nearer to the ring daily, and at length, spontaneously to return into the belly together with the hernial sac. Louis, he thinks, was wrong in denying the possibility of these facts. (*Acad. Royale de Chir. T.* 11, *p.* 486.)

Scarpa argues that, "under certain circumstances, the cellular substance will bear, without laceration, a considerable elongation, and afterwards shrink again. Thus, we often see a viscus, which has suffered a considerable displacement, return spontaneously into its natural situation. In the inguinal hernia, the spermatic cord is elongated, and descends farther, than in the natural state. No laceration of the cellular substance, however, is then occasioned; for, if the hernia be kept reduced, the spermatic cord becomes shorter, daily retracts, and at last has only the same length, which it had previously to the disease. When a sarcocele becomes large and heavy, the portion of the spermatic cord naturally situated within the belly, is by degrees drawn out into the scrotum; but, after the tumor is extirpated, this portion ascends again and of itself returns into its original situation.

The same thing happens after the operation for the strangulated inguinal hernia. All practitioners have noticed, that the hernial sac retracts and reascends progressively towards the ring. This alone would prove, that the cellular substance, which surrounds the spermatic cord, and unites it to the hernial sac, is highly endued with the property of yielding, and afterwards returning to its original state. Can the same property be refused to the cellular substance, which unites the sac to the cremaster muscle and other surrounding parts?

"While the inguinal hernia is recent, and not of much size, the cellular substance in question, possesses all its elasticity, and hence, the hernial sac, and the spermatic cord, may easily ascend towards the abdominal ring. I have had occasion (says Scarpa) to make this observation upon the dead body of a man, who had an incipient inguinal hernia. The small hernial sac was capable of being pushed back into the ring with the utmost facility; and in carefully examining the parts, both within and without the belly, it appeared to me, that the cellular substance, which united the sac to the spermatic cord and cremaster muscle, was disposed to yield equally from without inwards, and in the direction precisely opposite; that is to say, it made an equal resistance to the protrusion and the reduction of the hernial sac. Monteggia has seen a case exactly similar; although, according to his own expressions, (*Instituz. Chirurg. T.* 3, *sec.* 2, *p.* 249,) the hernial sac was not very small, it adhered very loosely to the surrounding parts, and it admitted of being entirely reduced into the abdomen with great facility."

In large old scrotal herniæ Scarpa allows, that such reduction is quite impracticable: "In these, the cellular substance, which unites the sac to the spermatic cord, and cremaster muscle, has acquired such a density, that it does not oppose less resistance to the further enlargement of the hernia, than to the efforts of the surgeon, who endeavours to effect its reduction." (*Scarpa, Traité des Hernies, p.* 57, *&c.*)

In the dead subject, Cloquet found the sac of an internal inguinal hernia reduced into the abdomen, whither it seemed to have been drawn by a piece of omentum adherent to what had, in its protruded state, been its fundus. (*Recherches sur les Causes &c. des Hernies, p.* 102.) The investigations of the same author prove, that complete or incomplete inversions of the sac may also happen in the femoral and internal inguinal hernia, without the existence of any adhesion: but that the intimate union between the sac and spermatic cord hinders the event in external, or common inguinal ruptures. Le Dran dissected a case, in which the sac of a femoral hernia, with its contents, had been returned into the abdomen in a mass. The observations of Cloquet also tend to confirm the possibility of the latter occurrence, which he describes as happening with more facility in the internal inguinal rupture, than in the crural, and with most difficulty in the external inguinal hernia.

We shall conclude this anatomical account of the inguinal hernia, with the following explanation of the parts as they appear on dissection: "The removal of the integuments exposes the exterior investment of the hernial tumour, continuous with the margins of the ring, and formed of tendinous fibres from the aponeurosis, the cremaster muscle, &c. This is connected by cellular substance with the proper hernial sac, formed of the peritonæum. This production of the peritonæum passes within the ring of the external oblique, and then goes upwards and outwards. Behind and above the ring, the inferior margin of the obliquus internus and transversalis crosses the neck of the sac. When these muscles are reflected towards the linea alba, the fascia, ascending from Poupart's ligament, and forming the upper opening of the ring, is exposed, and the epigastric artery is discovered emerging from the inner side of the neck of the hernial sac, (*Camperi Icones, Tab. X. F. M.*) which, at this precise point, becomes continuous with the peritonæum, lining the abdomen. The removal of the hernial sac will disclose the course of the spermatic cord in its descent towards the testicle; and when this is also elevated, the first part of the course of the epigastric artery, and its origin from the iliac trunk, are exposed." (*Lawrence on Ruptures, p.* 203, *Edit.* 4.)

In females, when a bubonocele occurs, (which is uncommon) the round ligament of the uterus bears the same relation to the tumor, as the spermatic cord in males. According to Sir Astley Cooper, the sac is much more considerable above the abdominal ring, than below it; and hence difficulty in the operation. All the cases, which he has seen, have been intestinal. The stricture is, in almost all cases, at a considerable distance above the abdominal ring; it may be divided upwards, or outwards, with safety, as the epigastric artery is situated more towards the linea alba. (See *Lancet, Vol.* 2, *p.* 172.)

Mr. Lawrence had a very rare instance pointed out to him, in which a bubonocele in a female was situated on the inner side of the epigastric artery. A still rarer case was examined by Hesselbach: it was not only an example of internal bubonocele in a woman, but of one in which the epigastric artery arose from the obturatrix artery an inch from the origin of this latter vessel from the inner side of the external iliac; the obturatrix first passed an inch obliquely downwards and inwards over the crural vein, and immediately afterwards, on the horizontal ramus of the pubes, made a sudden turn backward and downward to the obturator foramen; and at this bend arose the epigastric artery, which ran transversely inward along the horizontal ramus of the pubes, behind the neck of the hernial sac, at the inner side of which it ascended to the rectus muscle, accompanied by the ligamentous remains of the umbilical arteries, which were close behind it. (*Ueber den Ursprung, &c. der Leisten und Schenkelbrüche, p.* 17.)

The case in which the fixed portion of the large intestines protrudes through the ring, I have particularly considered in another work. (*First Lines of the Practice of Surgery, Vol.* 2.)

MARKS OF DISCRIMINATION BETWEEN OTHER DISEASES AND INGUINAL HERNIÆ.

The disorders, in which a mistake may possibly be made, are *Cirsocele, Bubo, Hydrocele,* and *Hernia Humoralis,* or *Inflamed Testicle.*

For an account of the manner of distinguishing the first complaint from a bubonocele, see *Cirsocele.*

"The circumscribed incompressible hardness, the situation of the tumor, and its being free from all connexion with the spermatic process, will sufficiently point out a bubo, at least while it is in a recent state; and when it is in any degree suppurated, he must have a very small share of the *tactus eruditus,* who cannot feel the difference between matter, and either a piece of intestine, or omentum.

"The perfect equality of the whole tumor, the freedom and smallness of the spermatic process above it, the power of feeling the spermatic vessels and the vas deferens in that process, its being void of pain upon being handled, the fluctuation of the water, the gradual formation of the swelling, its having begun below and proceeded upwards, its not being affected by any posture or action of the patient, nor increased by his coughing or sneezing, together with the absolute impossibility of feeling the testicle at the bottom of the scrotum, will always, to an intelligent person, prove the disease to be a hydrocele." The transparency of a hydrocele is also another criterion. Mr. Pott, however, allows, that there are some exceptions, in which the testicle cannot be felt at the bottom of the scrotum, in cases of hernia. "In recent bubonoceles, while the hernial sac is thin, has not been long, or very much distended, and the scrotum still preserves a regularity of figure, the testicle may almost always be easily felt at the inferior and posterior part of the tumor. But, in old ruptures, which have been long down, in which the quantity of contents is large, the sac considerably thickened, and the scrotum of an irregular figure, the testicle frequently cannot be felt, neither is it in general easily felt in the *congenital hernia* for obvious reasons." (*Pott.*)

Attention to these circumstances are highly necessary in practice, as the mistaking of a hernia for a hydrocele may, and has been, the cause of fatal accidents. A case, confirming this fact, is mentioned by Sir A. Cooper. (See *Lancet, Vol.* 2, *p.* 112.) Hydrocele of the spermatic cord is another case still more likely to be taken for a hernia, than the common form of hydrocele. (See *Hydrocele.*)

"In the *hernia humoralis,* the pain in the testicle, its enlargement, the hardened state of the epidydimis, and the exemption of the spermatic cord from all unnatural fulness, are such marks as cannot easily be mistaken; not to mention the generally preceding gonorrhœa. But, if any doubt still remains of the true nature of the disease, the progress of it from above downward, its different state and size in different postures, particularly lying and standing, together with its descent and ascent, will, if duly attended to, put it out of all doubt, that the tumor is a *true hernia.*" (*Pott.*)

INGUINAL HERNIA WITHIN THE CANAL.

When the parts only protrude into the inguinal canal, and not out of its lower aperture, they are covered by the aponeurosis of the external oblique muscle. The transverse and internal oblique muscles pass over the neck of the hernia, and cause the strangulation when it happens. The tumor is small; for, if the protrusion increases, the parts escape through the lower opening of the canal. Exceptions, however, are on record. Thus, Mr. Lawrence dissected a case in a female, where the aponeurosis of the external oblique was distended by a swelling equal in bulk to two fists, while another portion of the sac, as large as an egg, projected through the ring. Hesselbach's 8th plate also represents a hernia within the canal, of considerable size, in a female. As in the ordinary circumstances of this form of inguinal hernia, there is no very manifest swelling, the case is no doubt very often looked upon and treated, as Sir Astley Cooper remarks, as an inflammation of the bowels. (On *Inguinal and Congenital Hernia, p.* 48.)

When an inguinal hernia does not descend through the abdominal ring, but only into the canal for the spermatic cord, it is covered by the aponeurosis of the external oblique muscle, and the swelling is small and undefined.

Now and then, the testicle does not descend into the scrotum till a late period, and its first appearance at the ring, in order to get into its natural situation, may be mistaken for a hernia; unless the surgeon pay attention to the absence of the testicle from the scrotum, and the peculiar sensation occasioned by pressing the swelling.

POINTS OF DIFFERENCE BETWEEN THE EXTERNAL AND INTERNAL INGUINAL HERNIA, &c.

According to Hesselbach, the characteristic marks of the external bubonocele and scrotal hernia, are; 1st. The direction of the tumor in the groin. 2dly. The fleshy fibres of the cremaster. 3dly. The position of the spermatic cord and testis. 4thly. The situation of the epigastric artery. 5thly. The origin of the hernia itself. 6thly. A preternatural shape of the body of the hernial sac.

1. The neck of the hernial sac, distended by the protruded viscera, raises up the front side of the inguinal canal, and superincumbent integuments, into an oblong swelling, which extends obliquely inwards and downwards towards the abdominal ring, and terminates in the tumor, formed by the body of the hernial sac. From its origin it becomes gradually more prominent and broad; and the greater the quantity of viscera protruded, and the larger the body of the sac, the more manifest is this oblique swelling, particularly when the neck of the hernia is of its natural length. In strangulated cases, the direction of the tumor is still more striking, every part of the hernial sac being then considerably distended. When the inguinal canal, and of course the neck of the hernial sac are shortened, the swelling undergoes a proportional diminution in its length; and then its resemblance to the tumor attending an internal inguinal hernia, where the opening through which the parts pass, is long and slanting, is so great, that the cases can only be discriminated by one circumstance, viz. the situation of the spermatic cord, and even this criterion is of course wanting in females. (*Hesselbach, p.* 57, 58.) Hesselbach clearly explains, that the obliquity of the swelling is seated in the neck of the hernial sac. He observes, that when an internal bubonocele in a female subject passes into the labium, the descent takes place in a very sloping direction inwards, and therefore, may at first be supposed to be an external case. But, on further examination, the oblique swelling will be found to occupy the body of the hernial sac, and to reach upwards and outwards from the labium to the abdominal ring. Now this hernia cannot be mistaken for an external bubonocele, the course of which from the ring is obliquely upwards and outwards. As Sir A. Cooper has remarked, if there be any obliquity of an internal inguinal hernia, it will incline towards the linea alba. (See *Lancet, Vol.* 2, *p.* 109.)

Hesselbach reminds us, that an internal, inguinal, or scrotal hernia may be conjoined with an external incomplete bubonocele; a kind of case easily made out with a little attention; for the place of division between the two sacs is indicated by a more or less deep groove. The nature of the disease will also be still clearer, if one of the tumors admit of reduction. A specimen of such a double hernia is to be seen in the museum at Würzburg.

It is further noticed by Hesselbach, that, when the situations of the external and internal herniæ are compared, the first of these swellings will be found to be rather further, than the other, from the symphysis of the pubes: a difference ascribed to the effect of the internal oblique muscle, the lower fibres of which, attached to the horizontal ramus of the pubes, run in a curved direction transversely over the anterior and inner part of the neck of the hernial sac, and are applied so closely to it, that it cannot approach quite so much towards the symphysis of the pubes, as the neck of the internal bubonocele does. The muscular fibres in question are situated directly behind the inner pillar of the abdominal ring.

2. Most of the fibres of the cremaster lie on the back of the neck of the sac, but others are also scattered over its external and internal sides. Some fibres, may also be perceived on its forepart, which are remarkable, because they run in a transverse curved direction with their convexity downwards, and two fasciculi of which descend below the abdominal ring. These are the fibres of the cremaster, which proceed within the ring transversely upwards over the spermatic cord, and are pushed out of that opening by the hernial sac. These arched fleshy fibres are not always, though generally, perceptible; and, when they are present on the forepart of the hernial sac, Hesselbach accounts them a sure criterion of an external scrotal hernia; but, he has not yet ascertained, whether they are visible, while the rupture is confined to the groin.

3. The situation of the spermatic cord and testis in the external inguinal hernia, and,

4. That of the epigastric artery, and its displacement inwards by the neck of the sac, have been sufficiently explained.

5. With respect to the mode, in which the hernia originates, the disease often takes place suddenly, without any exciting cause being observed, capable of accounting for the effect. Here, says Hesselbach, the predisposing cause must have been great; for instance, the communication between the cavity of the peritonæum and that of the tunica vaginalis has remained a long while unclosed; and, when a hernia of this description is examined, the other marks of an external inguinal hernia are associated with the sudden formation of the disease. In this quick manner, the congenital hernia, which is one of the external cases, frequently arises. The internal inguinal hernia is also observed mostly to take place very suddenly, yet only after violent occasional causes. According to Sir Astley Cooper, it arises more frequently from the efforts

made to expel the urine, in cases of stricture, than from any other cause. (See *Lancet*, *Vol.* 2, *p.* 141.)

6. A preternatural form of the body of the hernial sac, Hesselbach remarks, is particularly seated in the sheath of the spermatic cord, and can never happen in the internal scrotal hernia; for, it is only in external cases, that the above sheath is ever converted into the hernial sac. Hesselbach here refers to the partial contraction, often noticed at the lower part of the above sheath in cases of congenital hernia; a circumstance, which is always discovered previously to the business of dividing the ring.

In adults an external inguinal, or scrotal hernia, on the right side, contains some of the ileum, and, when the swelling is large, it may include the cœcum, and sometimes a piece of omentum. In one child, ten weeks old, and in another still younger, the appendix vermiformis, was protruded and connected by a natural band to the posterior side of the peritonæum. When, in these ruptures of the right side, the cœcum, or, in those of the left, the colon, are met with closely adherent to the hinder side of the hernial sac, the adhesion is not to be looked upon as the effect of disease, since it is the perfectly natural connexion of those bowels with the peritonæum. On the left side, the parts most commonly protruded, are the colon and omentum.

With regard to the *internal inguinal hernia*, the place of its first protrusion has been already described. The protruded peritonæum and viscera, according to Hesselbach's account, *pass from behind straight forwards*, between the fibres of what he names the internal inguinal ligament, and the fleshy fibres of the internal oblique muscle: they then pass, at the inner side of the spermatic cord, out of the abdominal ring, where the hernia presents *a circular globular swelling, suddenly formed in consequence of some violent effort*. The neck of the hernial sac is very short; shorter, than it can ever be in an external inguinal hernia, and, when the tumor is of the above shape, the passage through which it passes is annular, narrower in some instances, than others, and its margin is tendinous. From the few cases, which Hesselbach has seen of this form of the disease, he is led to conjecture, that the hernial sac is rarely so large as in the external inguinal hernia. (*P.* 41.) According to Sir Astley Cooper, the internal inguinal hernia occurs when the tendon of the transversalis is unnaturally weak, does not exist at all, or has been broken, (*On Inguinal Hernia, p.* 51.) Cloquet states, that the sac either propels before it, and thus receives a covering from the fascia transversalis, or passes through an opening in it. (*Recherches Anat. p.* 83.) Mr. Lawrence dissected a case, where the fascia was neither thinner, than usual, nor broken, but it had been protruded before the peritonæum, and formed a thick aponeurotic, covering to the hernial sac. Mr. Stanley has always found it thus covered, and some specimens, illustrative of the fact, have been placed by him in the museum of St. Bartholomew's Hospital. (*On Ruptures, p.* 209, 211, *Ed.* 4.) According to Langenbeck, this is the usual state of the parts. (*Comment.* § 105, *tab.* 17, 18 *&* 19.) Sir Astley Cooper, in his lectures, also describes the hernia as having an investment, one half of which is formed by the tendon of the transversalis, and the other half by the fascia transversalis. (See *Lancet, Vol.* 2, *p.* 140.) The earlier dissections made by Hesselbach, led him to suppose, that, in the internal inguinal hernia, the opening, through which the protrusion happens, is always annular, and the swelling in front of the ring globular; but subsequent cases, which he has met with, have informed him, that the opening is frequently sloping and longish; in which circumstance, the resemblance of the tumor to that of the external bubonocele with a shortened neck, is such, that, the only mark of distinction between the two cases is the position of the spermatic cord. In females, even this criterion is of course deficient. (*Hesselbach, p.* 57.) Though individuals of almost every age are subject to internal bubonoceles, they are much less common, than external cases. According to Hesselbach, they may be known by the following characters. 1. The swelling, formed by the body of the hernial sac, immediately in front of the abdominal ring. 2. The situation of the spermatic cord. 3. That of the epigastric artery.

1. The neck of the hernial sac, besides being very short, does not, like that of an external inguinal hernia, take an oblique direction, but advances straight from behind forwards through the abdominal ring; and as the body of the sac lies directly over the neck, none of the swelling, formed by the distention of the latter part, can be felt. Nor does any other tumor, produced by the body of a hernial sac, ever cause a circular spherical swelling directly before the abdominal ring. The situation of the neck of this kind of hernia must already apprise us, that the internal bubonocele is nearer than the external, to the symphysis of the pubes. In women, the shape of the tumor is the only character, by which the case can be distinguished. (*Hesselbach, p.* 43.)

2. After what has been already stated, respecting the situation of the spermatic cord in the internal inguinal hernia, I shall merely notice one or two observations of Hesselbach. The cord lies either upon the outer side, or outer half of the fore part of the upper portion of the hernial sac, the blood-vessels forwards, and the vas deferens backwards. When the sac is adherent to the whole length of the cord, the testis is not situated under the fundus of the sac, as in the external scrotal hernia, but either at the forepart or outer side of the body of the sac. The hernial sac, as far as the abdominal ring, is excluded from the common peritonæal covering of the spermatic cord, but, at this opening, it descends between the cord and the internal thin part of the sheath of the cremaster, which, however, is somewhat stronger towards the front and outer side of the hernia, over which part alone the fleshy fibres of the cremaster are spread. (*P.* 44.)

3. The epigastric artery always ascends obliquely inwards at the outer side of the neck of the hernial sac. Hesselbach has never seen but one case of internal bubonocele, in which there was a deviation from this rule. The example has been already mentioned, and was one in the epigastric artery arose from the obturatrix about an inch from the origin of this last vessel. The viscera, usually contained in an internal inguinal, or scrotal hernia, on the right side, are the lower

part of the small intestines, and sometimes omentum; on the left, a part of the small intestines, frequently omentum, and when the the tumor is large, the colon may also protrude. A protrusion of the bladder may accompany the disease, but that organ is of course always excluded from the cavity of the hernial sac. When the remains of the umbilical cord are situated more outward than usual, and lie over the centre of the space, at which the protrusion happens, an internal bubonocele may be double, the prolapsus happening on each side of that ligamentous substance, which is itself also pushed outwards. In consequence of the accidental presence of some very strong tendinous fibres at the centre of the fascia, called by Hesselbach, the internal inguinal ligament, there may also be two distinct protrusions, with separate hernial sacs. (*P.* 46.)

When the surgeon, by a due consideration of the foregoing circumstances, has formed a judgment respecting the nature of the hernia, he will be better qualified to regulate the treatment of the case. Thus, in the external inguinal hernia, he will know, that the pressure, employed for the reduction of the bowels, should be made in the direction of the neck of the hernial sac, viz. obliquely upwards and outwards, towards the anterior superior spinous process of the ilium; but, that, when the neck of the same kind of hernia is very short, and the posterior side of the inguinal canal has been removed, the pressure should be made nearly in a straight line from before backwards. For what Hesselbach terms the long-necked external inguinal hernia, the pad of a truss should be so constructed, as not merely to press upon the abdominal ring, but also upon the neck of the sac and the inner opening of the inguinal canal. But, when the neck of the hernia is very short, the pad should be nearly of the same form, as that required for an internal inguinal hernia. (*Hesselbach, p.* 38; *and Brunninghausen, Gemeinnützıger Unterricht über die Bruche, &c. Würzb.* 1811.) In attempting the reduction of an internal inguinal hernia, the pressure should be directed nearly straight backwards; and the pad of the truss should only act upon the abdominal ring. (*Hesselbach, p.* 46.) It is a case in which the intestine often continues strangulated, after the reduction, within the ring. (*Sir A. Cooper; see Lancet, Vol.* 2, *p.* 142.)

THE OPERATION FOR STRANGULATED INGUINAL HERNIA, OR BUBONOCELE.

Sir Astley Cooper particularly recommends operations for strangulated herniæ to be performed before any peritoneal tenderness exists, which renders the issue very doubtful, though the parts be liberated by the division of the stricture. Such tenderness is not to be confounded with the tension produced by the inflation of the intestines. In old persons, the operation may be deferred longer, than in the young, or middle aged. (See *Lancet, Vol.* 2, *p.* 142.) The operation consists in dividing the integuments; dissecting down to the sac, and opening it; removing the stricture; and replacing the protruded viscera. The hair is first to be shaved from the pubes.

The external incision should begin an inch above the external angle of the ring, and extend over the middle of the tumor to its lower part, except when the swelling is large, in which circumstance, the cut need not extend so far down, as will be presently noticed. The advantage of beginning the wound so high, is to obtain convenient room for the incision of the stricture. By this first cut, the external pubic branch of the femoral artery may be divided; it crosses the hernial sac near the abdominal ring, and sometimes bleeds so freely, as to require to be immediately tied. In general, however, a ligature is unnecessary.

When this incision is carried low down, the caution, given by Camper, should always be remembered, viz. that there is a possibility of dividing the spermatic vessels, should they happen to be situated, as they sometimes are, in front of the hernia. And, in order to avoid such an accident, which is particularly apt to occur in cases of internal inguinal, or scrotal hernia, the incision through the skin should be made obliquely downwards and inwards. (*Hesselbach, p.* 46.) The division of the integuments brings into view the fascia, which is sent off from the tendon of the external oblique muscle, and covers the hernial sac.

The layers of tendinous fibres, cellular substance, &c. intervening between the skin and sac, should be carefully divided, one after another, with the knife and dissecting forceps; the edge of the former instrument being turned horizontally, lest the incisions be carried too deeply at once, and the viscera contained in the sac wounded.

After making a small opening through a part of the fascia covering the sac, some practitioners introduce a director, and divide this fascia upward and downward, as far as the tumor extends. The same manner they next pursue with regard to the cremaster muscle. Thus the sac becomes completely exposed. When this method is followed, Sir A. Cooper advises the incisions not to be carried upward nearer than one inch, to the abdominal ring, for reasons which will be presently explained.

However it may be rationally doubted, whether there is any good in these formal and successive divisions of the whole length of the coverings of the sac; and it is certain, that they protract the operation very much; for the manner, in which the sac adheres to the outer investment of it, prevents the latter from being raised and cut without trouble and delay. As the grand object, after the skin has been divided, is to make a small opening into the sac, sufficient for the introduction of a director, dissecting down at one particular place, answers every purpose, and enables us, in the end, to lay open the whole of the sac and its coverings in the shortest time. Let the operator only take care to raise the successive layers of fibres with the forceps, and divide the apex of each elevated portion with the knife held horizontally. As there is commonly a quantity of fluid in the sac, and it gravitates to the lower part, to which place the intestine seldom quite descends, this is certainly the safest situation for making the first opening into the sac. The operator, however, should not rely upon the presence of such fluid, and cut too boldly; for sometimes it is absent, and the viscera may be in immediate contact with, nay, adherent to, the inner surface of the sac.

The circular arrangement of the vessels of a piece of intestine, and its smooth polished surface, sufficiently distinguish it from the hernial sac, which has a rough cellular surface, and is always connected with the surrounding parts, although these adhesions, in a very recent case, may be but slight. (*Lawrence on Ruptures, p.* 232, *Edit.* 4.)

I have mentioned, that Sir A. Cooper only advises cutting the fascia, and other coverings of the sac, under the skin, to within an inch of the abdominal ring; and, of course, he also recommends limiting the division of the sac itself to the same extent. His reasons for this practice, are to avoid making the closure of the wound more difficult, and to lessen the danger of peritonæal inflammation.

Having laid open the hernial sac, with a probe-pointed bistoury, guided by a director, or the fore-finger, introduced into the opening, made at the lower part of the sac, the next desideratum is to divide the stricture, unless the viscera admit of being easily reduced, without such an incision being made, as occasionally happens.

From the anatomical account, which has been given of the bubonocele, it appears, that the stricture may either be situated at the abdominal ring, and be formed by the margins of this opening, or else at the inner aperture of the canal, about one inch and a half, in a direction upward and outward, from the outer opening in the tendon of the external oblique muscle. This latter strangulation is caused by the semicircular edge of the transversalis muscle and its tendon, which pass over the neck of the hernial sac, and by a fascia, arising from Poupart's ligament, the semicircular border of which passes under this part of the sac.

The common, and probably the best, practice is to divide the hernial sac, together with the stricture. When this is situated at the abdominal ring, the surgeon is to introduce the end of a director a little way into the neck of the sac, within the aperture in the tendon, and with a probe-pointed bistoury, guided on the latter instrument, *he is to cut the stricture upward and outward, or else directly upward*; a manner, which Sir A. Cooper recommends, because it is applicable to all cases, even the less frequent ones, in which the hernia protrudes at the inner side of the epigastric artery; and, in all common instances, we know, that this vessel runs upward round the inner side of the neck of the sac; a course prohibiting the division of the stricture upward and inward.

In the external inguinal hernia, the method of cutting the stricture upward and outward is perfectly safe; but when the case is what Hesselbach calls internal, and the viscera descend on the inner side of the epigastric artery; it is a plan, which would endanger the latter vessel, and ought never to be adopted, notwithstanding any statement made in its favour by Rudtorffer. (*Abhandlung über die einfachste und sicherste operations-Methode eingesperrter Leisten-und Schenkelbrüche. Wien.* 1808.) In this work, the erroneous plan of cutting the ring inwards is inculcated, both in the external and internal inguinal rupture. The author, however, seems to have performed many operations in this manner, without any accident from hemorrhage; a piece of good fortune, which Professor Langenbeck ascribes to the circumstance of the knife having always been applied, as Rudtorffer directs, to the middle of the inner pillar of the ring, and to the cut having been very limited. Langenbeck is of opinion, that, if the knife had been applied a little lower, and the incision carried to any extent, the epigastric artery, in ordinary cases, would not have escaped injury. Sir A. Cooper's rule of always cutting in one direction, viz. upward, which I believe was first advised by Rougemont, and afterwards by Autenrieth, (*Dissert. Moment. circa Herniotom. præcipue circa evitandam, art. epigastr. læsionem, Tub.* 1799,) is perhaps a very good one, because it is at least easy for the memory, and will answer very well, even when it is not in the power of the surgeon to pronounce positively, whether the case is a short-necked external bubonocele, or an internal one with an oblong oval fissure, cases having a great external resemblance, especially in women, in whom there is not the spermatic cord as a criterion; for, after all, this part, when present, is the surest guide, and that on which Desault founded his perfectly safe advice, viz. when the cord is at the posterior, or inner side of the neck of the hernial sac, to divide the ring upwards and outwards, but inwards and upwards when it lay at the outer or on the fore-part of the sac. (*Œuvres Chir. par Bichat, T.* 2.) At all events, this advice is subject but to one exception, which is the very rare one of the epigastric running round the inner side of the neck of the sac in an internal bubonocele; a possibility which has been already explained, and which leads Hesselbach particularly to recommend the division of the ring in every internal inguinal hernia, to be made straight upwards. (P. 47.) Indeed, the long necked external bubonocele is the only case, in which he thinks the latter plan should give way to that of cutting upwards and outwards. The safety and propriety of the method of always cutting upward, are strikingly illustrated by what Scarpa observes: he states, that the right direction of the incision of the ring is directly upwards, parallel to the linea alba. "I have (says he) operated in the way which I recommend, upon several dead subjects, who had either external, or internal inguinal herniæ, directing my incision in the course of a line drawn from the upper part of the ring parallel to the linea alba; in all, I constantly left the epigastric artery untouched, even when I extended the cut about an inch above the inguinal ring." (*Scarpa, Traité Pratique des Hernies, p.* 111.) Only one objection, as far as I know, has been made to this plan, and it is founded on the alleged impossibility of introducing the knife, so as to cut straight upwards, when the neck of the hernial sac is long, because then the posterior side of the inguinal canal is in the way. (*Hesselbach, p.* 40.) No more of the parts, forming the stricture, should be cut, than is just sufficient for allowing the protruded viscera to be reduced, without bruising, or otherwise hurting them; and I consider the middle of the upper margin of the ring the safest place for making the necessary incision.

Sir A Cooper, in his valuable work on the Inguinal Hernia, advises a mode of dividing the stricture, considerably different from the usual method. He directs the finger of the operator to be introduced into the sac (which in his plan, we know, is left undivided for the space of one inch below the ring). When the stricture is felt, a probe-pointed bistoury is to be conveyed over the front of the sac into the ring (between the two parts), and the latter only is then to be divided, in the direction upward, opposite the middle of the neck of the sac, and to an extent just sufficient to allow the protruded parts to be returned into the abdomen, without their being hurt. The two chief advantages which Sir A. Cooper imputes to this method, are, that the danger of peritonæal inflammation will be less, and that the epigastric artery, if wounded, would not bleed into the abdomen. I am of opinion, that Mr. Lawrence's remarks, concerning this proposal, are judicious: an accurate comparative trial of both methods would be necessary, in order to determine the weight of the first reason. The second circumstance cannot be a matter of any importance, if we cut in such a direction as will avoid the risk of wounding the artery. Many circumstances present themselves as objections to this proposal. The manœuvre itself, although perhaps easy to the experienced hand of so able an anatomist as Sir A. Cooper, would, I am convinced, be found highly difficult, if not impracticable, by the generality of surgeons. This difficulty arises from the firm manner, in which the sac and surrounding parts are connected, we might almost say, consolidated together. The experience of Richter (*Traité des Hernies*, *p.* 118) shows, that this objection is founded in reality. He once tried to divide the ring, without cutting the sac, but he found it impracticable. If the stricture is so tight, as to prevent the introduction of the finger, there must be great danger of wounding the protruded parts. The practice would still be not advisable, even if it could be rendered as easy as the common method of operating. Sir Astley leaves an inch of the sac, below the ring, undivided; thus a bag remains ready to receive any future protrusion, and the chance of a radical cure is diminished. It would be better to follow the advice of Richter, and scarify the neck of the sac, in order to promote an adhesion of its sides. He has found this practice so successful in accomplishing a radical cure, that he advises (*p.* 191,) its employment in every operation for strangulated hernia. (See *Lawrence on Ruptures*, *p.* 249, *Edit.* 4.)

If the stricture should be at the inner opening of the canal for the spermatic cord, Sir A. Cooper advises the operator to introduce his finger into the sac, as far as the stricture, and then to insinuate a probe-pointed bistoury, with the flat part of its blade turned towards the finger, between the front of the sac and the abdominal ring, till it arrives under the stricture, formed by the lower edge of the transversalis and obliquus internus. Then the edge of the instrument is to be turned forward, and the stricture cut in the direction upward. This plan of not cutting the neck of the sac, is liable to all the objections stated by Mr. Lawrence, in regard to the case, in which the strangulation takes place at the abdominal ring. Sir A. Cooper's bistoury is a very proper one for dividing the stricture, as it only has a cutting edge to a certain distance from the point. Perhaps, on the whole, we may infer, that it is both most easy and advantageous to divide the neck of the sac, together with the stricture, whether this be situated at the ring, or more inward. The method of cutting the stricture from without inwards, I consider objectionable, on the ground of the risk of wounding the bowels in this mode, being greater, than that of any accident from wounding the epigastric artery, when it arises in an unusual manner, and deviates from its regular course; a reflection, which has made Dr. Hesselbach, junior, an advocate for the practice. (See *Sicherste Art des Bruchschnittes*, 4*to. Bamberg.* 1819.)

When the stricture is at the upper opening of the inguinal canal, the ring should not be cut, unless it prevent the operator from reaching the more deeply-seated strangulation, as happened in a case recorded by Mr. Lawrence. (*On Ruptures*, *p.* 241, *Ed.* 4.)

Room being made for the reduction of the protruded parts into the abdomen, by the division of the stricture, they are to be immediately returned, if sound, and free from adhesions. This object is considerably facilitated by bending the thigh. The intestines are to be reduced before the omentum, but, when a portion of mesentery is protruded, it is to be returned before either of the preceding parts. The intestine should always be reduced, unless it be found in a state of actual mortification. It often appears so altered in colour, that an uninformed person would deem it improper to return it into the abdomen. However, if such alteration should not amount to a real mortification, experience justifies the reduction of the part. Sir A. Cooper has judiciously cautioned the operator not to mistake the dark chocolate-brown discolorations, for a state of gangrene. With these the protruded part is frequently found affected; and, as they generally produce no permanent mischief, they ought to be carefully discriminated from the black-purple, or lead-coloured spots, which usually precede mortification. To determine whether a discoloured portion of intestine be positively mortified, some recommend pressing forward the blood contained in the veins, and, if they fill again, it is looked upon as a proof, that the bowel is still possessed of life.

In returning a piece of intestine into the abdomen, the surgeon should first introduce the part, nearest the ring, into this aperture, and hold it there till another portion has succeeded it. This method is to be continued till the whole of the protruded bowel is reduced.

Writers on surgery cannot too severely reprobate the employment of any force, or violence, in the endeavours to return the contents of a hernia in the operation: a method, the more pernicious, because such parts are more or less in a state of inflammation. It is always better to enlarge the stricture, than pinch and bruise the bowel in trying to get it through an opening, which is too small. Distention of the intestine sometimes prevents the reduction: but, when this is the only impediment, the part may generally be returned, as soon as its contents have been compressed into the intestinal canal within the stricture. It is better, however, to dilate the strangulation a little more, than use any force in trying to get the intestine back into the abdomen in the manner just suggested.

Reduction is sometimes impeded by the protruded parts adhering to each other, or to the hernial sac. The intestines are not often found very firmly adherent together. The omentum and inside of the sac are the parts, which are most subject to become intimately connected by adhesions. The fingers will commonly serve for breaking any recent slight adhesions which may have taken place between the intestines and inside of the hernial sac. When those adhesions are firm, and of long standing, they must be cautiously divided with the knife; an object, which can be most easily and safely accomplished, in case they are long enough to permit the intestine to be elevated a little way from the surface of the sac. But, provided their firmness and shortness keep the external coat of the bowel and inner surface of the sac in close contact, the greatest care is requisite in separating the parts with a knife, so as to avoid wounding the intestine. In doing this, the most prudent and safe method, is not to cut too near the bowel, but rather to remove the adherent parts of the sac, and return them with the intestine into the abdomen. Every preternatural connexion should always be separated, before the viscera are reduced: Sir A. Cooper mentions, that a fatal obstruction to the passage of the intestinal matter has arisen from the mere adhesion of the two sides of a fold of intestine together. (*P.* 31.) When the adhesions, which prevent reduction, are situated about the neck of the sac, and out of the operator's view, it is best to make the wound through the skin and abdominal ring somewhat larger, so as to be able to separate the adhesions with more safety.

Having reduced the parts, the operator should introduce his finger, for the purpose of being sure, that they are fairly and freely returned into the abdomen, and no longer suffer constriction, either from the inner opening, from the ring, or the parts just within the cavity of the peritonæum.

Sometimes a strangulated hernia is complicated with a hydrocele; a circumstance, which may render it necessary either to cut through the latter swelling, or to limit the incision into the hernial sac, according as the hydrocele happens to cover the whole of the front of the sac, as seen by M. Cloquet and Mr. Stanley, or merely to advance in front of the lower part of the rupture. (See *Lawrence on Ruptures, p.* 276, *Ed.* 4.)

TREATMENT OF THE OMENTUM.

In an entero-epiplocele, this part, if healthy and free from gangrene, is to be reduced after the intestine. When, however, it is much diseased, thickened, and indurated, as it frequently is found to be, after remaining any considerable time in a hernial sac, the morbid part should be cut off. Its reduction, in this circumstance, would be highly improper, both because an immoderate enlargement of the wound would be necessary, in order to be able to put the diseased mass back into the abdomen, and because, when reduced, it would, in all probability, excite inflammation of the surrounding parts, and bring on dangerous symptoms. (See *Hey, p.* 172.)

The diseased omentum should always be cut off with a knife; and, if any of its arteries should bleed, they ought to be taken up with a tenaculum, and tied separately with a small ligature. An unreasonable apprehension of hemorrhage from the cut end of the omentum has led many operators to put a ligature all round this part, just above the diseased portion, which they were about to remove. This practice cannot be reprobated in terms too severe; for, a frequent effect of it is to bring on a fatal inflammation, and even mortification of the omentum, extending within the abdomen, as high as the stomach and transverse arch of the colon. Sir A. Cooper has remarked with great truth, that it is surprising, this custom should ever have prevailed. The very object of the operation is to extricate the omentum from its strangulated state, arising from the pressure of the surrounding tendon, and no sooner has this been done, than the surgeon includes it in a ligature, which produces a more perfect constriction, than that which existed before the operation was undertaken.

"When the omentum has suffered strangulation for a few days (says Mr. Lawrence,) it often becomes of a dark red, or livid colour; and there is an appearance, on cutting it, as if some blood were extravasated in its substance. This, I believe, is the state, which surgeons have generally described under the term of gangrene." (*P.* 262.)

When cut in this state, it does not bleed. I need hardly observe, that the dead part must be amputated, and never reduced. Some have advised leaving the omentum in the wound, especially in cases of old herniæ, in which it has been a long while protruded. Hey mentions cases, showing that granulations form very well, and that the wound becomes firmly healed, when this plan is followed. (*P.* 180, *&c.*) Every one, however, will acknowledge the truth of what Mr. Lawrence says on this subject. The method "is attended with no particular advantage, but certainly exposes the patient to the possibility of ill consequences. The omentum, left in the wound, must be liable to injury, inflammation, or disease. Unnatural adhesions, formed by this part, have greatly impaired the functions of the stomach. Cases are recorded, where the unfortunate patient has never been able to take more than a certain quantity of food, without bringing on instant vomiting: and even where it has been necessary for all the meals to be taken in the recumbent position, with the trunk curved, and the thighs bent. (*Gunz.*) To avoid the possibility of such afflicting consequences, we should, after removing any diseased portion, carefully replace the sound part of the omentum in the abdominal cavity." (See *Lawrence on Ruptures, p.* 291, *Edit.* 4.)

TREATMENT WHEN THE INTESTINE IN THE SAC IS MORTIFIED.

Sometimes, on opening the hernial sac, the intestine is found to be in a gangrenous state, although the occurrence could not be previously known, owing to the integuments and the hernial sac itself not being affected with the same mischief. In ordinary cases, however, both the skin and sac become gangrenous at the same time with the contents of the hernia. The tumor, vhich was previously tense and elastic, becomes oft, doughy, emphysematous, and of a purple olour. Sometimes the parts also now sponaneously return; but the patient generally surives only a few hours.

Sir A. Cooper has accurately remarked, that, other instances, the skin, covering the swellng, sloughs to a considerable extent, the intesine gives way, and, as the feces find vent at the ound, the symptoms of strangulation soon subide. When the patient continues to live in hese circumstances, the living part of the intesne becomes adherent to the hernial sac, the loughs separate and come away, and thus an rtificial anus is established, through which the eces are sometimes discharged, during the reainder of life. (See *Anus, Artificial.*)

Frequently, however, things take a more proserous course; the feces gradually resume their rmer route to the rectum, and, in proportion as e artificial anus becomes unnecessary, it is shut p. Many instances of this sort have fallen uner my own observation in St. Bartholomew's ospital. The chance of a favourable event is uch greater in some kinds of hernia, than in thers. When the strangulation only includes a art of the diameter of the gut, the feces are ometimes only partially discharged through the ortified opening. This quantity lessens, as e wound heals, and the patient gets perfectly ell. (*Louis, Mem. de l'Acad. de Chir. T.* 3. *. S. Palm. De Epiplo-enterocele crurali inrcerata sphacelata, cum deperditione notabili ubstantiæ intestini, sponte separati, feliciter urata alvo naturali restituta,* 4*to. Tub.* 1748. *aller, Disp. Chir.* 3, 2.) A small gangrenous ot, or two, may end in the same manner. Morfication, as well as wounds, of the large intesnes, is much more frequently followed by a ecovery, than the same affection and similar inries of the small intestines. Mortification of e cœcum and its appendix, in a hernial sac, as happened several times without materially sturbing the usual course of the feces to the nus, and the patients very soon recovered. *Med. Obs. and Inq. Vol.* 3, *p.* 162; *Hey's ract. Obs. p.* 162, *&c.*)

The grand thing, on which the establishment the continuous state of the intestinal canal epends, in all these cases, is the adhesion, which e living portion of the bowel, adjoining the ortified part, contracts with the peritonæum all und. In this manner, the escape of the connts of the bowels into the cavity of the perinæum becomes in general completely preented. The two ends of the sound portion of testine, after the mortified part has separated, pen into a membranous cavity, which previously nstituted a portion of the peritonæal sac, and ow unites the extremities of the gut. The radual contraction of the wound closes the embranous cavity externally, and thus the connuity of the canal is restored. The two ends, owever, are not joined so as to form a continued ylindrical tube, like that of the natural gut; t, they are united at an angle more, or less ute, and the matter, which goes from one to e other, describes a half circle in a newly formed embranous cavity that completes the canal; a bject which has been more fully explained in another part of this work. (See *Anus, Artificial.*

It is an observation of Sir A. Cooper's, that the degree of danger, attending an artificial anus, depends on the vicinity of the sphacelated part of the intestinal canal to the stomach. Thus, if the opening be in the jejunum, there is such a small extent of surface for absorption, between it and the stomach, that the patient dies of inanition.

Let us now suppose, that the mortified state of the intestine has only been discovered, after laying open the hernial sac in the operation. The mischief may only consist of one, or more spots; or of the whole diameter of the protruded bowel. In the first case, the proper practice is to divide the stricture, and return the intestine into the abdomen, with the mortified spots towards the wound. Mild purgatives and glysters are then to be exhibited. The most favourable mode, in which a case of this kind ends, is when the intestinal matter gradually resumes its natural course, after being either partly or entirely discharged from the wound. But, sometimes, the patient sinks under the disease, or an artificial anus continues for life.

The repeated observations of modern surgeons have now decided, that no ligature, passed through the mesentery, to keep the gangrenous part of the bowel near the wound, is at all necessary. The parts, in the neighbourhood of the ring, have all become adherent together, in consequence of inflammation, at the same time, that the parts in the hernial sac mortify; and, of course, the partially gangrenous bowel, when reduced, is mechanically hindered, by these adhesions, from slipping far from the wound. Desault and De la Faye, both confirm the fact, that the intestine never recedes far from the ring; and, even were it to do so, the adhesions, which it soon contracts to the adjacent surfaces, would, as Petit has explained, completely circumscribe any matter, which might be effused, and hinder it from being extensively extravasated among the convolutions of the viscera. (*Mem. de l'Acad. de Chir. T.* 1, 2.)

Where the chief part, or the whole, of the diameter of the protruded bowel is mortified, the first and most urgent indication is to relieve the bad symptoms arising from the distention of the intestinal canal above the stricture. "Let a free incision (says Mr. Lawrence) be made through the mortified part of the gut, in order to procure that evacuation of the loaded canal, which nature attempts by the process of gangrene." If the intestine has already given way, a free division of the integuments and sac allows the exit of the accumulated matter; and the opening in the gut may be enlarged, if necessary.—(*Lawrence on Ruptures, p.* 299, *Ed.* 4.) By such treatment, Sir Astley Cooper rescued from the grave a female who was pregnant at the time of the operation, and was some months afterwards safely brought to bed. (See *Lancet, Vol.* 2, *p.* 143.)

Here the division of the stricture is unnecessary, since all the mischief, which the bowel can receive from it, is done. This subject is well explained by Mr. Travers. (See *Inq. into the Process of Nature in Repairing Injuries of the Intestines, &c. p.* 300, *&c.*) Mild purgatives and clysters will be proper to unload the bowels, and determine the course of the feces towards the anus. Should, however, the stricture appear after the mortification to impede the free escape of the intestinal contents, a moderate dilatation of it must undoubtedly be proper.

Mr. Lawrence, in his valuable Treatise on Ruptures, has clearly exposed the impropriety of sewing the ends of the intestinal canal together, introducing one within the other, supported by a cylinder of isinglass, &c. put in their cavity, in those cases, in which the whole circle of the intestine has mortified, and been cut away, as was advised by former writers. By drawing the intestine out of the cavity, in order to remove the dead part, the adhesions behind the ring, on which the prospect of a cure chiefly depends, must be entirely destroyed; and new irritation and inflammation must be unavoidably produced, by handling and sewing an inflamed part. The adhesions would even be likely to render the scheme impracticable, as happened in a case related in the *Journ. de M. Le Roux*, *T.* 21, *p.* 260. (See *Lawrence on Ruptures, p.*314, *Ed.* 4.)

Instead of such practice, this gentleman judiciously recommends dilating the stricture, and leaving the subsequent progress of the cure entirely to nature. The sloughs will be cast off, and the ends of the gut are retained by the adhesive process in a state of apposition to each other, the most favourable for their union. Thus, there is a chance of the continuity of the intestinal canal becoming established again.

Whatever experiments it may be allowable to make in wounds with protrusion and division of the bowels, nothing, I think, is now more completely established, than the absurdity and danger of attempting to stitch the bowels in cases of hernia.

OPERATION FOR VERY LARGE INGUINAL HERNIÆ.

When the tumor is of long standing, exceedingly large, perhaps extending half way down to the knees, and its contents have never admitted of being completely reduced, the indication is to divide the stricture, provided a strangulation take place; but, without laying open the hernial sac, or attempting to reduce the parts.

The reasons, against the common plan of operating, under such circumstances, are, the difficulty of separating all the old adhesions; the hazardous inflammation, which would be excited by laying open so vast a tumor, and the probability that parts, so long protruded, might even bring on serious complaints, if reduced. J. L. Petit, and afterwards Dr. Monro, advised the sac not to be opened. (See *Mal. Chir. T.* 2, *p.* 372. *Description of Bursæ Mucosæ*, 1788.) Mr. Lawrence recommends an incision, of two or three inches in length, to be made through the integuments over the abdominal ring. The fascia, covering the hernial sac, is then to be exposed by dissection, and an opening made in it. This will permit a grooved direction to be put under the tendon; and the probe-pointed bistoury may be conducted, by means of the groove, to the part that requires division. If great difficulty should be experienced in accomplishing our object in this manner, a small aperture may be made in the sac near the ring, when the tendon may be divided with ease. The parts, after being thus liberated, should be returned into the belly, by pressure on the swelling, if adhesions do not prevent it: at all events, they generally admit of being replaced in part. (*Lawrence on Ruptures; p.* 269, *Ed.* 4.) A very interesting case has been lately recorded, in which the foregoing advice was deviated from, and a large scrotal hernia laid open; when it was found that nearly a foot of the colon was contained in the swelling, and could not be reduced. The integuments could not cover it; yet, its surface granulated, the skin extended itself as the cicatrix contracted over the swelling, which also diminished, and, in about six weeks, the cure was completed. (See *Journ. of Foreign Med. No.* 15, *p.* 460.)

OPERATION WHEN THE HERNIA IS SO SMALL THAT IT DOES NOT PROTRUDE EXTERNALLY THROUGH THE RING.

In this kind of case, there is little appearance of external tumor; consequently, the disease is very apt to be overlooked by the patient and surgeon, and some other cause assigned for the series of symptoms. The manner of operating in this form of the disease, differs from that in the common scrotal hernia; the incision is to be made parallel to the direction of the spermatic cord, and the stricture will be found at the internal ring. (*A. Cooper on Inguinal Hernia.*)

TREATMENT AFTER THE OPERATION.

Evacuations from the bowels should be immediately promoted by means of glysters, oleum ricini, or small doses of sulphate of magnesia dissolved in peppermint water; but, the patient should not be allowed to quit the recumbent position, or get on the night-stool, as doing so is apt to bring on a protrusion of the bowels again. (See *Case in Lancet*, *Vol.* 2, *p.* 148.) The safest plan is to let something be put under him for the reception of the feces. In the course of another day, if costiveness follow the effects of the first medicines, and tenderness and tension of the belly come on, local and general bleeding with the exhibition of liberal doses of calomel joined with opium, are strongly indicated. For some time, the diet is to be low. When symptoms of inflammation of the bowels and peritonæum threaten the patient, general bleeding, leeches on the abdomen, fomentations, blisters, doses of the oleum ricini, and glysters, are the means deserving of most dependence, and should be resorted to, without the least delay. In these circumstances, the warm bath, sometimes recommended, I think is more likely to do harm than good, by the disturbance to which it subjects the patient. When all danger of peritonæal inflammation is past, and the patient is very low and weak, bark, wine, cordials, and a generous diet, must be directed. The effervescing saline draught, with opium, is the best medicine for quieting the disturbance of the stomach after the operation. Opium and cordials are the most eligible for checking diarrhœa. As the operation does not usually prevent the parts from becoming protruded again, a truss must be applied before the patient leaves his bed, and afterwards constantly worn.

PROPOSALS FOR THE RADICAL CURE OF THE BUBONOCELE.

Of castrating the patient, applying caustic, or of the operation of the punctum aureum, with this view, I need only say, that they are barbarous, and not at all adapted for the attainment of the desired end. A description of these methods may be found in Paré, Wiseman, &c.

The old operation, termed the *royal stitch*, was one of the most promising plans. It consisted in putting a ligature, under the neck of the hernial sac, close to the abdominal ring, and then tying that part of the sac, so as to render it impervious, by the adhesive inflammation thus excited.

The royal stitch, performed in this manner, has been actually attended with success. (*Heister, Vol.* 2.) The umbilical rupture was cured by Saviard, on similar principles; and Desault radically cured nine cases of the exomphalos in children, by tying the hernial sac.

Schmucker cured two irreducible ruptures, free from strangulation, by cutting away the body of the sac, after tying its neck. (*Chir. Wahrnehmungen, B.* 2.) In one case, Sir A. Cooper found cutting away the sac alone insufficient.

Dissecting away the whole hernial sac, or even laying it open, must be a formidable operation, compared with merely making a small incision down to the neck of the sac, and applying one ligature. If the hernia were reducible, and the upper part of the sac could be rendered impervious by the ligature, all other more severe plans would be superfluous. However, Petit, Sharp, Acrel, &c. record cases, which tend to prove the danger and inefficacy of the royal stitch; though it is true, that none of these surgeons operated exactly in the simple manner above suggested.

Richter recommends scarifying the neck of the sac, with the view of producing an adhesion of its sides to each other; a plan, which, he says, he found very successful.

From the account, however, which has been given of the anatomy of the bubonocele, it is obvious, that none of these methods could do more than obliterate the sac as high as the ring, and never that portion of it, which is within the inguinal canal. Hence, the neck of the sac must still remain open for the descent of the viscera. This consideration, and that of the chances of bad and fatal symptoms from any operation undertaken solely for this purpose, and not urgently required for the relief of strangulation, are the grounds, on which these experiments are now disapproved.

CRURAL, OR FEMORAL HERNIA.

Verheyen, who wrote in 1710, first distinctly pointed out the nature of crural hernia, which, until then, had been generally confounded with bubonocele.

The parts, composing this kind of hernia, always protrude under Poupart's ligament, and the swelling is situated towards the inner part of the bend of the thigh. The rupture descends on the inside of the femoral artery and vein, between these vessels and the os pubis, through the *crural ring*, or *canal* for the transmission of the same vessels. And, as Hesselbach has remarked, the inner opening of this ring or canal is the predisposing cause of the disease, the peritonæum spread over it, being gradually propelled into it by various occasional causes, so as to complete the tendency to hernia. The actual protrusion of the bowels may be formed either suddenly, or by degrees. As soon as the bowels have once passed the outer aperture, or what Cloquet terms more properly the lower opening of the crural canal, the hernia has more room for extending itself forwards, and to each side, and the integuments now become elevated into *an oval swelling, the long diameter of which is nearly transverse.* (*Hesselbach, p.* 47.) Gimbernat names the passage, through which the femoral hernia protrudes from the abdomen, the *crural;* Hey, the *femoral ring;* and Cloquet, the *crural canal.*

Females are particularly subject to this kind of rupture. It has been computed, that nineteen out of twenty married women, afflicted with hernia, have this kind; but, that not one out of an hundred unmarried females, or out of the same number of men, have this form of the disease. (*Arnaud.*)

"The crural hernia," says Scarpa, "is frequently observed in women, who have had several children; it very seldom afflicts young girls; and still more rarely men. In the latter, the viscera can more easily escape through the inguinal ring, by following the spermatic cord, than they can descend along the crural vessels, and raise the margin of the aponeurosis of the external oblique muscle, that forms the crural arch. In women, an opposite disposition prevails, in consequence of the smallness of the inguinal ring, which, in them, only gives passage to the round ligament of the uterus, and besides is situated lower down, and nearer the pubes, than it is in men, whilst on the contrary, the crural arch is more extensive, by reason of the wider form of the pelvis. Morgagni expressly says, that he never met with the crural hernia in the dead body of any male subject. *Mihi, ut verum fatear, nondum nisi in fœminis accidit ut eam viderem.* (*De sed. et caus. morb. Epist.* 34, 15.) Camper gives us to understand almost the same thing. (*Icones Herniarum, in Præfat.*) Hévin often operated for this kind of hernia in females, but only once in the male subject. (*Pathol. et Therap. p.* 406.) Sandifort and Walter have both seen but a single instance of it in the dead body of the male subject. (*Obs. Anat. Pathol. cap.* 4, *p.* 72. *Sylloge comment. anat. p.* 24, *obs.* 21.) Arnaud himself, to whom modern surgery is highly indebted for many important precepts on the operation for the strangulated crural hernia in both sexes, candidly confesses, that he never had an opportunity of dissecting a hernia of this kind in the male subject." (*Scarpa, Traité des Hernies, p.* 201.)

Scarpa had at his disposal a male subject, in which there was a crural hernia, and he availed himself of the opportunity of examining the parts with the utmost care. He first injected the blood-vessels; he afterwards attentively dissected all the parts concerned in the disease; and he has published an exact description of the particulars, illustrated by an engraving.

According to Hesselbach, the femoral hernia, though not common in men, is more frequent, than is generally believed, and often overlooked on account of its being very small. (*Ueber den Ursprung, &c. der Leisten-und-Schenkelbrüche, p.* 47.) Thus, in an example published in a modern work, an inguinal and femoral hernia were met with together in a gentleman, sixty-three years of age. On examination of the body after death, a small piece of intestine, forming a crural hernia, was found strangulated, and concealed under an inguinal rupture and a mass of fat. (*C. Bell's Surgical Obs. Vol.* 1, *p.* 187.)

Mr. Lawrence states, that the femoral rupture is not so uncommon in men, as several authors would lead us to suppose. He has seen many instances of it. (*On Ruptures, p.* 409, *note, Ed.* 4.) Dr. Breschet, it seems, has also seen as many as thirty examples of it in the practice of Dupuytren. (*Consid. et Obs. Anat. &c. sur la Hernie Fem.* in his *Concours, p.* 42.)

According to the observations of Scarpa, and all the best modern writers upon surgery, the crural hernia forms, both in the male and female subject, in the cellular substance, which accompanies the crural vessels below Poupart's ligament. The swelling follows the internal side of those vessels, and gradually descends into the fold of the thigh, between the sartorius, gracilis, and pectineus muscles. "Many surgeons believe (says Scarpa) that the hernial sac, and the intestines, which it contains, are ordinarily situated above the crural vessels and trunk of the vena saphena, and sometimes between these vessels and the anterior superior spine of the ilium. But, as far as my knowledge extends, this assertion is not supported by a single accurate description of the crural hernia in the early stage. It is true, that when the tumor has in time acquired a large size, and its fundus is inclined in a parallel manner to the fold of the thigh, it partly or entirely covers the crural vessels, and even the crural nerve, as Walter says he once observed. (*Sylloge comment. anat. p.* 24.) But, it is not thence to be concluded, that the tumor in the beginning descended over the crural vessels, much less betwixt them and the anterior superior spinous process of the ilium. Neither must it be imagined, that the neck of the hernial sac becomes removed from the inner to the outer side of these vessels. If these two cases ever happen, they must be very rare; and the best authors, who have treated of crural hernia, concur in stating, that in performing the operation, they have constantly found the viscera situated on the inside of the crural vessels, but never on their outside. Even when the tumor, after acquiring a considerable size, is situated transversely over the crural vessels, the neck of the hernial sac has always been found upon their inner side, that is to say, between them and the pubes. Le Dran, (*Observ. de Chir. T.* 2, *p.* 2,) La Faye, (*Cours d'Opérations de Dionis, p.* 358,) Petit, (*Œuvres Posthumes, T.* 2, *p.* 219,) Morgagni, (*De Sed. et Caus. Morb. epist.* 34, 15,) Arnaud, (*Mem. de Chir. Tom.* 2, *p.* 768,) Gunz, (*De Herniis libellus, p.* 78,) Bertrandi, (*Trattato delle Operazoni, T.* 1, *annot. p.* 218,) Pott, (*Chirurg. Works, Vol.* 2, *p.* 152,) Desault, (*Traité des Mal. Chirurg. p.* 191—195,) B. Bell, (*A System of Surgery, Vol.* 1, *p.* 387,) Richter, (*Traité des Hernies, chap.* 34,) Nessi, (*Instituz. Chir. T.* 2, *p.* 198,) Lassus, (*Med. Oper. T.* 1, *p.* 198,) and many other writers, all concur upon this point. In support of their opinion, (says Scarpa,) I could cite a great number of cases of my own, which I have collected either in operating on several individuals for crural hernia, or in dissecting the same kind of hernia in the bodies of many female subjects, and in that of the man, from whom I have taken the 8th plate. Lastly, also, having had an opportunity of dissecting in a female an enormous crural hernia, which descended one-third of the way down the thigh, I observed that the neck of the sac did not encroach at all upon the crural vessels, but lay entirely on their inner side." (*Scarpa, Traité des Hernies, p.* 203, 206.)

The tumor, on account of its situation, is liable to be mistaken for an enlarged inguinal gland; and many fatal events are recorded to have happened from the surgeon's ignorance of the existence of the disease. Mr. Lawrence once saw an hospital surgeon mistake a crural hernia for a glandular tumor, and the patient died, without any attempt being made to afford relief by the operation. (*P.* 413, *Ed.* 4.) See also Petit, (*Traité des Mal. Chir. T.* 2, *p.* 293, *&c.*) A gland can only become enlarged by the gradual effects of inflammation; the swelling of a crural hernia comes on in a momentary and sudden manner, and, when strangulated, occasions the train of symptoms already described in our account of the inguinal hernia, which symptoms an enlarged gland could never occasion. Such circumstances seem to be sufficiently discriminative; though the feel of the two kinds of swelling, is often not of itself enough to make the surgeon decided in his opinion. It is particularly remarked by Hesselbach, that, while a femoral hernia is incomplete, that is to say, within the outer opening of the passage, through which the parts descend, the disease presents itself as a round, firm swelling, on the outer side of which the femoral artery can be felt pulsating: this small hernia may be mistaken for an inflamed gland, and the case can only be discriminated by the history of its origin and symptoms. (*Ueber den Ursprung der Leisten-und Schenkelbrüche, p.* 51.) A femoral hernia may be mistaken for a bubonocele, when the expanded part of the swelling lies over Poupart's ligament. As the taxis and operation for the first case ought to be done differently from those for the latter, the error may lead to very bad consequences. *The femoral hernia, however, may always be discriminated, by the neck of the tumor having Poupart's ligament above it. In the bubonocele, the spine of the pubes is behind and below this part of the sac; but, in the femoral hernia, it is on the same horizontal level, and a little on the inside of it.* (See *Lawrence on Ruptures, p.* 414, *Ed.* 4.)

In the male subject, "the crural hernia, in the early stage (says Scarpa), is situated so deeply in the bend of the thigh, that it is difficult, even in the thinnest persons, to feel its neck, and in examining its circumference with the extremity of the finger, the tendinous margin of the opening, through which the parts are protruded, can only be perceived with considerable difficulty. On the contrary, the inguinal hernia, however small it may be, is always less deeply situated;

it is about half an inch above the bend of the thigh. In carrying the finger round its neck, the tendinous margin of the inguinal ring can be easily felt at its circumference; and at the posterior part of the small tumor, the cord composed of the spermatic vessels is distinguishable. *When the crural hernia has acquired a considerable size, its neck is always deeply situated in the bend of the thigh; but, its body and fundus assume an oval form, and their great diameter is situated transversely in the bend of the thigh.* Whatever may be the size of the inguinal hernia, it always presents a tumor of a pyramidal form, the base or fundus of which, far from being directed towards the ilium, follows exactly the direction of the spermatic cord, and descends directly into the scrotum. Besides the symptoms, common to all hernial swellings, the crural hernia, when it has attained a certain size, presents some others, which are peculiar to it, such as *a sense of stupor and heaviness in the thigh*, and *œdema of the leg, and even of the foot*, of the same side." The reason, why œdema and numbness of the limb, are particularly remarkable in cases of femoral hernia is justly referred by Hesselbach, to the circumstance of the femoral vessels and nerves, with numerous lymphatics, taking their course through the crural ring, and, according to his observations, the numbness and œdema are especially great, when the protrusion is omentum, which makes stronger pressure on the vessels and nerves, than commonly happens in a case of enterocele. (*P.* 53.)

"In women, however, (as Scarpa observes,) it is less easy to distinguish the crural hernia from the inguinal. In fact, the absence of the spermatic cord, and the nearer situation of the ring to the crural arch, may easily occasion a mistake. Sometimes, a woman may even be supposed to have a double crural hernia of the same side, whilst, of these two distinct, though neighbouring herniæ, one may be inguinal, and the other crural. Arnaud (*Mém. de Chir. T.* 2, *p.* 605,) relates an instance of such a mistake." (*Scarpa, Traité des Hernies, p.* 207, 208.)

This interesting writer takes occasion to observe further, upon this part of the subject, that the portion of the inferior pillar of the abdominal ring, which separates this opening from the internal and inferior angle of the crural arch, is so slender in women, that it is sometimes hard to distinguish the crural from the inguinal hernia, which is not the case in male patients.

Until a few years ago, the stricture, in cases of femoral hernia, was always supposed to be produced by the lower border of the external oblique muscle, or, as it is termed, Poupart's ligament. A total change of opinion on this subject, however, has latterly taken place, in consequence of the observations first made by Gimbernat, in 1793. "In the crural hernia (says he,) the aperture through which the parts issue, is *not* formed by two bands, (as in the inguinal hernia) but it is a foramen almost round, proceeding from the internal margin of the crural arch (Poupart's ligament), near its insertion into the branch of the os pubis, between this bone and the iliac vein: so that, in this hernia, the branch of the os pubis is situated more internally than the intestine, and a little behind; the vein, externally, and behind; and the internal border of the arch, before. Now it is this border which always forms the strangulation. (See *A new Method of Operating for the Femoral Hernia.*)

The utility of knowing, that it is not Poupart's ligament which produces the strangulation, in cases of femoral hernia, is important; for we then know, that cutting the lower and outer border of the external oblique muscle, is quite erroneous. This proceeding is the more to be reprobated, because the lower pillar of the abdominal ring, in both sexes, will be divided by directing the incision upward, or upward and inward; and thus the abdominal and crural rings will be made into one common aperture, large enough to make the future occurrence of hernia very likely to happen. In the male, there is also considerable danger of the spermatic cord being cut. Cutting Poupart's ligament obliquely outwards, is attended with still more danger; for the epigastric artery will infallibly be divided at its origin; and with all these hazards, the incision must be quite useless, unless carried on to the internal edge of the crural arch. (*Gimbernat, p.* 16.)

The inclination, however, of several modern writers to refer the strangulation entirely to Gimbernat's ligament is not sanctioned by the most careful observers, like Hesselbach and Langenbeck. (*Neue Bibl. B.* 2, *p.* 132.) The former justly remarks, that a complete femoral hernia may be strangulated in two places, either at the outer or inner opening of the passage, through which the protrusion happens. Nay, says he, that the strangulation is sometimes caused by the outer opening was known to former surgeons, for they remarked, that the constriction was removed by dividing the fascia. (*P.* 53.) And, in addition to these two modes of strangulation is to be enumerated a third, in which the viscera are constricted by protruding through some weaker point, or accidental opening, in the anterior parietes of the crural canal; (*Hesselbach, p.* 48; *Cloquet, Recherches Anat. p.* 85; *also Langenbeck, Op. cit. p.* 132,) or even through an aperture in the inner side of this passage, as we find depicted in the twentieth plate of Langenbeck's treatise, "De Structurâ Peritonæi."

I know of no surgical writer, who has given a clearer account of the anatomy of the femoral hernia, than Langenbeck. (*Neue Bibl. B.* 2, *p.* 112, *&c.*) He observes, that when the dissection is begun at the inside of the inguinal region, the following circumstances are noticed: after the removal of the peritonæum from the abdominal muscles, and from the psoas, iliacus internus, and the great vessels, the inner surface of the transversalis still has an investment, which Cloquet terms the *fascia transversalis*, and which is always a white glistening aponeurosis. From the place, where the femoral artery lies under Poupart's ligament, to the anterior superior spine of the ilium, the preceding fascia is extended in a strong fibrous form behind the inner surface of Poupart's ligament, and a thin continuation of it is extended over the iliacus internus and psoas muscles, where it is named by Sir A. Cooper and Cloquet the *fascia iliaca*. The fascia of the transverse muscle closes the belly behind Poupart's ligament, as completely as the peritonæum does, so that between the femoral artery and the anterior superior spine of the ilium none of the bowels can protrude, which occurrence is still further prevented by the fascia lata, which below Poupart's ligament is closely attached to the muscles of the thigh. By the pelvis being thus shut up, the origin of a crural hernia on the outside of the femoral vessels is rendered quite impossible. (*Langenbeck, op. cit.*) This part of the explanation very nearly resembles that delivered by Sir A. Cooper, except that the latter describes the iliac fascia, and not what Cloquet calls the transverse fascia, as closing the pelvis from the spine of the ilium to the crural vessels. But, this difference is easily accounted for by the circumstance of Sir A. Cooper extending the name fascia iliaca beyond the limits given it by Cloquet and Langenbeck.

Near the anterior superior spinous process of the ilium, Langenbeck remarks, that the fascia of the transverse muscle has some strong fibres, which proceed inwards under the internal opening of the inguinal canal, of which they form, as it were, the bottom, and are named by Hesselbach the *internal inguinal ligament.* They go over the femoral artery and vein, are connected above with the fascia of the transverse muscle, and below are continued into the fascia of the psoas and iliac muscles. Where these fibres pass over the femoral vessels, they expand into a firm aponeurosis, which passing downwards, is intimately attached at the inner side of the femoral vein to the horizontal branch of the os pubis, close to the symphysis, and then joins the aponeurosis of the recti muscles. The expanded portion of the foregoing tendinous fibres, thus continued along the crista of the os pubis to the sheath of the rectus, forms the inner surface of *Gimbernat's* or the *femoral*, or *crural ligament.* The inner edge of this ligament is falciform, and concave, the concavity being turned towards the femoral vein. Now where the fascia of the transverse muscle extends downwards, on the outer side of the crural artery, to the fascia of the psoas and iliac muscles, so as to close the pelvis between that vessel, and the anterior superior spinous process of the ilium, it also forms, like Gimbernat's ligament, a falciform edge, the concavity of which lies close over the external convexity of the crural artery. Thus, partly by the concave edge of Gimbernat's ligament, directed towards the crural vein, and partly by the concave edge of the extension of the fascia of the transverse muscle to the fascia iliaca, which edge is turned towards the crural artery, an aperture is produced, through which the femoral vessels pass out of the pelvis. This opening is named by Cloquet the *upper opening of the crural canal*, or, as many English surgeons would say, of the *crural* or *femoral ring.* By Hesselbach, it is called the *internal opening for the femoral vessels.* However, as these vessels do not lie loosely and unconnectedly in this aperture, the opening itself is shut up, as it were, and cannot be seen without dissection.

On the above-described fasciæ, there is a considerable quantity of cellular substance, which covers the vessels in the pelvis, forms a sort of sheath for the crural artery and vein, and accompanies these vessels through the inner opening of the crural canal, or ring, which is itself accurately shut up by it. When this cellular substance is removed, the white glistening fasciæ are plainly seen passing through the same opening, and coming nearer together in a funnel-like manner. Where the fascia of the transverse muscle forms the outer falciform edge of this aperture, and is passing over the arteria circumflexa ilii to the psoas and iliac muscles, it sends off through the opening a process, which becomes connected with the outer side of the crural canal, or ring: while from the internal inguinal ligament, which lies above this opening, and constitutes the upper edge of the inner aperture of the crural canal, a production is sent, which is connected with the anterior side of this canal. As for the posterior and inner sides, they have a connexion with the fasciæ of the psoas and levator ani.

When the groin is externally dissected, in order to have a view of the crural ring or canal, on the outside of the pelvis, the following appearances present themselves: after the removal of the common integuments, one finds below Poupart's ligament, a quantity of fat, glands, lymphatics, veins, and arteries, which vessels come out through small openings in the fascia lata. As soon as the outer surface of the external oblique muscle is cleared, its aponeurosis is found to become stronger at the anterior superior spinous process of the ilium, and its fibres to collect together, and assume the form of a band, which is Poupart's ligament, called by Hesselbach the *external inguinal ligament*, and by Gimbernat, Cloquet, and others, the *crural arch.* This ligament, as is well known, passes obliquely, inwards and downwards, towards the os pubis, and after forming the external pillar of the abdominal ring, is first closely inserted into the angle, or tubercle of the os pubis, and then being continued inwards, or backwards, in the form of a firm fascia, is attached to the horizontal ramus of that bone, making the *anterior or outer surface of Gimbernat's, or the femoral, ligament*, which is consequently produced by the junction of Poupart's with Hesselbach's internal inguinal ligament along the spine of the os pubis. Thus, just as the internal inguinal ligament is a strengthened part of the fascia of the transverse muscle, the outer inguinal ligament, (or, as it is here commonly called,) Poupart's ligament, is produced by the strengthened fibres of the lower portion of the aponeurosis of the external oblique muscle, the fibres of it, making the external pillar of the ring, being continued further towards the symphysis of the pubes, in the form of the outer surface of Gimbernat's ligament. (*Langenbeck, Neue Bibl. B. 2, p.* 120, 121.) English surgeons make the formation of Gimbernat's, or the femoral ligament more simple: thus, Mr. Lawrence states, that when Poupart's ligament approaches the pubes, " it becomes suddenly broader; that it is fixed by this broad portion, along the whole length of the angle and crista of the pubes; that it has a rounded and strong anterior edge, a thin and sharp posterior margin; and that the former of these is nearer to the surface, while the latter is comparatively deeply seated. The breadth of this part varies, in different subjects: it is generally from three quarters of an inch to an inch. Sometimes, as Gimbernat has stated, it measures more than an inch. Dr. Monro has observed, that it is broader in the male, than in the female subject; and, from this structure, he explains in part the more rare occurrence of this rupture in the male." (*P.* 368, *Ed.* 3.)

The fascia lata, which is spread over the muscles of the thigh, is only a continuation of the aponeurosis of the external oblique muscle, and, as it proceeds downwards from Poupart's ligament, is very closely attached to the muscles of the thigh, all the way from the anterior superior spinous process of the ilium, to the femoral artery, drawing, as it were, Poupart's ligament downwards and inwards, or backwards, towards the cavity of the pelvis, so as to give to its external edge a convex appearance, and shut up the outside of the pelvis, from the anterior superior spine of the ilium as far as the crural nerve and artery, so firmly, that the formation of a femoral hernia at this part is impossible. And, if small apertures, filled with fat, be discernible in this portion of the fascia lata, still no hernia can here take place, because, as Langenbeck has already explained, here the interior of the pelvis is again shut up by fasciæ already described.

Under the fascia lata are situated the anterior crural nerve, the vein and artery. The vena saphena magna lies on the outside of it, and passes through an opening in it into the femoral vein. This aperture in the fascia lata is at the inner side of the groin, opposite the internal opening of the crural ring, or canal. It is named by Hesselbach *the external aperture for the femoral vessels*, and described by him as an oblique fissure about fifteen lines in length. He takes notice of its external semilunar edge, and two horns, which are directed inwards; the parts first particularly described by Mr. A. Burns of Glasgow, under the name of the *semilunar*, or *falciform process of the fascia lata.* The lower horn bends rather inwards and upwards, and terminates in the production of the fascia lata spread over the pectinalis muscle. The upper horn, which is less curved, buries itself under the external pillar of the abdominal ring. Over the lower horn of the opening, just now described, the vena saphena magna ascends into the femoral vein. Through the same aperture also pass nearly all the superficial lymphatics of the lower extremity. According to Cloquet, the fascia lata consists of two layers, of which the anterior superficial one is closely attached to the crural arch, extends over the femoral vessels, and forms the anterior side of the crural canal. The other layer, near the pubes, quits the former, and, covering the pectinalis muscle, constitutes the hinder side of that canal. The anterior layer of the fascia then forms an oval aperture, through which the vena saphena passes, and which is considered by Cloquet as *the lower opening of the crural canal.* This opening, called by Hesselbach *the external foramen for the femoral vessels*, is well delineated both in his excellent work, and in the twenty-third plate of Langenbeck's book (*De Structurâ Peritonæi, testiculorum tunicis, &c.* 8*vo. Gött.* 1817.) According to the investigations of the last anatomist, as soon as the integuments are removed, this opening in the fascia lata, with its external semilunar edge, and two horns, are regularly seen. The front side of the crural canal is formed by the fascia lata. Where this fascia proceeds in the form of Hesselbach's upper horn under and behind the external pillar of the abdominal ring, and makes the outer layer of Gimbernat's ligament, it is continued as a thin aponeurosis over the vena saphena, so that it makes not merely the upper horn, but reaches further downwards and forms the outer side of the crural canal. The outer side then of the crural canal, or ring, according to Langenbeck, extends from the outer semilunar edge of the external opening for the femoral vessels, or as English surgeons would say, from the edge of the *falciform process of the fascia lata.* The larger the preceding thin continuation of fascia is, the smaller is the external opening for the femoral vessels, the more is the upper horn bent downwards, and the more determinate is the form of the canal. (*Langenbeck, Neue Bibl. B.* 2, *p.* 124, 125.)

According to Mr. Lawrence, " At the upper and anterior part of the limb, the fascia lata consists of two portions, an external and an internal, with distinct insertions. The former, which is the thickest and strongest, covers the sartorius and rectus femoris, and is inserted into Poupart's ligament, from the anterior superior spine of the ilium to the inner edge of the femoral vein. The latter, thinner and weaker, covers the pectineus and adductor muscles, and is inserted into the pubes, in front of the origin of the former. It passes behind the femoral vessels, and is there continuous with the iliac fascia, while the external portion covers these vessels anteriorly, just below the crural arch, and the vessels themselves are consequently situated between these two divisions of the fascia." (*On Ruptures, p.* 391, *Ed.* 4.)

Where the insertion of the fascia lata into Poupart's ligament ends, it forms what Mr. Burns of Glasgow calls the *falciform process*, the upper part of which is attached to the above ligament, while the lower proceeds further down the thigh. The concavity of the falciform process is directed towards the pubes. This anatomical connexion is one chief cause, why extending the thigh, and rotating it outward, render the crural arch tense.

The hernia being situated in front of the pectineus, must of course be exterior to the fascia lata. In my opinion, surgeons are very much indebted to Mr. Lawrence for his able explanation of this fact. As for myself, I am candid enough to own that, until I read his clear and concise account of the anatomy of the crural hernia, I could never reap any accurate notions concerning the relative situations of the hernial sac and fascia of the thigh, from other more prolix works, with the exception of those of Hesselbach and Langenbeck, by whom the anatomy is made perfectly intelligible. Mr. Lawrence reminds us, however, that the particular crural hernia, contained in the sheath of the femoral vessels, lies under the fascia; *p.* 403, *Edit.* 4. And he mentions, that, " the upper end of the falciform process passes over the upper and outer part of the neck of the tumor; it ist hen folded under the crural arch, and continues into the thin posterior border. The iliac vein is placed on its outer side; the pubes is directly behind it; and the upper and inner parts are bounded by the thin posterior edge of Poupart's ligament. It is this part which forms the strangulation."

(*On Ruptures*, *p.* 404. *Ed.* 4.) While, however, the latter statement is made by this gentleman and others, Sir Astley Cooper as positively declares, that the stricture is never situated at Gimbernat's ligament, but at the crural arch, just where the viscera leave the abdomen. (See *Lancet*, *Vol.* 2, *p.* 182.) He also mentions, that he has known the stricture continue after the division of that ligament, and the patient die. The more comprehensive view of this part of the subject, taken by Hesselbach and Langenbeck, I have already explained.

The inner side of the crural ring or canal, as already explained, is connected with the fascia of the transverse muscle. And, according to Langenbeck, below the part of the fascia lata, which forms the external foramen for the femoral vessels, the front side of the crural canal is sometimes formed by a continuation of the fascia of the transverse muscle, as he found was the case in both groins of one female subject. In such a case, there is a good deal of fat between the fascia lata, and the aponeurosis of the transverse muscle, and the two parts are easily separable. Langenbeck admits, however, that the same appearance may arise from a splitting of the layers of the fascia lata. Frequently the front side of the crural ring is so short, that the opening cannot rightly be termed a canal, and it is always shorter, than the posterior side. When the outer side exists, it is extended across the inner over the space between the two horns, and is then connected with the aponeurosis of the pectinalis derived from the fascia of the psoas and levator ani muscles. In the anterior and inner sides of the crural canal, there are some small openings. Doubtless, this structure is referred to by Hesselbach, when he says, that, in the male subject the outer opening for the femoral vessels is further closed by a net-like web of tendinous fasciculi. The posterior side of the crural canal, or ring, is entirely formed by the part of the fascia of the psoas, which enters its inner opening, and joins the aponeurosis of the pectinalis muscle. The outer side of the canal lies under the fascia lata, and joins the anterior and posterior sides, where the aponeuroses of the transverse and iliac muscles proceed to the outside of the femoral artery. Langenbeck thinks the opening, by which the vena saphena passes over the lower horn of the falciform process of the fascia lata, might be named *the lower aperture of the crural canal.* (See *Langenbeck's Neue Bibl. für die Chirurgie. B.* 2, *p.* 126, 127, *8vo.* [*Hanover.* 1819.)

According to Hesselbach, in femoral hernia, the two openings of the passage now termed the crural or femoral ring, are one half larger than natural. The outer portion of the inner of these apertures is propelled more outward, and with it the episgastric artery. The femoral vein no longer lies at the external end of this opening, but rather at the back of the canal or passage. The external semilunar edge (the falciform process) of the outer opening is carried more outward and upward, and is tightly applied over the distended hernial sac. In this state of the parts, the outer opening forms an oval firm tendinous ring, the direction of which, like that of the inner opening for the passage of the femoral vessels, is transverse. The neck of the hernial sac is that portion of it, which lies within the canal between the two openings. The posterior side of this canal, or passage, now frequently named the crural, or femoral ring, is longer than the anterior. In one large hernia, Hesselbach found it an inch and a half in length, but the anterior side of the passage more than one-third shorter. The greatest diameter of the inner opening was one inch five lines, while that of the outer one was only one inch four lines. Most of the posterior part of the neck of the hernial sac, with the hinder side of the canal, lies upon the pectineus muscle, and towards the outer side upon the femoral vein. The neck of the hernial sac adheres more firmly to the anterior, than to the posterior, side of the passage. At the outer opening of the passage, the neck terminates at almost a right angle forwards in the body of the sac, the upper portion of which lies upon Poupart's ligament, but the largest part of it is situated on the deep-seated layer of the femoral fascia, by which the outer side of the body of the sac, as high as the neck, is separated from the crural vessels and nerves. In the male subject, when the tendinous fibres, mixed with the cellular substance covering the outer opening of the passage, make great resistance at particular points, the hernial sac of a femoral hernia may be double, or even divided into several pouches, a preparation exhibiting which occurrence, is in the anatomical museum at Wurzburgh. (*Hesselbach*, *p.* 48.) Except in a few cases, in which the origin and course of the epigastric artery are unusual, this vessel runs very close to the external side of the neck of the hernial sac, much nearer than it does in an internal bubonocele.

The sac of the femoral hernia is exceedingly narrow at its neck; and, where its body begins, it becomes expanded in a globular form: the sac of the bubonocele is generally of an oblong pyramidal shape. The body of the sac of the femoral hernia, makes a right angle with the neck, by being thrown forward and upward, a circumstance very necessary to be known in trying to reduce the parts by the taxis. Though the tumor, formed by the body of the sac, is oval and nearly transverse, it is found, when attentively examined, to take the direction of the groin, which extends obliquely downwards and inwards, the outer, rather smaller end of the swelling being somewhat higher than the inner. (*Hesselbach*, *p.* 50.)

The sac of the femoral hernia is said by Sir A. Cooper to be covered by a kind of membranous expansion, consisting of condensed cellular substance, and named by him, the *fascia propria*, which is thus described: " A thin fascia naturally covers the opening, through which the hernia passes, and descends on the posterior part of the pubes. When the hernia, therefore, enters the sheath, it pushes this fascia before it, so that the sac may be perfectly drawn from its inner side, and the fascia which covers it, left distinct. The fascia which forms the crural sheath, and in which are placed the hole or holes for the absorbent vessels, is also protruded forwards, and is united with the other, so that the two become thus consolidated into one. If a large hernia is examined, the fascia is only found to proceed upwards, as far as the edge of the orifice on the inner side of the crural sheath by which the hernia descends; but, in a small hernia it passes into the abdomen, as far as the peritonæum, and forms a pouch, from which the hernial sac may be withdrawn, leaving this, forming a complete bag over the hernia." (*On Hernia*, *Part* 2, *p*. 6.) However, Mr. Lawrence has not been able to find, on dissection, the abovementioned thin fascia, said to cover the opening through which the hernia passes, nor does his account refer any covering of the hernia, in ordinary cases, to any elongated production of the sheath for the crural vessels. According to Sir Astley Cooper, a weak aponeurosis, derived from the superficial fascia of the bend of the thigh, covers the swelling, and lies immediately beneath the skin and adipose substance. Under this fascia is the condensed cellular substance or fascia propria joined with the expansion of the crural sheath, then some adipose substance, and lastly, the true peritonæal sac itself. It is of infinite use to remember these several investments in operating, lest one should think the hernial sac divided when it is not so.

All late writers on hernia, have remarked how very small the aperture is, through which the viscera protrude in the femoral rupture; how much greater the constriction generally is, than in the bubonocele; consequently, how much more rapid the symptoms are; how much less frequently the taxis succeeds; and how much more dangerous delay proves. (See *Sir A. Cooper*, *Hey*, *Lawrence*, *&c.*)

Though the crural ring is almost always small, yet, in a few instances, in which the tumor is large, and of long standing, it becomes very capacious, just as the opening often becomes, through which the inguinal hernia protrudes. Dr. Thomson, of Edinburgh, Mr. Hey, and Mr. Lawrence, have related examples of this kind.

The remarks already made, concerning the treatment of hernia, before having recourse to the knife, are all applicable to the present case, and need not be repeated. In attempting to reduce the femoral hernia by the taxis, the surgeon should recollect, however, that relaxing Poupart's ligament, and the femoral fascia, is of the highest consequence. Hence, the thigh should be bent, and rolled inwards. The pressure ought also to be first made downwards and backwards, in order to push the swelling off Poupart's ligament; and afterwards, the parts should be propelled upwards, so that they may return through the crural ring.

OPERATION FOR THE FEMORAL, OR CRURAL HERNIA.

Sir A. Cooper says, "the incision of the integuments is to be begun an inch and a half above the crural arch, in a line with the middle of the tumor, and extended downwards to the centre of the tumor below the arch. A second incision, nearly at right angles with the other, is next made, beginning from the middle of the inner side of the tumor, and extending it across to the outer side, so that the form of this double incision will be that of the letter T reversed." The angular flaps are, of course, to be next dissected off, and reflected. Dupuytren also makes the external wound of a similar shape, the first cut being always parallel to the femoral vessels. (*Breschet*, *op. cit. p*. 169.)

The making of two incisions, however, is not deemed necessary by the majority of surgeons; and, in all the numerous operations which I have seen performed in St. Bartholomew's Hospital during my apprenticeship there, and afterwards, a transverse wound was not necessary. The division of the skin should begin about an inch above the crural ring, and be continued obliquely downwards and outwards. In this manner, we cut exactly over the place, where the incision of the stricture should be made. (See *Lawrence*, *p*. 425, *Ed*. 4.)

"The first incision (Sir A. Cooper remarks) exposes the superficial fascia, which is given off by the external oblique muscle, and which covers the anterior part of the hernial sac; but, if the patient is thin, and the hernia has not been long formed, this fascia escapes observation, as it is then slight and delicate, and adheres closely to the inner side of the skin. When this fascia is divided, the tumor is so far exposed, that the circumscribed form of the hernia may be distinctly seen; and a person, not well acquainted with the anatomy of the parts, would readily suppose that the sac itself was now laid bare. This, however, is not the case, for it is still enveloped by a membrane, which is the fascia, that the hernial sac pushes before it, as it passes through the inner side of the crural sheath. This membrane, the fascia propria, is to be next divided longitudinally from the neck to the fundus of the sac; and if the subject is fat, an adipose membrane lies between it and the sac, from which it may be distinguished, by seeing the cellular membrane passing from its inner side to the surface of the sac.

"This is, in my opinion, the most difficult part of the operation; for the fascia propria is very liable to be mistaken for the sac itself; so that, when it is divided, it is supposed, that the sac is exposed, and the intestine is laid bare; following upon this idea, the stricture is divided in the outer part of the sac, and the intestine, still strangulated, is pushed, with the unopened sac, into the cavity of the abdomen.

"The hernial sac being exposed, is to be next opened; and, to divide it with safety, it is best to pinch up a small part of it between the finger and thumb; to move the thumb upon the finger, by which the intestine is distinctly felt, and may be separated from the inner side of the sac; and then to cut into the sac, by placing the blade of the knife horizontally. Into this opening a director should be passed, and the sac opened from its fundus to the crural sheath." (*On Crural and Umbilical Hernia.*)

Sometimes the contents of the hernia, thus exposed, admit of being returned, without the further use of the knife. When this object, however, cannot be readily done, the protruded parts should never suffer injury from repeated manual attempts; and it is best to divide the stricture at once.

The merit of having first proposed the safest plan of cutting Poupart's ligament, even before surgeons were aware of the parts which really form the strangulation, is assigned by Gimbernat to Mr. B. Bell, who introduced his finger below Poupart's ligament, between the ligament and the intestine; (an evident proof, says Gimbernat, that there was no strangulation there;) he then made a very superficial incision from above downwards into the thickest part of the ligament to its lower edge; and, without cutting quite through it, he continued his incision about an inch. He rested the back of the scalpel upon his finger, which served as a guide to the instrument, and, at the same time, as a defence to the intestine. The incision, however, having been continued for an inch, would, as Gimbernat remarks, inevitably cut the internal edge of the crural arch. Now, cutting this, only for a few lines, gives sufficient room for the easy reduction of the parts, and there is no necessity to touch the ligament, as it never occasions the strangulation. (*Gimbernat, p.* 27.)

Gimbernat's method of dividing the stricture, in cases of femoral herniæ, is now frequently regarded as the safest and most effectual. "Introduce, along the internal side of the intestine, a cannulated or grooved sound, with a blunt end, and a channel of sufficient depth. This is to be directed obliquely inwards, till it enter the crural ring, which will be known by the increased resistance; as also when its point rests upon the branch of the os pubis. Then suspend the introduction; and keeping the sound (with your left hand, if you are operating on the right side, and v. v.) firmly resting upon the branch of the os pubis, so that its back shall be turned towards the intestine, and its canal to the symphysis pubis, introduce gently with your other hand, into the groove of the sound, a bistoury with a narrow blade and blunt end, till it enter the ring. Its entry will be known, as before, by a little increase of resistance. Cautiously press the bistoury to the end of the canal; and employing your two hands at once, carry both instruments close along the branch to the body of the pubis, drawing them out at the same time. By this easy operation, you will divide the internal edge of the crural arch at its extremity, and within four or five lines of its duplicature; the remainder continuing firmly attached by the inferior band, or pillar, of which it is the continuation. This simple incision being thus made, without the smallest danger, the internal border of the arch, which forms the strangulation, will be considerably relaxed, and the parts will be reduced with the greatest ease." (*Gimbernat, p.* 45, 46.)

Mr. Lawrence thus executes Gimbernat's plan: "it will generally be practicable (says he) to introduce the tip of the finger, or of the nail under the edge of the tendon, the fibres of which should be carefully divided in succession, with the probe-pointed knife, until we have gained just sufficient room to replace the contents of the swelling. When the tightness of the stricture prevents the operator from using his finger as a guide, he will employ the deeply-grooved curved director, introducing it as near as he can to the pubes. In both cases, the blunt end only of the curved knife should be passed beyond the stricture, that the division may be effected without risk to the arteries, in case they should not follow their usual course." The intestine should be protected by the operator's left fore-finger, or if that cannot be spared, it may be held aside by an assistant. (*On Ruptures, p.* 432, *Ed.* 4.)

Sir A. Cooper recommends the stricture to be divided "obliquely inwards and upwards, at right angles to the crural arch." In consequence of the very deep situation of the posterior edge of the crural arch, and the tight manner in which the protruded viscera are surrounded by the tendon, this excellent surgeon considers, that the intestine is in great danger of being wounded with the knife, or, if held aside sufficiently, of being torn. Hence, his custom is to divide the stricture on its anterior part, as far as the front margin of the crural arch, directing the edge of the knife upwards and inwards. If this is not sufficient, he afterwards cuts the thin posterior border of the tendon in the the same direction.

After advising us to open the sac of a femoral hernia, with particular care, on account of its being much thinner than that of a bubonocele, and (as might be added) on account of its seldom containing any fluid, and often having no omentum in it covering the intestine, Mr. Hey remarks; "The stricture made upon the prolapsed parts is very great, as I have already observed; but if the tip of the finger can be introduced within the femoral ring, to guide the bubonocele knife, a small incision (for the ring is narrow) will be sufficient to set the parts at liberty. If the tip of the finger cannot be introduced at the proper place, a director with a deep groove must be used instead of the finger; but I prefer the latter. The finger or director should not be introduced very near the great vessels; but on that side of the intestine or omentum which is nearest to the symphysis of the ossa pubis. *The incision may then be made directly upwards.* The surgeon must take especial care to introduce his finger or director within that part where he finds the stricture to be the greatest, which, in this species of hernia, is the most interior part of the wound." (*P.* 155.)

Gimbernat's mode is preferable to Mr. Hey's, because, were the operation done on a male, cutting directly upward would endanger the spermatic cord. In order to obviate this risk, Sir A. Cooper makes a small incision above Poupart's ligament, and draws the cord out of the way of the knife, with a bent probe.

Mr. Lawrence has noticed, that "an incision of the most interior part of the stricture is free from all danger, in the ordinary course of the vessels. But that variety, in which the obturatrix artery, arising from the epigastric, runs along the inner margin of the sac, seems to preclude us from cutting even in this direction." Hesselbach met with a remarkable instance of such irregularity in the origin and course of the obturatrix artery in the body of a female, in whom there were two small crural herniæ. On the right side, the epigastric and obturatrix arteries arose, by a common trunk, from the crural artery below Poupart's ligament. They soon separated from one another; the epigastric taking its ordinary course upwards at the outer side of the neck of the hernial sac, while the obturatrix made a considerable turn, and ran transversely inwards over the strong fibres of the femoral ligament, and encircled the anterior and inner side of the neck of the hernia, whence it afterwards proceeded obliquely downwards and outwards, behind the horizontal branch of the os pubis, towards the obturator foramen. (*Hesselbach, p.* 52.) A mode of operating has been lately proposed, (*Edinb. Med. and Surg. Journal, Vol.* 2, *p.* 205,) with a view of avoiding this danger. We are directed to make an incision through the aponeurosis of the external oblique muscle, just above the crural arch, and in a direction parallel to that part: to introduce a director under the stricture from this opening, and to divide the tendon to the requisite extent, by means of a curved knife passed along the groove. (*On Ruptures, Edit.* 4, *p.* 430.) For reasons which Mr. Lawrence states, this plan is certainly not altogether eligible, and, upon the whole, Gimbernat's method of cutting the stricture is the safest. Dupuytren uses a curved probe-pointed bistoury, that cuts with its convexity: it is conducted flat on the left fore-finger, and with it, under the stricture, and then its edge is turned upwards, the incision being extended through the upper end of the falciform process to the margin of the crural arch. (*Breschet, Concours, &c. p.* 182.)

Monro computes, that the obturator artery may arise from the epigastric, once in twenty-five or thirty subjects. But, allowing that it originates more frequently, it then does not always deviate from its usual course along the outside of the sac. Sir A. Cooper says; "in all cases, which I have myself dissected, where this variety existed with crural hernia, the obturator has passed into the pelvis, on the outer side of the neck of the sac, entirely out of the reach of any danger of the knife." (*On Crural Hernia, p.* 21.) Mr. Lawrence concludes, that the comparative number of instances, in which it is found on the opposite side, cannot be more than one in twenty, and consequently, if we admit that the obturatrix artery arises from the epigastric once in five times, it would only be liable to be wounded once in a hundred operations. (*P.* 412, *Edit.* 3.)

When the origin and course of the epigastric artery differ from what is common, this vessel, as Hesselbach remarks, sometimes passes inwards along the horizontal branch of the os pubis, ere it ascends towards the rectus muscle; and when this variation exists in a case of femoral hernia, the artery does not pass over the outer side of the neck of the sac, but first under it, and then round its inner side. Hesselbach has seen only one instance of this irregularity of the epigastric artery in a female, and never in a male subject. (*Ueber den Ursprung, &c. der Leisten- und Schenkelbrüche, p.* 52.)

The industrious Cloquet examined 250 bodies, for the purpose of estimating the average number of cases, in which the origin and course of the obturatrix artery are different from what is most common. He found, that when this artery and the epigastric arise by one common trunk, they sometimes separate from each other above, and rarely below the upper opening of the crural canal. In the first case, the longer their common trunk is, the closer do they lie to Gimbernat's ligament, and to the inner edge of the upper opening of the above canal. In the second case, the common trunk of these arteries arises within this canal, and the two vessels then return into the abdomen. In 160 bodies, of which 87 were male, and 73 female, the obturatrix artery arose on both sides from the hypogastric, and only in 56, of which 21 were male, and 35 female, did it originate on both sides from the epigastric. In 28, of which 15 were male, and 13 female, the obturatrix arose on one side from the hypogastric, and on the other from the epigastric. In 6 bodies, viz. 2 male, and 4 female, it originated from the crural. (*Rech. Anat. sur les Hernies*, 4*to. Paris.*)

It is observed by Professor Scarpa, that "the round ligament of the uterus, in passing through the abdominal muscles, follows precisely the same track as the spermatic cord. It is equally situated behind Poupart's ligament, with the difference, that it does not become so distinct from the internal extremity of this ligament, as the spermatic cord does, because it has not so far to run, in order to get from that ligament to the inguinal ring, the latter opening being situated lower in the female, than the male subject. The round ligament, like the spermatic cord, also crosses the epigastric artery, before reaching the inguinal ring. And as the crural hernia always begins at the internal and inferior angle of the arch of this name, as well in the male as the female, it follows, that, in the two sexes, the epigastric artery remains in its natural situation, and invariably corresponds to the external side of the neck of the crural hernia; whilst the spermatic cord in man, and the round ligament, in women, pass over the extremity of the front of the neck of the hernial sac. In the operation for the crural hernia, in females, the incision of the neck of the hernial sac, and crural arch, when directed upward towards the linea alba, cannot wound the epigastric artery, which it is of the most consequence to avoid; but it always divides, either totally, or partially, the round ligament of the uterus, which cannot lead to any dangerous hemorrhage; for except in the period of pregnancy, the arteries of the round ligament are very small; they are almost obliterated in women advanced in years; and in general, they are quite capillary in the extremity of the ligament adjoining the ring. Hence, it cannot be surprising, that so many crural herniæ have been successfully operated upon in women, by cutting the hernial sac and crural arch directly upward, while not a single instance can be cited of such an incision being made in man without mischief, although, in both sexes, the epigastric artery may have been avoided in operating by this process." (*Scarpa, Traité des Hernies, p.* 240.)

In operating upon the crural hernia in males, Scarpa recommends us to follow a method, which he calls new, but which, in fact, is the same as that advised by Gimbernat. "I have found (says Scarpa) that, in man, the neck of the hernial sac may be divided without danger, by giving to the incision a direction exactly contrary to that which is practised in the female subject. After having opened the hernial sac, it is to be drawn outward by one of its sides sufficiently to allow the introduction of a small director between its neck and the strangulated intestine, *the groove of the instrument being turned downwards towards the internal and inferior angle of the crural arch. A probe-pointed bistoury, the edge of which is also to be directed downwards towards the point of insertion of Poupart's ligament to the pubes, is to be pushed along the groove. By this means the neck of the hernial sac will be divided its whole length, at its internal and inferior side, and Poupart's ligament will be cut close to its attachment, to the top of the os pubis.* The epigastric artery will certainly be avoided, because it lies upon the opposite side of the hernial sac. As for the spermatic cord, I have demonstrated, that it is situated on the forepart of the neck of the hernial sac; consequently, it cannot be touched by an incision made from above downwards, whilst it is constantly cut in the ordinary method, since the knife is carried from below upwards. In the first case, this part may be the more easily avoided, as it lies at some distance from the internal and inferior angle of the crural arch. In fact, it is at this place that it quits, as we have seen, the edge of Poupart's ligament, in order to ascend towards the inguinal ring. The incision that I propose (says Scarpa) not only has the advantage of slitting open the neck of the hernial sac its whole length, it also divides a part of the insertion of Poupart's ligament into the upper part of the os pubis, a thing that greatly contributes to relax the crural arch, and facilitate the reduction of the viscera; of those, at least, which are not adherent to the sac." *(Scarpa, Op. cit. p. 235.)*

Although this accurate anatomist and surgeon, at the time when he first published on hernia, was quite unacquainted with the valuable works on hernia, which had made their appearance in this country, it is curious to find, both in his account of the inguinal and crural hernia, how strongly his doctrines and observations tend to confirm every thing that has recently been insisted upon in modern works, respecting the place where the bubonocele first protrudes, its passing through a sort of canal before it comes out of the abdominal ring, the advantage of cutting in the crural hernia the internal and inferior angle of Poupart's ligament, or, in other terms, that part of the ligament which was first particularly pointed out by Gimbernat, as causing the principal part of the strangulation.

Hesselbach considers an incision through the outer side of the crural ring safer than one through Gimbernat's ligament, and safer in women than men. In women, he recommends the cut to be made through the middle of the forepart of the ring, nearly straight upwards, or a little inclined inwards, in which mode the epigastric artery cannot be hurt, whether it lie at the outer, or inner side of the neck of the sac. In men, this incision, directed obliquely upwards and inwards, he says, cannot be made, on account of the nearness of the spermatic cord: therefore, in the male subject, he advises cutting the inner side of the opening, that is to say, Gimbernat's or the femoral ligament, directly inwards towards the symphysis of the os pubis. *(Ueber den Ursprung, der Leisten-und-Schen-kelbrüche, p. 54.)* When the epigastric, or obturator, artery deviates from its usual course, and surrounds the inner side of the neck of the hernia (which variety can never be ascertained *a priori*), a wound of the vessel Hesselbach regards as unavoidable.

From the views taken of femoral hernia in this article, I consider the unrestricted direction always to cut Gimbernat's ligament in the operation, perfectly erroneous. For, as Langenbeck has stated, the seat of strangulation may either be in the external aperture of the crural canal, or in an opening of the front or inner side of this passage, or in its inner opening, where then Gimbernat's ligament is truly concerned. When the strangulation is of the two first descriptions, only the fascia lata need be cut; but, in the third, most frequent case, the inner semilunar edge of the internal opening of the ring, must, of course, be divided. In all cases, says Langenbeck, whether the strangulation be caused by the inner or external opening of the crural canal, or by an aperture in the front parietes of this passage, the stricture must be cut inwards, as directing the cut in the least outwards would injure the epigastric artery. When it is perceived in the operation, that the neck of the hernial sac is strangulated, close below and behind the external pillar of the abdominal ring, then the inner opening of the crural canal must be divided inwards, with the knife directed along the horizontal ramus of the os pubis, under the external pillar of the ring, towards the symphysis of the pubes. If, in such a case, the knife were carried inwards and upwards, that part of Poupart's ligament forming the upper side of the crural canal might be cut, and the spermatic artery injured. *(Neue Bibl. 2 B. p. 133.)*

Dr. Trüstedt has published some remarks, in favour of employing dilatation, instead of an incision, in the operation for the strangulated crural hernia. He observes, that even when the common trunk of the obturatrix and epigastric arteries is short, the bowels may protrude under the first of these arteries, which will lie upon the upper and inner side of the hernia. In an operation performed upon a woman, in la Charité, at Berlin, for a strangulated femoral hernia, the crural ligament was divided in Gimbernat's way by an incision, exactly parallel to the horizontal ramus of the os pubis, and the obturatrix artery was wounded. The patient died eight days after the operation, having been previously attacked by trismus and opisthotonos. On dissection, about six ounces of putrid blood were found in the lesser cavity of the pelvis, and the above artery cut. The vessel arose from the epigastric, ran over the upper edge of the inner opening of the crural canal, or ring, and then descended along its inner edge, towards the obturator foramen. This occasional course of the obturatrix artery leads Dr. Trüstedt to suggest the following rules: if, after the hernial sac is opened, the bowels cannot be returned, the outer opening of the crural canal should be cut directly inwards, in order to produce a considerable relaxation. But, if the reduction should yet be impracticable (the strangulation being at the inner opening of the canal), then an attempt is to be made to insinuate the end of the finger through the constriction, a plan said to have answered very often in the practice of Surgeon-General Rust. Should the resistance be too great, however, for this method to succeed, Trüstedt advises the crural ligament to be forcibly drawn inwards and upwards, towards the navel, with Arnaud's tenaculum, assisted by the introduction of the finger, or with two hooks. When this plan fails, he recommends Schreger's practice of dividing the anterior edge of Poupart's ligament with a pair of blunt-pointed scissars, and then the use of Arnaud's tenaculum again. (See *Rust's Magazin für die gesammte Heilkunde, B. 3, H. 2.*) The consideration, however, which will ever prevent the common adoption of Dr. Trüstedt's suggestion is, that fifty times more lives would be lost by the mischief done to the protruded bowels by the forcible introduction of the fingers and hooks, than by hemorrhage from the obturatrix, or epigastric artery, when the course of the vessel is irregular.

Of late years, a fact of considerable interest has been ascertained in relation to femoral hernia; viz. that the constriction of the bowel by the smallness of the aperture and the sharp edge of Poupart's ligament, is so great, that either a permanent contraction of the part, ulceration of the internal and muscular coats, or even that of the serous coat also may occur, followed by fatal extravasation, after the reduction of the hernia by the operation. (*Chevalier, in Med. Chir. Trans. Vol.* 4, *p.* 324; *Breschet, Op. cit. Obs.* 2; *Lawrence, p.* 442, *Ed.* 4.) Hence, the latter gentleman is an advocate for gently drawing out the bowel, after liberating it from stricture; if no reason be found to apprehend perforation of the tube, he advises its reduction; but, in the opposite case, he directs it to be left out of the abdomen, rather than that the patient should be exposed to the danger of effusion into the abdomen. (*P.* 444.)

CONGENITAL HERNIA.

Before the beginning of the sixth month of the fœtal state, the testicle is situated near the kidney, where it receives a covering from the peritonæum, just like the other abdominal viscera. Between the beginning of the sixth month, and end of the seventh, the testicle has either descended as low as just above the abdominal ring, or else is passing through it, or arrived a little below it. (*Wrisberg. Comm. Reg. Societ. Gotting.* 1785.)

When the testicle passes through the abdominal ring into the scrotum, it is received into a production of the peritonæum, which afterwards constitutes the tunica vaginalis; while that peritonæal investment, which was given to the testicle in the loins, is closely adherent to this body, and forms what is named the tunica albuginea.

After the descent of the testicle into the scrotum, the communication, between the cavity of the tunica vaginalis and that of the abdomen, commonly becomes obliterated, which latter event is usually effected before birth, sometimes not till afterwards, and in a few subjects, even as late as the adult state.

In the congenital hernia, the protruded viscera are situated in the tunica vaginalis, in contact with the testicle: having descended into this position before the closure of the communication with the abdomen. Of course, the tunica vaginalis itself is the hernial sac. The nature of this case was not understood, before it was elucidated by Haller in 1755, and the two Hunters in 1762 and 1764. (See *Hunter's Med. Comment.*; *Haller's Opuscula Patholog. and Opera Minora, T.* 3.) Many particulars, relating to the origin and formation of this hernia, having been described in the 2d vol. of the First Lines of Surgery, I shall not here repeat them. Before the periods now named, surgeons imputed the circumstance of the contents of the hernia and testicle being in contact, to the bowels having made their way, by laceration, through the tunica vaginalis, from the ordinary hernial sac of a bubonocele. The old surgeons, indeed, frequently cite this instance, in proof of their doctrine, that some herniæ are attended with a laceration of the peritonæum. (See *Sharp's Inquiry.*)

From the term *congenital*, we might suppose, that this hernia always existed at the time of birth. The protrusion, however, seldom occurs till after this period, on the operation of the usual exciting causes of herniæ in general. It does not commonly happen till some months after birth; and, in certain instances, not till a late period. Mr. Hey relates a case, in which a hernia congenita was first formed in a young man, aged sixteen, whose right testis had, a little while before the attack of the disease, descended into the scrotum. In the generality of cases which actually take place when the testicle descends into the scrotum before birth, the event may be referred to the testicle having contracted an adhesion to a piece of intestine, or omentum, in its passage to the ring. In an infant, which died a few hours after birth, Wrisberg found one testicle, which had not passed the ring, adhering, by means of a few slender filaments, to the omentum, just above this aperture. Sometimes, adhesions of the testicle to the adjacent viscera, instead of leading to the formation of a congenital hernia, only prevent the descent of the former organ. Cloquet examined the body of an old man, in which the left testicle lay on the psoas and iliacus muscles, connected to the sigmoid flexure of the colon, while an inguinal hernia existed on the same side. (*Recherches, &c. p.* 24.) Sometimes, no protrusion at all happens, even though the communication between the tunica vaginalis and abdomen continue open in the adult subject, as is particularly exemplified in a case, recorded by Hesselbach, where such communication existed on each side in a man thirty-eight years of age, without any hernia. (*Med. Chir. Zeitung*, 1819, *p.* 110. Also *A. Cooper, in Lancet, Vol.* 2, *p.* 173.)

The appearance of a hernia in very early infancy, Mr. Pott observes, will always make it probable that it is of this kind; but, he was not correct in asserting, that in an adult, there is no reason for supposing his rupture to be of this sort, but his having been afflicted with it from his infancy; and that there is no external mark, or character, whereby it can be certainly distinguished from one contained in a common hernial sac. This statement is erroneous, inasmuch as the hernia congenita is attended with an impossibility of feeling the testis, which part in the common scrotal hernia is always distinguishable under the fundus of the hernial sac. The hernia congenita, when returnable, "ought, like all other kinds of ruptures, to be reduced, and constantly kept up by a proper bandage; and when attended with symptoms of stricture, it requires the same chirurgic assistance as the common hernia."

Mr. Pott notices, that "in very young children, a piece of intestine, or omentum, may get pretty low down in the sac, while the testicle is still in the groin, or even within the abdomen. In this case, the application of a truss would be highly improper; for, in the latter, it might prevent the descent of the testicle from the belly into the scrotum; in the former, it must necessarily bruise and injure it, give a great deal of unnecessary pain, and can prove of no real use. Such bandage, therefore, ought never to be applied on a rupture in an infant, unless the testicle can be fairly felt in the scrotum, after the gut or caul is replaced; and when it can be so felt, a truss can never be put on too soon." This is also the advice delivered by Sir A. Cooper.

Many additional observations on the foregoing topic are contained in the 2d vol. of the First Lines of Surgery, for which reason I do not here expatiate upon it. Mr. Pott explains, that an old rupture, originally congenital, is subject to a stricture made by the sac itself, as well as to that produced by the abdominal ring, or, as might have been added, to that caused by the inner opening of the inguinal canal.

The fact he noticed several times, both in the dead and in the living. "I have seen (says he) such stricture made by the sac of one of these herniæ, as produced all those bad symptoms which render the operation necessary: and I have met with two different strictures, at near an inch distance from each other, in the body of a dead boy, about fourteen, one of which begirt the intestine so tight, that I could not disengage it without dividing the sac.

"In this kind of hernia I have also more frequently found connexions and adhesions of the parts to each other, than in the common one; but there is one kind of connexion sometimes met with in the congenital hernia, which can never be found in that which is a common hernial sac, and which may require all the dexterity of an operator to set free; I mean that of the intestine with the testicle.

"If a large quantity of fluid should be collected in the sac of a congenital hernia, and, by adhesions and connexions of the parts within, the entrance into it from the abdomen should be totally closed, (a case which I have twice seen) the tightness of the tumor, the difficulty of distinguishing the testicle, and the fluctuation of the fluid, may occasion it to be mistaken for a common hydrocele; and if without attending to other circumstances, but trusting merely to the feel and look of the scrotum, a puncture be hastily made, it may create a great deal of trouble, and possibly do fatal mischief." (*Works, Vol.* 2.)

Mr. Pott also believed, that common ruptures, or those in a common sac, are generally gradually formed, that is, they are first inguinal, and by degrees become scrotal; but that the congenital are seldom remembered by the patient to have been in the groin only. As the tunica vaginalis is thicker, than the peritonæum, the contents of a congenital hernia are not so easily felt, as those of a common rupture. In children, the hernia generally contains intestine only, the omentum not being in them sufficiently long commonly to protrude.

The sac of a congenital hernia, especially when the case is strangulated, is every where equally tense, (*Hesselbach, p.* 36,) and below it the testis cannot be felt.

The reader must not conclude, however, from the above account, that every rupture in children is congenital. Mr. Lawrence has related a case of strangulated bubonocele, which took place in an infant only fourteen months old. (*P.* 65, *Edit.* 3.)

The common inguinal hernia, which first protrudes at the inner opening of the inguinal canal, and which has the epigastric artery on the inner side of its neck, has been named by Hesselbach *external,* while the less common instance, in which the viscera burst directly through the aponeuroses of the transverse and internal oblique muscles, and pass directly out of the abdominal ring, leaving the epigastric artery on the outer side of the neck of the sac, is distinguished by the epithet *internal.* (*Anat. Chir. Abhandlung über den Ursprung der Leistenbruch, Wurzb,* 1806.) "The inguinal congenital hernia (says Scarpa) cannot be divided into *external* and *internal;* it is evident, that it must always be external, since the neck of the tunica vaginalis invariably corresponds to the point, at which the spermatic cord passes under the margin of the transverse muscle. As for other circumstances, the tunica vaginalis lies in its whole course in the same manner as the sac of a common inguinal hernia: like this, it passes completely through the inguinal canal from one end to the other, resting upon the anterior surface of the spermatic cord. Consequently, it passes between the separation of the inferior fibres of the obliquus internus, and the principal origin of the cremaster muscle. (See *Wrisberg. syllog. comment. anat. p.* 23.) After coming out of the ring, as it is always united to the spermatic cord, it is enclosed in the muscular and aponeurotic sheath of the cremaster muscle, which accompanies it to the bottom of the scrotum. Since the tunica vaginalis, including the displaced viscera, enters the inguinal canal on the outside of the point, at which the spermatic cord crosses the epigastric artery, it is manifest, that, as it follows exactly the direction of this cord, it must also cross the artery, and remove it from the outer to the inner side of the ring, according to the mechanism already explained in speaking of the common inguinal hernia. Hence, the displacement of the epigastric artery constantly happens in the inguinal congenital, just as it does in the ordinary external inguinal hernia.

"But, if these two species of inguinal herniæ have some analogy to each other, in regard to the parts which constitute them, yet, they present some remarkable differences. 1. The common inguinal hernia, whether internal, or external, when it extends into the scrotum, cannot descend beyond the point at which the spermatic vessels enter the testicle. There the cellular substance of the spermatic cord terminates. There the hernial sac must also unavoidably terminate. On the contrary, in the congenital hernia, the viscera may descend lower than the testicle, with which they are in immediate contact; and, at length, they even occupy the situation of this organ, which is then pushed upward and backward. 2. In the case of a congenital hernia, the descent of the viscera from the groin to the scrotum commonly takes place in a very short time, and in some measure precipitately: it is much slower and more gradual in the ordinary inguinal hernia. The reason of this difference is very plain. In the first case, the descent of the testicle, and the formation of the tunica vaginalis, have opened and prepared the way, which the viscera must follow in forming a protrusion; while, in the second, the hernial sac cannot descend into the scrotum, but by gradually elongating the layers of the cellular substance, which joins it to the surrounding parts. This fact is so generally known, that experienced practitioners consider the promptitude, with which the viscera have descended from the groin to the bottom of the scrotum, as a characteristic sign, of a scrotal congenital hernia." (*Scarpa, Traité des Hernies, p.* 73, *&c.*; *Hesselbach, p.* 35; *Pott, &c.*)

In the hernia congenita, the spermatic artery and vein are sometimes on one side of it, and the vas deferens behind it. A preparation, exhibiting this alteration of the cord, may be seen in the Museum of St. Thomas's Hospital.

If circumstances will admit of a truss being applied and worn, in cases of congenital hernia, in young subjects, there will be a considerable chance of a radical cure being effected, in consequence of the natural propensity of the opening between the abdomen and tunica vaginalis to become closed.

In the operation, the surgeon has to lay open the tunica vaginalis, instead of a common hernial sac; but, as Sir Astley Cooper judiciously recommends, that membrane should not be opened low down, 1st. because a sufficiency of it should always be left to cover the testicle; and, 2dly, because the spermatic artery and vein are situated obliquely on the front and lower portion of the tumor. He therefore directs, three inches of the lower part of the tunica vaginalis to be left undivided. (See *Lancet, Vol.* 2, *p.* 175.) The stricture is to be divided on the same principle as that of an inguinal hernia, and much in the same manner. As, in a case of congenital hernia, the parts are always protruded on the outside of the epigastric artery, the stricture may be safely divided towards the ilium, as well as directly upwards. (*Lawrence on Ruptures, p.* 507, *Edit.* 4.) According to Sir Astley Cooper, the stricture is generally about an inch and a half from the abdominal ring, except in large cases, when it is nearer to it. The parts having been reduced, the edges of the wound are to be immediately brought together, and retained so by means of one or two sutures, and sticking plaster, which is much preferable to the old plan of applying dressings to the testicle and inside of the tunica vaginalis, so as to heal the part by the granulating process.

A new species of hernia congenita was described by the late Mr. Hey, in which a common peritonæal hernial sac, containing the viscera, is included in the tunica vaginalis. It arises from the parts being protruded, after the communication, between the abdomen and tunica vaginalis, is closed, so that the peritonæum is carried down along with the intestine, and forms a hernial sac, within the tunica vaginalis. It is evident also, that such a hernia can only be produced, while the original tunica vaginalis remains, in the form of a bag, as high as the abdominal ring. Operators should be aware of the possibility of having a sac to divide after laying open the tunica vaginalis. (See *Hey's Practical Obs. p.* 221, *and Sir A. Cooper's Work on Inguinal Hernia, p.* 59.)

UMBILICAL HERNIA, OR EXOMPHALOS.

"The exomphalos, or umbilical rupture, (says Pott) is so called from its situation, and has (like other herniæ) for its general contents, a portion of intestine, or omentum, or both. In old umbilical ruptures, the quantity of omentum is sometimes very great. Mr. Ranby says, that he found two ells and a half of intestine in one of these, with about a third part of the stomach, all adhering together. Mr. Gay and Mr. Nourse found the liver in the sac of an umbilical hernia; and Bohnius says, that he did also. But whatever are the contents, they are originally contained in the sac, formed by the protrusion of the peritonæum. In recent and small ruptures, this sac is very visible; but in old, and large ones, it is broken through at the knot of the navel, by the pressure and weight of the contents, and is not always to be distinguished; which is the reason why it has by some been doubted whether this kind of rupture has a hernial sac or not.

"Infants are very subject to this disease in a small degree, from the separation of the funiculus; but in general they either get rid of it as they gather strength, or are easily cured by wearing a proper bandage. It is of still more consequence to get this disorder cured in females, even than in males, that its return, when they are become adult and pregnant, may be prevented as much as possible; for at this time it often happens, from the too great distention of the belly, or from unguarded motion when the parts are upon the stretch. During gestation, it is often very troublesome, but, after delivery, if the contents have contracted no adhesion, they will often return, and may be kept in their place by a proper bandage.

"If such bandage was always put on in time, and worn constantly, the disease might in general be kept within moderate bounds, and some of the very terrible consequences which often attend it might be prevented. The woman who has the smallest degree of it, and who, from her age and situation, has reason to expect children after its appearance, should be particularly careful to keep it restrained.

"In some the entrance of the sac is large, and the parts easily reducible; in others they are difficult, and in some absolutely irreducible. Of the last kind many have been suspended for years in a proper bag, and have given little or no trouble. They who are afflicted with this disorder, who are advanced in life, and in whom it is large, are generally subject to colics, diarrhœas, and, if the intestinal canal be at all obstructed, to very troublesome vomitings. (Hence, patients are often supposed to labour under a stricture, when they really do not.) It therefore behoves such to take great care to keep that tube as clean and free as possible, and neither to eat or drink any thing likely to make any disturbance in that part." (*Pott on Ruptures, Vol.* 2.)

Authors, who have published since the time of this celebrated surgeon, have not added much to the stock of information which he left, concerning the exomphalos. The writings of Sir A. Cooper, Scarpa, (*Traité des Hernies, p.* 327,) and all the most accurate moderns, confirm the fact described by Pott, that, in the umbilical rupture, there is a hernial sac, just as in other instances of herniæ. Every one, acquainted with anatomy, knows, that behind the opening in the linea alba at the umbilicus, the peritonæum is complete, and consequently must protrude along with the viscera, in cases of exomphalos. In the only two cases which Sir A. Cooper has seen of a deficiency of the sac, the membrane had been partially absorbed, or lacerated, so as to allow the protrusion of its contents, and threaten, from this cause, a double stricture. Similar appearances, less closely inspected, probably gave rise to the opinion so firmly maintained by Dionis, De la Faye, Garengeot, and J. L. Petit, that, in the umbilical hernia, the peritonæum was always lacerated, and there was no hernial sac. According to Bichat, early infancy is most subject to the *umbilical* hernia, strictly so called, in which the parts protrude through the navel; while the other periods of life are more liable to false umbilical herniæ, or such as arise in the vicinity of the umbilicus. (*Œuvres Chir. de Desault, T.* 2, *p.* 315.)

Besides a true hernial sac, the exomphalos is also covered by a more superficial expansion, consisting of condensed cellular substance. In operating, however, a surgeon should always cut with great caution; for the integuments and hernial sac, in front of the tumor, are inseparably adherent; and sometimes, in large cases, when an absorption of part of the sac has been caused by the pressure of the bowels, they are even found adherent to the integuments.

Pregnant women, and dropsical and corpulent subjects, are peculiarly liable to the exomphalos. In adults, when there is intestine in the sac, there is almost always omentum. The transverse arch of the colon is observed to be particularly often contained in umbilical hernia, but the small intestines are not unfrequently protruded: and even the cœcum has been found in a rupture at the navel. (See *Lawrence on Ruptures, p.* 454, 455, *Ed.* 4.)

In the true umbilical hernia, the stricture is made by the tendinous opening in the linea alba. Let us next consider the umbilical hernia in the three particular forms, in which it has been noticed by the latest writers.

CONGENITAL UMBILICAL HERNIA.

Dr. Hamilton has met with about two cases of this kind annually, for the space of seventeen years; and they strictly deserve the epithet *congenital*, as they appear at birth. The funis ends in a sort of bag, containing some of the viscera, which pass out of the abdomen through an aperture in the situation of the navel. The swelling is not covered with skin, so that the contents of the hernia can be seen through the thin distended covering of the cord. The disease is owing to a preternatural deficiency in the abdominal muscles, and the hope of cure must be regulated by the size of the malformation, and quantity of viscera protruded.

The plans of cure proposed, consist of the employment of a ligature, or of a bandage. The latter seems preferable, and was practised by Mr. Hey, as follows: having reduced the intestine, he desired an assistant to hold the funis compressed sufficiently near the abdomen, to keep the bowel from returning into the hernial sac.

"I procured (says he) some plaster spread upon leather, cut into circular pieces, and laid upon one another in a conical form. This compress I placed upon the navel, after I had brought the skin on each side of the aperture into contact, and had laid one of the lips a little over the other. I then put round the child's abdomen a linen belt; and placed upon the navel, a thick, circular, quilted pad, formed about two inches from one extremity of the belt.

"This bandage kept the intestine securely within the abdomen, and was renewed occasionally. The funis was separated about a week after birth; and at the expiration of a fortnight from that time, the aperture at the navel was so far contracted, that the crying of the child, when the bandage was removed, did not cause the least protrusion. I thought it proper, however, to continue the use of the bandage a little while longer. A small substance, like fungous flesh, projected, after the funis had dropped off, about half an inch from the bottom of that depression which the navel forms. A dossil of lint spread with cerat. e lapide calaminari, and assisted by the pressure of the bandage, brought on a complete cicatrization." (*P.* 227.)

This gentleman has related another example, in which the intestines were quite uncovered, and inflamed, the sac having burst in delivery. The parts were reduced; but the child died. (See *also G. A. Fried de Fœtu intestinis plane nudis extra abdomen propendentibus nato. Argent.* 1760.)

UMBILICAL HERNIA IN CHILDREN.

The umbilical hernia, which is sometimes formed in the fœtus, from causes difficult of explanation, takes place, in other instances, at the moment of delivery; and then, as Sabatier remarks, should it be tied by mistake, with the funis, death would be the consequence. Most frequently, however, it is not till the second, third, or fourth month after birth, that the disease occurs; and the numerous cases collected by Desault prove that, of ten infants attacked with this hernia, nine become afflicted at the periods just mentioned.

The umbilicus, still open, now begins to contract, so as to close the cicatrix, which, soon forms an obstacle capable of preventing a protrusion of the viscera. Sometimes, however, the repeated crying of the child, propels the viscera through the opening, and thus the closure of the cicatrix of the navel is prevented. By degrees, the umbilical ring becomes more and more dilated, the quantity of protruded bowel increases, and thus a tumor arises, which, from being of trivial size at first, at length attains the size of an egg, or large walnut, and presents itself with all the characteristic marks of a hernia.

The presence of a piece of intestine and omentum in the tumor, keeps the umbilicus open, and opposes the continual tendency which it has to close. Such tendency, however, being sometimes superior to the resistance of the protruded parts, forces them back into the abdomen, obliterates the opening through which they passed, and thus the spontaneous cure of the umbilical hernia in children is accomplished. Two cases illustrative of this fact, are related by Bichat. (*Œuvres Chir. de Desault*, *T*. 2, *p*. 318.)

Nature, however, does not effect many such cures, and when the case is left to her alone, she not only fails in bringing about a radical cure, but gradually renders it impossible. In short, the propensity of the opening to close diminishes, and is lost, as the subject grows older.

Thus, the umbilical hernia of children seems to be essentially different from that of adults, in the tendency of the aperture to contract. Hence the ease of effecting a radical cure in children, and the almost utter impossibility of doing so in adults. In the former, it is enough to keep the intestines from protruding, and the opening becomes of itself obliterated; in the latter, the opening always remains, whether the bowels continue in it or not. This indisposition of the aperture to contract in the adult, also frequently depends upon the protrusion not being through the umbilical ring itself, but through a fissure in the vicinity of it, not endued with the same natural tendency to close, which the umbilicus possesses in young subjects. In fact, it would appear from the observations of Scarpa, detailed in the 2d vol. of the First Lines of Surgery, that, unless a grown up person has the protrusion from infancy, it never occurs exactly through the umbilical ring itself.

The means of curing the umbilical hernia of children, are compression, and the ligature. The former is the most modern; the latter the most ancient treatment, as it is mentioned by Celsus. The design of both is the same, viz. to prevent the lodgment of the protruded viscera in the opening of the umbilicus, and thus facilitate the approximation of its sides. To accomplish this end, the ligature retrenches the hernial sac, and skin pushed before it; and, by the union of the cut parts, a cicatrix is produced, which hinders the protrusion of the viscera. At the same time, the sides of the opening, obeying their natural tendency, compression closes the deficiency, or opening, in the parietes of the abdomen, hinders the protrusion of the bowels, and keeps these parts from resisting the contraction of the sac. Desault remarks, that though compression occasions no pain, it is irksome, during the great length of time its employment is necessary. The ligature (he says) produces momentary pain; but it is not at all irksome, and it effects in a few days, what compression, when successful, accomplishes in several months. In one plan, long and continual attention is requisite, and if its employment be only for a short time neglected, the previous effect becomes almost destroyed. The other method always accomplishes its object with certainty, independently of the crying of the child, and the care of its attendants. When compression is adopted, it is executed either by means of a flat compress applied to the opening, and which does not enter it, or else by means of some round or oval body, such as a ball of wax, a nutmeg, &c. adapted to the shape of the aperture, and, as Platner, and Richter, (in his Treatise on Hernia) advise, continually kept within the opening. In the first case, Bichat argues, that if the bandage be exactly applied, the skin and sac will form a fold in the aperture of the navel, hinder its closure, and operate in the same manner, from without, inward, as the protruded intestines did from within, outward. In the second case, he observes, the foreign body, being depressed into, and maintained in the opening, will occasion, notwithstanding what Richter says, the same inconveniences, and, in a more striking manner, similar consequences. But, on the contrary, when the ligature is employed, the sac and skin of the tumor are removed, while the opening remains free, and nothing prevents its obliteration. In this method, the omentum can never protrude outward; but, in the other, if the compression should ever be inexact, the parts slip out again, above or below, and the disorder prevails on one side of the useless application. The ligature is also commended as producing an adhesion of the sides of the opening, either to each other, or the adjacent parts. This adhesive process arises from the inflammation excited, and occasions a degree of firmness, not producible by any other mode of cure. Desault's method, which much resembled that of Saviard, is described by Bichat.

The child must be placed on its back, with its thighs a little bent, and its head inclined towards the chest. The surgeon is to reduce the protruded parts, and to hold them so with his finger, at the same time, that he raises the hernial sac, and rubs its sides between his fingers, so as to be sure, that there is nothing contained in it. Being certain, that the parts, which he lifts up, are only the skin and sac, he is to direct an assistant to surround their base several times with a waxed ligature, of middling size, each turn being tied with a double knot, in such a manner as only to occasion little pain. The tumor, thus tied, is to be covered with lint, which is to be supported with one or two compresses, and a circular bandage, secured with a scapulary. By the following day, a slight swelling has commonly taken place in the constricted parts.

On the second, or third day, the parts shrink, and then the ligature becomes loose, so that a fresh one must now be applied in the same manner as the first, taking care to draw it a little more tightly. The sensibility of the parts, increased by the inflammation, which the constriction of the ligature has already produced, usually renders this second ligature more painful. After the operation, the same dressings as at first, are to be applied. The tumor soon becomes discoloured, livid, and smaller. A third ligature, put on in the same way as the preceding ones, entirely obstructs the circulation in it. The part turns black and flaccid, and commonly falls off on the eighth or tenth day. A small ulcer is left, which, being properly dressed, very soon heals, and leaves a cicatrix sufficiently strong to resist the impulse occasioned by coughing, or other efforts of the abdominal muscles. For two or three months, however, after the operation, the child should wear a circular bandage, in order to prevent, with still greater certainty, the viscera from being propelled against the cicatrix, so as to interrupt the process of nature, which is now producing a gradual closure of the umbilical opening. Numerous cases might here be adduced, in confirmation of the above practice; but, several (nine) are already published in the Parisian Chirurgical Journal.

But, one may doubt, (says Sabatier) quoting the article in the Journal, where Desault treats of the present disease, whether the infants got rid of the hernia, as it might have returned some time afterwards. To this observation, Bichat replies, that numerous facts remove the doubt: for, several of the subjects were brought to Desault's public consultation, for other diseases, a long while after they had been operated upon, and the great number of students, who examined them, all acknowledged, that the ring was completely obliterated, and there was no impulse of the viscera in coughing, sneezing, &c. Other children, in the knowledge of the surgeons of the Hôtel-Dieu, remained perfectly cured, and Bichat was acquainted with two young subjects, on whom the operation had been performed four years, and they had had no relapse.

In young infants the operation almost constantly answered; but, in proportion as their age increased, it was found to be less certain. Bichat relates three cases, which tend to prove, that success may be completely obtained at the age of a year and a half; that the cure is difficult, when the child is four years old; and impossible, when it is nine. (See *Œuvres Chir. de Desault, par Bichat, T. 2, p. 315, &c.*)

Mr. Pott notices the plan of curing the exomphalos with the ligature, and expresses himself strongly against the practice in general. To adults the plan is not applicable, particularly, when the tumor is large. Mr. Pott was decidedly in favour of compression, and he observes, that in young subjects, and small herniæ, a bandage, worn a proper time, generally proves a perfect cure. (*Vol. 2.*)

Anxious that this work should be strictly impartial, I next proceed to relate what has been more recently urged against the employment of the ligature for the cure of the umbilical hernia in children.

The incessant care that a bandage requires, either to keep it clean, or make it always keep up the proper degree of pressure, renders its employment difficult in the children of the poorer classes. Scarpa expresses his opinion, that this was what induced Desault to revive the operation for the umbilical hernia by the ligature, nearly such as is described by Celsus; an operation (continues Scarpa), which, a long while since, and for good reasons, was altogether abandoned. Desault himself has put some restrictions to the employment of the ligature, since he observes, that this method does not radically cure the umbilical hernia of children, arrived at the age of four years; and, that, even in the youngest children, a radical cure cannot be effected by the ligature, unless a methodical compression of the navel, by means of a bandage, be kept up immediately after the operation, and for two or three months. It is perhaps to the omission of this last means, that a relapse is to be ascribed in several of the children operated upon by Desault. "*Desault avoit remis en vigueur la ligature tombée en désuétude. Il s'abusoit sur sa valeur; et il n'est pas difficile d'en connoître la cause. Tous les enfans qu'il opéroit à l'Hôtel-Dieu sortoient guéris, et n'y revenoient plus: on regardoit alors comme radicale une guérison momentanée.*" (*Richerand, Nosographie Chir. T. 2. p. 453.*) "I have carefully watched (says Scarpa) the immediate effects, and the more or less remote consequences of tying the umbilical hernia, either simply, or by means of a needle and double ligature: and, after a considerable number of such cases, I believe I can assert, that *this operation, howsoever performed, is not always exempt from grave and sometimes dangerous accidents. I can also add, that it never procures a truly radical cure, unless the cicatrix, occasioned by it in the umbilical region, be submitted for some months to a methodical and uninterrupted compression. It is not so uncommon, as some surgeons pretend, to see arise after the application of the ligature, a fever attended with symptoms of most violent irritation, and acute sufferings, which cause incessant crying, and sometimes convulsions. The ulcer, which is produced by the detachment of the swelling, is always very large and difficult to heal. Every now and then it becomes painful, and emits fungous granulations, even though dressed with dry applications.*

"Latterly, it has been explained by a celebrated surgeon, (*Paletta Memor. del' Instituto, Tom. 2, Part 1,*) that the umbilical vein and the suspensory ligament of the liver, being included in the ligature of the umbilical hernia, the inflammation, which originates in these parts may, perhaps, in certain cases, be communicated to the liver, so as to put the child's life in great danger. When, in consequence of the ligature, symptoms of violent irritation come on, they are ordinarily attributed to certain individual circumstances, such as extreme sensibility, or a particular disposition to spasm. Hence, it is believed, that they should be considered as exceptions, which do not exclude the general rule, and prove nothing against the utility of the operation. But, how (says Scarpa) can the surgeon ascertain the existence, or nonexistence of these individual dispositions, in the children, upon which he is to operate? Assuredly, those subjects, in which I have had occasion to notice the above accidents, enjoyed, before the operation, perfect health in every respect.

"Whatever process be adopted for tying the umbilical hernia, it is evident, that the tumor can only be constricted as far as a little way on this side of the aponeurotic ring of the umbilicus, whence, it follows, that the integuments must always remain prominent and relaxed for a certain extent, at the front and circumference of this opening. Also, after the separation of the strangulated portion, there necessarily remains, under the cicatrix, a portion of the hernial sac, and of the loose integuments, which covered it; and as the cicatrix itself never acquires sufficient firmness to resist the impulse of the viscera, which tend to insinuate themselves into the remains of the hernial sac, the hernia sooner or later reappears, and, in a short time, becomes larger, than it was before the operation. If the subject is a little girl, it may be apprehended that the first pregnancy will cause a recurrence of the hernia; for, it is known, that, during gestation, the external cicatrix of the umbilicus is considerably distended, and much disposed to give way."

Scarpa then notices, that "after the separation of the tumor, there always remains, between the aponeurotic ring of the navel, and the integuments, a small cavity, formed by the neck of the hernial sac; a cavity into which the viscera begin to insinuate themselves after the operation, so as to hinder the complete contraction of the umbilical ring. The demonstration of what I have advanced is, in some measure to be found, in the old method of operating for the inguinal hernia, not in a strangulated state, by the ligature of the hernial sac and spermatic cord. Most of the herniæ, operated upon by this barbarous process, were subject to relapses, because, in all probability, the cicatrix was not sufficiently firm to resist the impulse of the viscera, which entered the remains of the hernial sac. In the same manner, after the common operation for the strangulated inguinal hernia, although the cicatrix is formed very near the ring, there is no prudent surgeon, who does not advise the patient to wear a bandage the rest of his life, observation having proved, that the hernia is still liable to recur.

"The experience of several ages leaves no doubt, that compression alone is an extremely efficacious method of radically curing the umbilical hernia of young subjects. It is attended with no risk, and, provided it be executed with the requisite caution, it is hardly ever necessary to continue it longer, than two, or three months, for the purpose of obtaining a complete cure. On the other side, if it be clearly proved, by all that I have been observing, that the ligature never accomplishes a perfect cure without compression, it is manifest, that it cannot be at all advantageous for the children of the poor, since a bandage cannot be dispensed with. It may be said, that, in general, it does not shorten the treatment; for, in the most successful cases, the ulcer, caused by it, is not healed in less than a month, and, in order to make the cure certain, an exact compression must afterwards be kept up, by means of a bandage, two months longer. It has already been stated, that three months are ordinarily sufficient for obtaining a radical cure by the mere employment of a compressive bandage." (*Scarpa, Traité des Hernies, p.* 344—349.)

In the Journal Général de Médecine, T. 41, 1811, M. Girard has published a memoir on the umbilical hernia of children, which was read to the Medical Society of Lyons in May, 1811, and the object of which was to recommend compression as an effectual means of cure. The arguments used were very similar to those adduced by Scarpa. In the course of the discussion, M. Cartier affirmed, that he had seen many children operated upon by Desault, who were not cured of their herniæ.

The subject was afterwards taken up by the Medical Society of Paris, and the result of the debate was, that the employment of the ligature ought to be rejected. 1. Because the cure of umbilical herniæ is often accomplished by nature alone. 2. Because compression, either alone, or aided by tonic remedies, always succeeds. 3. Because the operation of the ligature deserves the triple reproach of being painful, and not free from danger, if unfortunately a piece of intestine should chance to be included in the ligature; of not succeeding in general, except with the assistance of compression; and of being sometimes uselessly practised, as Desault himself gives us instances of. According to M. Cayol, the insufficiency of the ligature was long since acknowledged by Sabatier, Lassus, Richerand, &c.

The treatment by compression is universally preferred by British surgeons.

UMBILICAL HERNIA IN ADULT SUBJECTS.

This case is to be treated on the principles common to all ruptures. When reducible, the parts should be kept up with a bandage, or truss; which plan, however, in grown up persons, affords no hope of a radical care. Mr. Hey has described some very good trusses for the exomphalos, which are applicable to children, when compression is preferred, as well as to adult subjects. One was invented by the late Mr. Marrison, an ingenious mechanic at Leeds.

"It consists of two pieces of thin elastic steel, which surround the sides of the abdomen, and nearly meet behind. At their anterior extremity they form conjointly an oval ring, to one side of which is fastened a spring of steel of the form represented. At the end of this spring is placed the pad or bolster that presses upon the hernia. By the elasticity of this spring, the hernia is repressed in every position of the body, and is thereby retained constantly within the abdomen. A piece of calico or jean is fastened to each side of the oval ring, having a continued loop at its edge, through which a piece of tape is put, that may be tied behind the body. This contrivance helps to preserve the instrument steady in its proper situation." (*Practical Obs. in Surgery, p.* 231.) And, in the second edition of the preceding work, another truss for the exomphalos is described, the invention of Mr. England, of Leeds, but, as some account is given of this instrument, with an engraving, in the 2d vol. of the First Lines of Surgery, I shall not here repeat the description.

When the exomphalos is irreducible and large, the tumor must be supported with bandages.

It is observed by Scarpa, that the umbilical hernia, and those of the linea alba, are less subject to be strangulated, than the inguinal and femoral herniæ; but that, when they are unfortunately affected with strangulation, the symptoms are more intense, and gangrene comes on more rapidly, than in every other species of rupture. If the operation be performed, the event is frequently unfavourable, because it is generally done too late. This practical fact is proved by the experience of the most celebrated surgeons of every age. "*Il est certain* (says Dionis) *que de cette opération il en périt plus qu'il n'en réchappe.*" (*Cours d'Opérations, p.* 98, *Ed.* 1777, *avec les notes de La Faye.*) He also adds, that they who have the misfortune to be afflicted with an exomphalos, should rather dispense with their shirt, than a bandage. Heister says nearly the same thing. (*Instit. Chirurg. T.* 2, *Cap.* 94.)

When the omentum alone is strangulated in the exomphalos, or hernia of the linea alba, observation proves, that the symptoms are not less intense, than when the intestine is also incarcerated. There is this difference, however, that when the omentum alone is strangulated, only nausea occurs, and, if vomiting should likewise take place, it is less frequent and violent than when the bowel itself is strangulated. In the first case, the stools are hardly ever entirely suppressed. The proximity of the stomach is, no doubt, the reason, why the strangulation of the omentum, in the umbilical hernia, occasions far more intense symptoms of sympathetic irritation, than the strangulation of the same viscus in the inguinal, or crural hernia.

Here, the operation is not only always necessary, but urgently required. It is not materially different from that, which is practised for strangulated inguinal and crural herniæ; but, in general, it demands greater circumspection, on account of the connexion, or intimate adhesions, which frequently exist between the integuments and hernial sac, and also the adhesions, which often prevail between the latter part and the omentum which it contains. The situation of the intestine, which is frequently covered by, and enveloped in the omentum, is another circumstance deserving earnest attention. (*Scarpa, Traité des Hernies, p.* 361, 362.)

Mr. Pott is not such an advocate as Scarpa for the early performance of the operation in cases of exomphalos: "The umbilical, like the inguinal hernia, becomes the subject of chirurgic operation, when the parts are reducible by the hand only, and are so bound as to produce bad symptoms. But though I have, in the inguinal and scrotal herniæ, advised the early use of the knife, I cannot press it so much in this; the success of it is very rare, and I should make it the last remedy. Indeed, I am much inclined to believe, that the bad symptoms which attend these cases are most frequently owing to disorders in the intestinal canal, and not so often to a stricture made on it at the navel, as is supposed. I do not say that the latter does not sometimes happen; it certainly does; but it is often believed to be the case when it is not.

"When the operation becomes necessary, it consists in dividing the skin and hernial sac, in such manner as shall set the intestine free from stricture, and enable the surgeon to return it into the abdomen." (*Pott on Ruptures.*)

The rest of the conduct of the surgeon is to be regulated by the usual principles.

The division of the stricture is properly recommended to be made directly upward, in the course of the linea alba.

In consequence of the great fatality of the usual operation for the exomphalos, I think the plan suggested, and successfully practised by Sir A. Cooper in two instances, should always be adopted, whenever the tumor is large, and free from gangrene; a plan, that has also received the high sanction of that distinguished anatomist and surgeon, Professor Scarpa. (*Traité des Hernies, p.* 362.) Perhaps, I might safely add, that when the parts admit of being reduced, without laying open the sac, this method should always be preferred. It consists in making an incision just sufficient to divide the stricture, without opening the sac at all, or at all events, no more of it, than is inevitable.

In umbilical hernia, of not a large size, Sir A. Cooper recommends the following plan of operating: "As the opening into the abdomen is placed towards the upper part of the tumor, I began the incision a little below it, that is, at the middle of the swelling, and extended it to its lowest part. I then made a second incision at the upper part of the first, and at right angles with it, so that the double incision was in the form of the letter T, the top of which crossed the middle of the tumor. The integuments being thus divided, the angles of the incision were turned down, which exposed a considerable portion of the hernial sac. This being then carefully opened, the finger was passed below the intestines to the orifice of the sac at the umbilicus, and the probe-pointed bistoury being introduced upon it, I directed it into the opening at the navel, and divided the linea alba downwards, to the requisite degree, instead of upwards, as in the former operation. When the omentum and intestine are returned, the portion of integument and sac, which is left, falls over the opening at the umbilicus, covers it, and unites to its edge, and thus lessens the risk of peritonæal inflammation, by more readily closing the wound." (*On Crural and Umbilical Hernia.*)

LESS FREQUENT KINDS OF HERNIA.

The *ventral hernia*, described by Celsus, is not common; it may appear at almost any point of the anterior part of the belly, but is most frequently found between the recti muscles. The portion of intestine, &c. is always contained in a sac, made by the protrusion of the peritonæum. Sir A. Cooper imputes the disease to the dilatation of the natural foramina for the transmission of vessels, to congenital deficiencies, lacerations, and wounds, of the abdominal muscles, or their tendons. In small ventral herniæ, a second fascia is found beneath the superficial one: but, in large cases, the latter is the only one covering the sac.

Herniæ in the course of the linea alba sometimes occur so near the umbilicus, that they are liable to be mistaken for true umbilical ruptures. They may take place either above, or below the navel. The first case, however, is more frequent, than the second, and the following is the reason of this circumstance, according to the opinion of Scarpa. "The upper half of the linea alba, that which extends from the ensiform cartilage to the umbilicus, is naturally broader and weaker, than the lower half, the recti muscles coming nearer and nearer together, as they descend from the navel to the pubes." (*Scarpa Traité des Hernies, p.* 333.)

The hernial sac of ruptures at the upper part of the linea alba may contain a noose of intestine, and a piece of the omentum, though, in most cases, a portion of the latter membrane alone forms the contents. In some subjects, the linea alba is so disposed to give way, that several herniæ are observed to be formed successively in the interspace between the ensiform cartilage and the umbilicus.

"With respect to the small hernia (says Scarpa) which is considered as formed by the stomach, and concerning which Hoin and Garengeot have written so much, (without either of them having related, at least to my knowledge, a single example proved by dissection) it is at least unproved, that it was exclusively formed by this viscus. I do not see, why the other viscera, particularly the omentum and transverse colon, might not also contribute to it. In my judgment, it only differs from other herniæ of the linea alba, in being situated on the left side of the ensiform cartilage, a situation that must materially influence the symptoms of the case. In fact, whatever may be the viscera, which form it, a sympathetic irritation of the stomach is occasioned, that is much more intense, than that which ordinarily accompanies umbilical herniæ, those of the lower part of the linea alba, or, in short, all other herniæ, which are more remote from the stomach." (*Op. cit. p.* 334.)

The following are said to be the circumstances, by which the umbilical hernia, and that which occurs in the linea alba near the navel, may be discriminated.

The first, whether in the infant, or the adult, has a roundish neck, or pedicle, at the circumference of which the aponeurotic edge of the umbilical ring can be felt. Whatever may be its size, its body always retains nearly a spherical shape. Neither at its apex, or its sides, is any wrinkling of the skin, or any thing like the cicatrix of the navel, distinguishable. In some points of the surface of the tumor, the skin is merely somewhat paler and thinner, than elsewhere.

On the contrary, the hernia of the linea alba has a neck, or pedicle, of an oval form, like the fissure, through which it is protruded. The body of the tumor is also constantly oval. If the finger be pressed deeply round its neck, the edges of the opening in the linca alba can be felt; and, if the hernia be situated very near the umbilical ring, the cicatrix of the navel may be observed upon one side of it, which cicatrix retains its rugosity and all its natural appearance; a certain indication, that the viscera are not protruded through the umbilical ring. (*Scarpa, Traité des Hernies, p.* 336.)

The distinction, which Scarpa has established between the umbilical hernia, properly so called, and those of the linea alba, is not useless in regard to practice. Indeed, when the latter are left to themselves, they make much slower progress than the former. On account of their smallness, they frequently escape notice, particularly in fat persons, and, when situated at the side of the ensiform cartilage. They occasion, however, complaints of the stomach, habitual colics, especially after meals; and, unfortunately for the patient, he may be tormented a very long time by these indispositions, before the true cause of them is discovered.

The umbilical hernia may be known, from the earliest period of its formation, by the alteration, which it produces in the cicatrix of the navel, and the rapidity of its increase.

In other respects, these two kinds of herniæ demand the same means of cure: but those of the linea alba, *cæteris paribus*, are more difficult to cure, than ruptures at the umbilicus. This is probably owing to the natural tendency, which the umbilical ring has to close, when the hernia is kept well reduced, whilst accidental openings in the linea alba, have not the same advantage. (*Scarpa, p.* 340.)

When a common ventral hernia is reduced, it should be kept in its place by means of a bandage or truss. When strangulated, it admits, more frequently, than most other cases, of being relieved by medical treatment. If attended with stricture, which cannot otherwise be relieved, that stricture must be carefully divided. Sir A. Cooper recommends the valvular incision, and the dilatation to be made, either upward or downward, according to the relative situation of the tumor and epigastric artery, which crosses the lower part of the linea semilunaris.

Pudendal Hernia. This is the name assigned by Sir A. Cooper to the hernia, which descends between the vagina and ramus ischii, and forms an oblong tumor in the labium, capable of being traced within the pelvis, as far as the os uteri. He thinks, that this case has sometimes been mistaken for a hernia of the foramen ovale. When reducible, a common female bandage, or the truss used for a prolapsus ani, should be worn. A pessary, unless very large, could not well keep the parts from descending, as the protrusion happens so far from the vagina. Sir A. Cooper is of opinion, that, when strangulated, this hernia, in consequence of the yielding nature of the parts, may generally be reduced, by pressing them with gentle and regular force, against the inner side of the branch of the ischium. If not, the warm bath, bleeding, and tobacco glysters, are advised. Were an operation indispensable, the incision should be made in the labium, the lower part of the sac carefully opened, and with a concealed bistoury, directed by the finger, in the vagina, the stricture should be cut directly inward, towards the vagina. The bladder should be emptied, both before the manual attempts at reduction and the operation. (On *Crural Hernia, &c. p.* 64.)

Vaginal Hernia.—A tumor occurs within the os externum. It is elastic, but not painful. When compressed, it readily recedes, but, is reproduced by coughing, or even without it when the pressure is removed. The inconveniences produced are an inability to undergo much exercise or exertion; for, every effort of this sort brings on a sense of bearing down. The vaginal hernia protrudes in the space, left between the uterus and rectum. This space is bounded below by the peritonæum, which membrane is forced downwards towards the perinæum; but, being unable to protrude further in that direction, is pushed towards the back part of the vagina. In one case, Sir A. Cooper advised the use of a pessary, but the plan was neglected. Probably, these cases are always intestinal.

Some herniæ protrude at the anterior part of the vagina. (*A. Cooper on Crural Hernia, &c. p.* 65, 66.)

Perinæal Hernia.—In men, the parts protrude between the bladder and rectum; in women, between the rectum and vagina. The hernia does not project, so as to form an external tumor, and, in men, its existence can only be distinguished by examining in the rectum. In women, it may be detected both from this part and the vagina.

In case of strangulation, perhaps this hernia might be reduced by pressure from within the rectum. An interesting case of perinæal hernia, which took place from the peritonæum being wounded with the gorget in lithotomy, is related by Mr. Bromfield; *Chirurgical Obs. p.* 264.

The reducible perinæal hernia in women, may be kept from descending, by means of a large pessary. Both this kind of rupture and the vagina may prove very dangerous in cases of pregnancy. (See *Smellie's Midwifery, Case* 5.)

Sacro-rectal Hernia.—In a young infant, where the ossification of the sacrum was incomplete, a protrusion is said to have been met with through an opening in that bone. The possibility of such a case should be remembered, in order that the disease may not be mistaken for spina bifida. (See *Journ. of Foreign Med.* No. 16, *p.* 616.)

Thyroideal Hernia, or *Hernia Foraminis Ovale.*—In the anterior and upper part of the obturator ligament, there is an opening, through which the obturator artery, vein, and nerve proceed, and through which, occasionally, a piece of omentum, or intestine is protruded, covered with a part of the peritonæum, which constitutes the hernial sac.

In the case, which Sir A. Cooper met with, the hernia descended above the obturatores muscles. The os pubis was in front of the neck of the sac; three-fourths of it were surrounded by the obturator ligament; and the fundus of the sac lay beneath the pectineus and adductor brevis muscles. The obturator nerve and artery were situated behind the neck of the sac, a little towards its inner side. This species of hernia can only form an outward tumor, when very large. Garengeot, however, met with an instance, in which there was not only a swelling, but one attended with symptoms of strangulation: he reduced the hernia, which went up with a guggling noise; the symptoms were stopped, and stools soon followed.

The hernia of the foramen ovale, when reducible, must be kept up with a suitable truss; and if it were strangulated, and not capable of relief from the usual means, an operation would be requisite, though attended with difficulties. The division of the obturator ligament and mouth of the sac should be made inwards, to avoid the obturator artery. If this vessel, however, were to arise in common with the epigastic artery, it would be exposed to injury by following this plan. (See *Garengeot in Mém. de l'Acad. de Chir. T.* 1; *A. Cooper on Crural Hernia, &c. p.* 70; *and First Lines of Surgery, Vol.* 2, *p.* 80, *&c.*)

Cystocele.—As Mr. Pott observes, "The urinary bladder is also liable to be thrust forth from its proper situation, either through the opening in the oblique muscle, like the inguinal hernia, or under Poupart's ligament, in the same manner as the femoral.

This is not a very frequent species of hernia, but does happen, and has as plain and determined a character, as any other.

"It has been mentioned by Bartholin, T. Dom. Sala, Platerus, Bonetus, Ruysch, Petit, Mery, Verdier, &c. In one of the histories given by the latter, the urachus, and impervious umbilical artery on the left side, were drawn through the tendon into the scrotum, with the bladder; in another he found four calculi.

"Ruysch gives an account of one complicated with a mortified bubonocele. Petit says, he felt several calculi in one, which were afterwards discharged through the urethra. (See also *J. G. F. John de insolitâ Calculi Ingentis per Scrotum exclusione. Wittenberg*, 1750.)

"Bartholin speaks of T. Dom. Sala as the first discoverer of the disease, and quotes a case from him, in which the patient had all the symptoms of a stone in his bladder; the stone could never be felt by the *sound*, but was found in the bladder (which had passed into the groin) after death.

"As the bladder is only covered in part by the peritonæum, and must insinuate itself between that membrane and the oblique muscle, in order to pass the opening in the tendon, it is plain, that the hernia cystica can have no sac, and that, when complicated with a bubonocele, that portion of the bladder which forms the cystic hernia must lie between the intestinal hernia and the spermatic chord, that is, the intestinal hernia must be anterior to the cystic.

"A cystic hernia may, indeed, be the cause of an intestinal one; for when so much of the bladder has passed the ring, as to drag in the upper and hinder part of it, the peritonæum which covers that part must follow, and by that means a sac be formed for the reception of a portion of gut or caul. Hence the different situation of the two herniæ in the same subject.

"While recent, this kind of hernia is easily reducible, and may, like the others, be kept within by a proper bandage; but when it is of any date, or has arrived to any considerable size, the urine cannot be discharged, without lifting up, and compressing the scrotum; the outer surface of the bladder is now become adherent to the cellular membrane, and the patient must be contented with a suspensory bag.

"In case of complication with a bubonocele, if the operation becomes necessary, great care must be taken not to open the bladder instead of the sac, to which it will always be found to be posterior. And it may also sometimes by the inattentive be mistaken for a hydrocele, and by being treated as such, may be the occasion of great or even fatal mischief." (*Vol.* 2.)

The cystocele is always easily distinguishable by the regular diminution of the swelling, whenever the patient makes water.

Verdier and Sharp have accurately described the cystocele. Pott has offered two cases, which fell under his observation; *Vol.* 3. Pipelet le Jeune mentions a cystic hernia in perinæo, and several cases of its occurrence in the female; *Acad. de Chir. T.* 4. Pott cut into one cystocele, by mistake. Mention is made (*Edinb. Surg. Journ. Vol.* 4, *p.* 512,) of a cystic hernia, which protruded between the origins of the levator ani, and obturator internus muscles: the tumor made its appearance in the pudendum of an old woman. Much additional information, respecting the cystocele, and its various forms, is contained in the second volume of the *First Lines of Surgery, p.* 49, *&c.*, accompanied with references to all the most interesting writers on the subject. An instance of protrusion of the bladder through a wound, caused by a bullock's horn, is recorded by Larrey. (*Mém. de Chir. Mil. T.* 4, *p.* 289.)

Ischiatic Hernia.—This disease is very rare. A case, however, which was strangulated, and undiscovered till after death, is related in Sir A. Cooper's second part of his work on hernia. It was communicated by Dr. Jones, so celebrated for his book on hemorrhage. The disease happened in a young man, aged 27. On opening the abdomen, the ileum was found to have descended on the right side of the rectum into the pelvis, and a fold of it was protruded into a small sac, which passed out of the pelvis at the ischiatic notch. The intestine was adherent to the sac at two points: the strangulated part, and about three inches on each side, were very black. The intestines towards the stomach were very much distended with air, and here and there, had a livid spot on them. A dark spot was even found on the stomach itself just above the pylorus. The colon was exceedingly contracted, as far as its sigmoid flexure. A small orifice was found in the side of the pelvis, in front of, but a little above, the sciatic nerve, and on the forepart of the pyriformis muscle. The sac lay under the glutæus maximus muscle, and its orifice was before the internal iliac artery, below the obturator artery, but above the vein. Sir A. Cooper remarks, that a reducible case might be kept up with a spring truss, and, that if an operation were requisite, the orifice of the sac should be dilated directly forwards. (On *Crural Hernia, &c. p.* 73. For a further account of the ischiatic hernia, and references to the most interesting works on the subject, see *First Lines of Surgery, Vol.* 2, *p.* 84, *&c.*)

Phrenic Hernia.—The abdominal viscera are occasionally protruded through the diaphragm, either through some of the natural apertures in this muscle, or deficiencies, or wounds, and lacerations in it. The second kind of case is the most frequent: Morgagni furnishes an instance of the first. Two cases, related by Dr. Macauley in *Med. Obs. and Inq. Vol.* 1, two more detailed in the *Medical Records, and Researches*, and two others published by Sir A. Cooper, are instances of the second sort: and another case has been lately recorded by the latter gentleman, affording an example of the third kind. A laceration of the diaphragm by fractured ribs, has produced a hernia. A case of this kind was dissected by Mr. Travers, at Guy's Hospital. (*Med. Chir. Trans. Vol.* 6, *p.* 375.) In this last volume, may also be found the particulars of an interesting example, in which a considerable part of the large curvature of the stomach was protruded through a fissure of the diaphragm. The accident was unattended with any fracture of the ribs, and was caused by the upsetting of a stage-coach, on which the patient was an outside passenger. Before death, he vomited up a large quantity of blood, and a small semicircular aperture was discovered on dissection in the lower part of the strangulated portion of the stomach. (*P.* 378, 379.) See also *B. Stehelin, Tentamen, Med. quod ventriculum, qui in thoracem migraverat, &c. describit,* 1721; *(in Hallerii Disp. Anat.* 6, 675.) Hildanus, Paré, Petit, Schenck, &c. also mention cases of phrenic hernia. The disease is quite out of the reach of art.

Mesenteric Hernia.—If one of the layers of the mesentery be torn by a blow, while the other remains in its natural state, the intestines may insinuate themselves into the aperture, and form a kind of hernia. The same consequence may result from a natural deficiency in one of these layers. Sir A. Cooper records a case, in which all the small intestines, except the duodenum, were thus circumstanced. The symptoms during life were unknown. (*On Crural Hernia, &c. p.* 82.)

Mesocolic Hernia.—So named by Sir A. Cooper, when the bowels glide between the layers of the mesocolon. A specimen of this disease is preserved at St. Thomas's hospital.

Every surgeon should be aware, that the intestines may be strangulated within the abdomen from the following causes: 1. Apertures in the omentum, mesentery, or mesocolon, through which the intestine protrudes. 2. Adhesions, leaving an aperture, in which a piece of intestine becomes confined. 3. Membranous bands at the mouths of hernial sacs, which becoming elongated, by the frequent protrusion and return of the viscera, surround the intestine, so as to strangulate them within the abdomen, when returned from the sac. (See *A. Cooper on Crural Hernia, &c. p.* 85.)

Pott remarks, that "Ruysch gives an account of an impregnated uterus being found on the outside of the abdominal opening; and so do Hildanus and Sennertus. Ruysch also gives an account of an entire spleen having passed the tendon of the oblique muscle. And I have myself seen the ovaria removed by incision, after they had been some months in the groin." (*Vol.* 2.) More particulars, respecting all the less frequent kinds of hernia, are given in the second volume of the *First Lines of Surgery. Franco Traité des Hernies, &c.* 8*vo., Lyon,* 1561; *Lud. von Hammen, De Herniis,* 12*mo., Lugd.* 1581. *Malach-Geiger, Kelegraphia, sive Descriptio Herniarum, cum earundem curationibus, tam Medicis, quam Chirurgicis,* 12*mo., Monachii,* 1631. *Ant. Le Quin, Le Chirurgien Herniaire,* 12*mo., Paris,* 1697. *Littre, Observation sur une Nouvelle Espèce de Hernie, Mém. de l'Acad. des Sciences*; 1700. *Mery, in the same work*; 1701. *Littre, sur une Hernie Rare; same work*; 1714. *Heister, Instit. Chirurg. et de Herniâ Incarceratâ Suppuratâ non semper lethali. Peyronie, Observations, &c. sur la Cure des Hernies avec Gangrene; Mém. de l'Acad. de Chir. T.* 1, *Gunz, Observationum Anatomico-chirurgicarum de Herniis, libellus; Lips.* 1744; *et Prolusio Invitatoria in qua de Entero-Epiplocele agebat. Lips.* 1746. *P. S. Kok, De Herniis; Roterod.* 1782. *Arnaud on Hernias,* 1748; *also his Mém. de Chir. Haller de Herniis Congenitis,* 1749. *Garengeot, sur plusieurs Hernies singulières; Mém. de l'Acad. de Chir. t.* 2. *Moreau sur les suites d'une Hernie opérée; Mém. de l'Acad. de Chir. t.* 3. *Haller Herniarum adnotationes; extant. in Opuscul. Pathol.* 1755. *Le Blanc, Nouvelle Méthode d'opérer les Hernies; avec un Essai sur les Hernies, par M. Hoin; Orleans,* 1767; 8*vo. Louis, Réflexions sur l'Opération de la Hernie: Mém. de l'Acad. de Chir. T.* 4. *Hoin, Essai sur les Hernies rares et peu connues;* 1767. *Medical Observations and Inquiries. Pott's Works, vols.* 2 *and* 3. *Goursaud sur la Difference des Causes de l'étranglement des Hernies; Mém. de l'Acad. de Chir. T.* 4. *Le Dran, Traité des Opérations de Chir. et Observations de Chir. obs.* 57. *F. Hildanus, cent.* 5, *obs.* 54. *J. L. Petit, Traité des Mal. Chir. Tom.* 2. *S. Sharp on the Operations, and his Critical Enquiry. Bertrandi, Traité des Opérations; et Exemple d'une Hernie formée du côté droit par l'intestin ileum seulement, dont une portion s'étoit echappée par une des échancrures ischiatiques, en se glissant sur les ligaments sacro-sciatiques; Mem. de Chir. T.* 2. *Saltzmann, Disp. de Vesicæ Urinariæ Herniâ;* 1712. *Mery sur des Descentes de la Vessie; Acad. des Sciences,* 1713. *J. L. Petit sur les Hernies de la Vessie; Acad. des Sciences,* 1717. *Verdier, Recherches sur la Hernie de la Vessie; Mém. de l'Acad. de Chir. T.* 2. *Divoux, Disp. de*

Herniâ Vesicæ Urinariæ; Argent. 1732. *Levret, Obs. sur la Hernie de la Vessie; Mém. de l'Acad. de Chir. T.* 2. *P. Petit (le jeune) sur les Hernies de la Vessie, et de l'Estomac; Acad. de Chir. T.* 4. *Vater de Lienis Prolapsione;* 1746. *M. G. Pfannius, De Entero-Oschcocele antiquâ, restitutione sacci herniosi feliciter peractâ, absque bracherio et sectione curatâ. Erlângæ,* 1748. *La Peyronie sur un étranglement de l'intestin, causé intérieurement par l'adhérence de l'epiploon au-dessus de l'anneau; Mem. de l'Acad. de Chir. T.* 1. *Tenon, in Acad. des Sciences;* 1764. *Richter Von den Brûchen in 2 vols.* 1778, 1779*: or the French transl. by Rougement,* 4to., *Bonn,* 1788. *Also Richter's Bibliothek, and Anfang. der Wundarzn. A. G. Richter, De Hernia incarceratâ, una cum sacco suo reponi per annulum abdominalem posse monet,* 4to. *Gott.* 1777. *Wilmer's Pract. Obs. on Herniæ,* 8vo. *Lond.* 1788. *Schmucker's Chir. Wahrnehmungen,* 8vo. 1774, 1789. *Desault, Œuvres Chirurg. par Bichat, T.* 2. *Hey's Pract. Observ. in Surgery, Ed.* 3. *Sandifort, Obs. Anat. Pathol.* 4to. *Lugd.* 1777, *et Icones Herniæ Inguinalis Congenitæ,* 4to. *Lugd.* 1781. *Camper's Demonstrat. Anat. Pathol.* 1760; *and his Icones Herniarum, edit. à Soemmerring, fol. Francof,* 1801. *Dr. Hunter's Med. Comment.* 1762, 1764. *Monro in Edinb. Med. Essays: and the edition of his works by his Son. Gimbernat's Account of a New Method of operating for Femoral Hernia, transl. from the Spanish by Beddoes,* 8vo. 1795. *Also the German transl. with additions by Schreger,* 12*mo. Nürnb.* 1817. *Sir A. Cooper on Inguinal and Congenital Hernia; fol. Lond.* 1804; *and on Crural and Umbilical Hernia, fol. Lond.* 1807. *A. Monro on Crural Hernia,* 1803; *and the Morbid Anatomy of the Human Gullet, Stomach, and Intestines,* 8vo. *Edinb.* 1811. *Sabatier, Médecine Opératoire, T.* 1. *Chopart et Desault, Parisian Surgical Journal. Wrisberg, in Comment. Reg. Societ. Götting.* 1778. *Schmucker's Vermischte Chir. Schriften. Haller's Opera Minora; and Disputationes Chir. F. X. Rudtorffer, Abhandlung über die einfachste und sicherste Operationsmethode Eingesperrter Leisten-und-Schenkelbrüche, 2 Bände,* 8vo. *Wien,* 1808. *Sull'ernie Memorie Anatomico-chirurgiche di Antonio Scarpa, Ediz. nuova,* 1819; *or the French transl. by Cayol,* 1812, *or the English by Wishart. C. Bell's Surgical Observations, pt.* 2, *p.* 177, *&c. London,* 1816. *Lassus, Pathologie Chir. T.* 1, *p.* 1, *&c., Ed.* 1809. *Pelletan, Clinique Chir. T.* 3. *B. Travers on Injuries of the Intestines, &c.* 1812. *A case of hernia ventriculi through a laceration of the diaphragm, by T. Wheelwright in Med. Chir. Trans. Vol.* 6, *p.* 374. *F. C. Hesselbach, Disquisitiones Anatomico-Pathologicæ de ortu et progressu Herniarum Inguinalium et Cruralium, cum tab.* 17. *æneis,* 4to. *Würzburg,* 1816; *the original edition in German was first published in* 1806. *Also Beschreibung und Abbildung eines neuen Instrumentes zur sichern Endeckung und Stillung einer beidem Brüchschnitte enstandenen gefährlichen Blutung,* 4to. *Würzb.* 1815. *Soemmering über die Ursache, &c. der Brüche am Bauchen und Becken, ausser der Nabel und Leistengegend,* 8vo. *Frankof.* 1811. *B. G. Schreger, Versüche Chirurgische, T.* 1, *p.* 149, *&c. Versüche zur Vervollkommung der Herniotomie,* 8vo. *Nürnberg,* 1811. *Also B.* 2, *Ueber einige Hernien ausser der Nabel und Leistengegend. p.* 155, 8vo. *Nürnberg,* 1818. *F. L. Trustedt, De Extensionis in Solvendis Herniis Cruralibus incarceratis præ incisione præstantia,* 4to. *Berol.* 1816. *A. C. Hesselbach, Die Sicherste Art der Brüchschnittes in der Leiste,* 4to. *Bamb. et Würzb.* 1819. *B. G. Seiler, Observationes nonnullæ testiculorum ex abdomine in Scrotum descensu, et Partium Genitalium Anomalis,* 4to. *Lips.* 1817. *J. Cloquet, Récherches Anat. sur les Hernies,* 4to. *Paris,* 1819. *C. J. M. Langenbeck, Commentarius de Structurâ Peritonæi, Testiculorum Tunicis, eorumque ex Abdomine in Scrotum descensu ad illustrandam Herniarum indolem,* 8vo. *Gött.* 1817. *For some valuable remarks on the two preceding works, and on the Anatomy of Hernia, see Quarterly Journal of Foreign Medicine, Vol.* 1, *p.* 347, *&c. Langenbeck, Bibl. für die Chir. B.* 4, *St.* 3, *and Neue Bibl. B.* 2, *p.* 112, *&c. Gött.* 1819. *Walther de Herniâ Crurali.* 4to. *Lips.* 1820. *G. Breschet, Considerations sur la Hernie Femorale in his Concours, &c. J. Syme, on the Fasciæ of the Groin, Edinb. Med. Journ. No.* 81, *p.* 295. *But, above all, the work, which I feel infinite pleasure in recommending, from a conviction of its superior merit, is a Treatise on Ruptures, by W. Lawrence,* 8vo. *Ed.* 4, *Lond.* 1824.

HERNIA CEREBRI. (*Fungus Cerebri. Encephalocele.*) There are two principal kinds of hernia cerebri: one presents itself in young infants, before the ossification of the skull is completed; the other takes place after the destruction of a part of the skull by the operation of the trephine, accidental violence, or disease.

The congenital hernia cerebri of infants occurs, however, in two very different forms; in one, it is covered by the scalp: in the other, the corresponding integuments of the head, and sometimes even the dura mater, are deficient.

The common encephalocele, met with in newborn children, seems to originate from the imperfect ossification of the skull, especially in the situation of the fontanella, and sutures. This case is characterized by a soft swelling, of an equal round shape, which is attended with a pulsation corresponding to that of the pulse; it yields and disappears under pressure, offers no alteration in the colour of the skin, and is circumscribed by the margin of the defective portion of the skull. (*Ferrand, in Mém. de l'Acad. de Chir. T.* 13, *in* 12*mo. p.* 102.) In general, the mental faculties are not affected; and we read of one example, in which a patient had such a hernia cerebri thirty-three years, without his intellects ever having been impaired during the whole of that period. (*Op. cit. T.* 5, *in* 4*to. p.* 863.)

It is tolerably well established, that the congenital hernia cerebri, which arises from the incomplete ossification of the skull, and is covered by the scalp, ought to be treated by the application of constant, yet moderate, pressure. M. Salleneuve communicated to the Royal Academy of Surgery in France an example of the good effects of this treatment, which reduces the size of the tumor, and accomplishes a perfect cure as soon as the ossification is completed. M. Salleneuve put a piece of thin sheet lead, properly covered with soft linen, under the child's cap, to which it was sewed in a suitable situation, and the degree of pressure was increased, or lessened, according as circumstances required, by tightening or loosening the cap. (*Op. cit. p.* 103, *T.* 13, *Edit.* 12*mo.*)

The experience of Callisen also confirms, that hernia cerebri, when of moderate size, may be cured by the foregoing method, the aperture becoming gradually closed. But he adds, that large tumors of this description, especially when situated about the occiput, scarcely admit of any means of relief, except the employment of some contrivance to protect them from external injury. (*Callisen, System. Chir. Hodiernæ, Vol.* 2, *p.* 513, 514, *Ed.* 1800.)

When the ossification of the sutures in children is late, the cerebellum, as well as the cerebrum, is liable to protrusion. In 1813, two such cases occurred at Paris. In one, Professor Lallement mistook the disease for a common tumor, and commenced an operation for its removal, when, after making some of the necessary incisions, his proceedings were stopped by his seeing the white silvery colour of the dura mater, and that the swelling came out of an aperture in the occipital bone. The day after the operation the child was seized with violent pain in the head, had a hard pulse, prostration of strength, vomiting, &c. and died in the course of a week. On dissection, a part of the tentorium, and an elongation of the two lobes of the cerebellum, about as large as a nut, were found in the protruded sac of the dura mater. Several abscesses were also discovered in the substance of the cerebellum. The other example fell under the observation of M. Baffos, principal surgeon to the Hôpital des Enfans. Upon the death of the child, the dissection evinced similar appearances. (*Richerand, Nosographie Chir. T.* 2, *p.* 319, *Ed.* 4.)

Such facts should teach the surgeon to be particularly cautious in ascertaining the nature of tumors about the back part of the head, before he ventures to attempt their removal.

The second kind of congenital encephalocele is that, in which not only large portions of the cranium, but also more or less of the integuments of the head, are deficient. It is rather to be regarded as a malformation, than a disease, and, indeed, in most instances, the infants are still-born. The case sometimes consists of the protrusion of most of the brain through the inferior and posterior fontanellæ, so that the child is born with a largish bag, on the back of its head, hanging down over the posterior part of the neck. Several specimens of these malformations, taken from infants born in the Hospice de la Maternité, are preserved in the Museum of the Faculté de Médecine at Paris. (*Richerand, Nosogr. Chir. T.* 2, *p.* 316, *Edit.* 4.) In the year 1810, a remarkable case of this last description of congenital hernia cerebri was published by Dr. Burrows. "The whole of the forehead, summit, and a great part of the occiput, were deficient, and in lieu of them, a substance projected of a light mulberry colour, and of the mushroom form, except that it was proportionably broader. From the deficiency of bone, the eyes appeared to project much more than usual. The child lived six days without either taking sustenance, or having any evacuation." On dissection, the scalp, the os frontis, the parietal, and a great part of the occipital bones, were wanting. Through the parts, at which these bones were deficient, the cerebrum projected, exhibiting its usual convolutions. It was covered with the pia mater; was of a mulberry colour; appeared to be more vascular, than the pia mater usually is; and the edge of the scalp adhered to the neck of the tumor. The cerebellum was not more than one-fourth of its usual size; for, the posterior part of the os occipitis was much nearer to the sella turcica, than natural. The child was destitute of the power of voluntary motion, and all the secretions appeared to be stopped. (See *Med. Chir. Trans. Vol.* 2, *p.* 52.)

The most interesting species of hernia cerebri to the practitioner, is that which sometimes arises after the removal of a portion of the skull by the trephine, or the destruction of part of it by disease. Various examples of this disease are recorded in the Memoirs of the French Academy of Surgery, and I have myself seen many instances of it. Although the case has attracted considerable notice, modern surgeons are far from entertaining settled opinions, concerning the exact nature of the tumor.

In one example, recorded by Mr. Abernethy, the hernia cerebri arose on the tenth day after trephining, and was as large as a pigeon's egg. The pia mater, covering it, was inflamed; and a turbid serum was discharged at the sides of the swelling, from beneath the dura mater. On the eleventh day, the tumor was as large as a hen's egg, smooth, and ready to burst. The man died the next day. On examination, the swelling was found still larger, and of a dark colour, with an irregular granulated surface. This appearance was owing to coagulated blood, which adhered to its surface, as the part had bled so much, that the patient's cap was rendered quite stiff with blood. The pia mater was in general much inflamed, and, as well as the dura mater, was deficient at the place of the tumor. The deeper part of the swelling seemed to consist of fibrous coagulated blood, and it was found to originate about an inch below the surface of the brain.

Mr. Abernethy explains the formation of the disease as follows: "In consequence of the brain being injured to some depth beneath the surface, disease of the vessels, and consequent effusion of the blood, had ensued; the effusion was, for a time restrained by the superincumbent brain and its membranes; but, these gradually yielding to the expansive force exerted from within, and at last giving way altogether, the fluid blood oozed out and congealed upon the surface of the tumor." An organized fungus can hardly be produced so rapidly as these tumors are formed. (On *Injuries of the Head, in Surgical Works, Vol.* 2, *p.* 53.)

On the contrary, Mr. C. Bell declares, that the swelling is vascular and organized. (*Operative Surgery, Vol.* 1.)

Dr. John Thomson also entertains a different opinion from that of Mr. Abernethy, respecting the mode in which these herniæ cerebri are formed; but, I question whether he may not have confounded with the disease now under consideration, fungous tumors of the dura mater. At least, some of the cases, to which he alludes, as a reason for his sentiment concerning their mode of formation, must have been the disease so well described by M. Louis. (See *Dura Mater.*) The reader, however, must judge for himself from the following passage: "In a considerable number of those who had the cranium severely contused, or fractured by musket-balls, (says Dr. Thomson) fungous growths took place through the openings, which had been made at first by the ball, or afterwards by the trepan. These growths, I am inclined to believe, are the consequence of a contusion of the substance of the brain, and of the membranes that cover it, which gives rise to the formation of a new organized substance, different in its texture from brain; and are not, as some late writers would endeavour to persuade us, simply protrusions of the brain, resulting from the removal of the natural resistance, which is made to them by the dura mater and cranium. *I have known instances of substances, similar to these growths, forming on the surface of the brain, immediately under the place, where the cranium had received a contusion, in cases in which the trepan had not been applied, or any portion of the cranium removed.*

"Fungus of the brain, in the greater number of instances, in which we had an opportunity of observing it, was accompanied either with stupor or paralysis, and other symptoms of compressed brain. In a fracture of the vertex of the cranium, produced by a musket ball, and followed by a fungus of the brain, the paralysis took place in the lower extremities. In a case of wound, made by a musket ball on the right side of the forehead, and in which spiculæ of bone had been driven in upon the brain, a large fungus protruded. The formation of this fungus was followed by slow pulse, stupor, dilated pupils, slight strabismus, and distortion of the mouth. In the progress of this case, escharotics were applied to the fungus, portions of it were torn off by the patient, and all of it that was exterior to the cranium, was twice pared off by the knife, with an apparent alleviation, rather than aggravation, of the symptoms. On the death of this patient, nearly the whole of the right hemisphere of the brain was found converted into a soft pulpy mass. The left hemisphere was not changed in structure, though much vascular turgescence appeared on its surface." (See *Dr. J. Thomson's Report of Observations made in the Military Hospitals in Belgium*, *p.* 57, 58.)

From the investigations of Mr. Stanley, the fact is placed beyond all doubt, that a part of the brain occasionally constitutes the substance of herniæ cerebri; and he thus confirms the opinion formerly entertained upon this point by Quesnay and Louis. Thus, in the first case which Mr. Stanley has recorded, "the whole tumor was sliced off with a scalpel. During the operation, the boy gave no manifestation of positive pain, although not unconscious of what we were doing. Considerable hemorrhage took place from the surface of the brain, exposed by the removal of the tumor, the blood being thrown with great force, and to a considerable distance from numerous vessels, which were attempted to be secured, but ineffectually, by ligatures. After a short time, however, the bleeding ceased. On examination of the part, which had been cut off, its exterior was found to consist merely of a layer of the coagulated blood; the rest of the mass was brain, possessing a natural appearance, the distinction between the cortical and medullary matter being readily seen, with the convolutions and pia mater dipping down between them." In the dissection after death, "all that part of the dura mater, adjacent to the ulcerated aperture, through which the brain had protruded, was black, sloughy, and much thickened. The exposed surface of the brain, from which the portion had been cut off, exhibited a softened and broken down texture; a state of disorganization, which extended deep into its substance. About an ounce of fetid and dark-coloured fluid was found between the dura mater and arachnoid membrane. Several small effusions of blood were met with, both between the membranes and in the substance of the brain. The arachnoid membrane was thickened and opaque over each hemisphere. The vessels on the surface, and in the substance of the brain, were remarkably free from blood. The lateral ventricles were large, and filled with transparent fluid, and there was some found between the membranes at the basis, so that, altogether the quantity from these two sources was very considerable." (See *Med. Chir. Trans. Vol.* 8, *p.* 15—17.) In another dissection, a considerable quantity of pus was found on the arachnoid membrane, on each side of the falx. (*P.* 27.) In most of the cases of hernia cerebri, which I have seen, the patient was at first more or less sensible, but labouring under considerable nervous agitation. The stupor, paralysis, and other symptoms of compressed brain, noticed by Dr. J. Thomson, did not take place, till the latter stage of the disease, and then convulsive twitches of the muscles and strabismus occasionally came on. (See *Med. Chir. Trans. p.* 26.) The disease is usually attended with great frequency of the pulse.

With regard to the cause of the protrusion, it is a subject very difficult of explanation, because if the origin of the tumor depended simply on the removal of a portion of the skull, or on any changes of the dimensions of the brain in expiration, the effect would always follow such causes, and prevail in all patients. From the particulars of the dissections, performed by Mr. Abernethy and Mr. Stanley, and those referred to by Dr. J. Thomson, it is clear, that the hernia cerebri is a disease connected with deep-seated changes throughout a great part of the brain. (See also *Larrey, Mém. de Chir. Mal. T.* 4, *p.* 206.) The substance of this organ is found more or less pulpy and disorganized; and after death, large effusions of serum, and even sometimes of blood, and purulent matter are observed. These appearances leave no doubt of the disease being associated with inflammatory action within the head. It is highly probable, therefore, that a hernia cerebri is only produced when these deep-seated changes are conjoined with the removal of bone. The changes alluded to, may be supposed to cause an increase in the general contents of the skull, and thus a disposition to protrusion, as rapid as the serum and other fluids are effused. This statement, however, can only be received as an hypothesis, because we find, that in one of the dissections, described by Mr. Stanley, "there existed a considerable space between the upper surface of the right hemisphere, all around the situation of the protrusion and the internal surface of the dura mater, while, in every other part, the brain and dura mater were in close contact." (See *Med. Chir. Trans. Vol.* 8, *p.* 27.) Now, the idea of an empty space within the cranium is rather inconsistent with the supposition, that the brain is thrust out, in consequence of changes, which augment the quantity of the general contents of the skull, unless such space were filled with air, that had no external communication.

When the bad symptoms disappear, on the tumor being no longer confined by the dura mater, some practitioners deem it best to interfere as little as possible, and let the tumor drop off in pieces. (See *Edinb. Med. Comment. Vol.* 1, *p.* 98, *Med. Museum, Vol.* 4, *p.* 463.) The mildest dressings are to be employed; but whether the protrusion should be resisted by pressure, or not, seems unsettled.

When the tumor acquires a very great size, it may be pared off with a knife, as was done by Mr. Hill, in several instances, with success. (*Cases in Surgery, 8vo. Edinb.* 1772.)

In one of the cases, published by Mr. Stanley, the patient, a boy about eleven years of age, recovered after the upper part of the tumor had been pared off, and some of the removed substance found to consist decidedly both of cortical and medullary substance. In this instance, the reproduction of the tumor was checked by firm pressure with graduated compresses, and a bandage. The protruded brain gradually lost its natural color; it acquired a light yellow appearance, was split into several portions, and a very fetid odour exhaled from it. Its substance daily became softer, ultimately acquiring almost a semifluid state, and, in this condition, the whole mass gradually wasted away. *Fresh granulations arose to fill up the vacancy, and they were manifestly produced from the exposed substance of the brain.* Compression being continued, the part now quickly healed up. (See *Med. Chir. Trans. p.* 20, 21.) In a third case, the part of the tumor cut off consisted entirely of cortical and medullary substance, quite healthy in its appearance (*P.* 24); and subsequently granulations were formed from the exposed surface of the brain. The case, however, had a fatal termination. By the removal of the swelling, and the use of compression, one cure was effected by Mr. Pring. (See *Edinb. Med. and Surgical Journ. Vol.* 9.)

Richerand affirms, indeed, generally, that when the brain is exposed, in consequence of an injury of the head, the encephalocele should be cut down with a knife and repressed by gentle compression. (See *Nosogr. Chir. T.* 2, *p.* 318, *Ed.* 4.)

Sir A. Cooper is also an advocate for pressure, made with adhesive plaster; and a compress of lint wet with liquor calcis: his aim is to reduce the swelling to a level with the bone, when, he says, the scalp will heal over it. (*Lectures, Vol.* 1, *p.* 317.)

The cases published by Mr. Stanley are rather favourable to the employment of pressure, inasmuch as it appeared evidently to check the protrusion, and was mostly borne without inconvenience.

The idea, however, that when the brain protrudes through the dura mater, pressure can effect its return, is, as Mr. Stanley judiciously observes, quite untenable. (*Med. Chir. Trans. Vol.* 8, *p.* 36.)

Quesnay mentions an instance in which a patient tore off the protruded mass himself, and the cavity healed up. (*Mém. de l'Acad. de Chir. T.* 1.) Van Swieten relates a case, in which the swelling was repeatedly removed with a ligature, and a cure ensued. (*Comment. T.* 1, *p.* 440.) The danger of applying styptics, and irritating applications, is shown by Hildanus, *Obs.* 14, and Mr. Hill, *p.* 198.

Baron Larrey considers the treatment by excision, pressure, and spirituous applications, hurtful and dangerous: his advice is merely to apply to the swelling a pledget of slightly camphorated oil of camomile; to have recourse to cooling aperient beverages; to remove all kinds of irritation; to exclude the air; and apply the dressings with great gentleness. By these means, the only case which Larrey ever saw recover, was saved, and in it the tumor was small. (*Mém. de Chir. Mil. T.* 4, *p.* 206.)

One would suppose, that cases of this kind must generally require the employment of every thing at all likely to keep off, and diminish, inflammation of the brain. *Quesnay, sur la Multiplicité des Trépans, in Mém. de l'Acad. Royale de Chirurgie, T.* 2. *p.* 25, 56, *Ed. in* 12*mo. M. Corvin's Dissert. in Haller's Disputat. Chir. Vol.* 2. *Mémoire sur l'Encephalocele par M. Ferrand, in Mém. de l'Acad. de Chir. T.* 13, *p.* 96, *Edit.* 12*mo. Lassus Pathologie Chir. T.* 2, *p.* 140, *Edit.* 1809. *Abernethy's Essay on Injuries of the Head. Hill's Cases in Surgery. Burrows in Med. Chir. Trans. Vol.* 2. *Callisen, Systema Chirurgiæ Hodiernæ, Vol.* 2, *p.* 512, Ed. 1800. *C. Bell's Operative Surgery, Vol.* 1. *Richter's Ansfangsgründe der Wundarzneykunst, B.* 2, *p.* 197, *Ed.* 1802. *Richerand, Nosographie Chir. T.* 2, *p.* 316, *Ed.* 4, *Paris*, 1815. *Dr. J. Thomson's Report of Observations made in the Military Hospitals in Belgium, p.* 57, *Edinb.* 1816. *Delpech, Précis Elémentaire des Maladies Chirurgicales, T.* 2. *p.* 447, *et seq. Paris*, 1816. *Crell and Sand, in Haller's Disput. Chir. T.* 1. *E. Stanley, in Med. Chir. Trans. Vol.* 8; *a paper, containing many valuable observations. Larrey, in Mém. de Chir. Mil. T.* 4, *p.* 203, *&c. Hennen's Military Surgery, p.* 311, *&c. Ed.* 2. *A. Solomons, De Cérebri Tumoribus, Edinb.* 1810. *J. C. Schoenlein Von der Hirnmetamorphose, 8vo. Würzb.* 1816.

HERNIA HUMORALIS. (*Swelled or Inflamed Testicle.*) A very common symptom, attending a gonorrhœa, is a swelling of the testicle, which is only sympathetic, and not venereal, because the same symptoms follow every kind of irritation of the urethra, whether produced by strictures, injections, or bougies. Such symptoms are not similar to the actions arising from the application of venereal matter; for, suppuration seldom occurs, and when it does, the matter is not venereal. The swelling and inflammation appear suddenly, and as suddenly disappear, or go from one testicle to the other. The epididymis remains swelled, however, even for a considerable time afterwards.

The first appearance of swelling is generally a soft pulpy fulness of the body of the testicle, which is tender to the touch; this increases to a hard swelling, accompanied with considerable pain. The epididymis, towards the lower end of the testicle, is generally the hardest part. The hardness and swelling, however, often pervade the whole of the epididymis. The spermatic chord, and especially the vas deferens, are often thickened and sore to the touch. The spermatic veins sometimes become varicose. A pain in the loins, and sense of weakness there, and, in the pelvis, are other casual symptoms. Colic pains; uneasiness in the stomach and bowels; flatulence; sickness; and even vomiting; are not unfrequent. The whole testicle is swelled, and not merely the epididymis, as has been asserted.

The inflammation of the part most probably arises from its sympathizing with the urethra. The swelling of the testicle coming on either removes the pain in making water, and suspends the discharge, which do not return, till such swelling begins to subside; or else the irritation in the urethra, first ceasing, produces a swelling of the testicle, which continues till the pain and discharge return; thus rendering it doubtful, which is the cause, and which the effect. Occasionally, however, the discharge has become more violent, though the testicle has swelled: and such swelling has even been known to occur after the discharge has ceased; yet the latter has returned with violence, and remained as long as the hernia humoralis. (*J. Hunter.*)

Irritation at the mouth of the vasa deferentia has been mentioned as a cause; but, were this true, both testicles would usually be affected at the same time, and the complaint would occur more frequently, when the irritation of the urethra extends far towards the bladder, than when it only reaches about an inch and a half, or two, inches, from the orifice of the passage.

Hernia humoralis, with stoppage of the discharge, is apt to be attended with strangury. It is singular, that the inflammation should more frequently come on when the irritation in the urethra is going off, than when it is at its height.

The enlargements of the testicle, from cancer and scrofula, are generally slow in their progress; that of a hernia humoralis very quick. (*J. Hunter.*)

Rest is the best remedy, and the horizontal position of the body is easiest. At all events, the testicle must be well suspended; to which expedient the patient will readily have recourse as soon as he knows the ease which it affords. The case is treated as inflammation in general, by bleeding and purging, and applying fomentations and poultices. In the hernia humoralis from gonorrhœa, however, cold applications are sometimes preferred. (*James on Inflammation, p.* 164.) Leeches have often proved serviceable. The swelling not being venereal, mercury is only useful in removing the induration, after the inflammation has subsided. Vomits have been recommended, and found beneficial. They have even been known to cure the complaint in a surprisingly sudden manner. Opiates are useful. When suppuration occurs, no mercury is requisite, only common treatment.

As the hernia humoralis often appears to depend on the cessation of the discharge, some (*Bromfield*) have advised irritating the urethra with bougies to bring on the gonorrhœa again; but the practice is not followed by the expected good. The introduction of venereal matter into the urethra has also been most absurdly suggested.

A hernia humoralis is at first very quick in subsiding; but some of the swelling remains a long while, and the hardness of the epididymis may even continue for years, nay, for life. However, no inconvenience attends the mere induration. In such instances, the vas deferens may occasionally be rendered impervious, though the occurrence must be by no means frequent.

Frictions with camphorated mercurial ointment; fumigations with aromatic herbs; and electricity; are the best means for dispersing the induration in question. (*J. Hunter.*)

The signs, distinguishing a hernia humoralis from a scrotal rupture, are explained in the article *Hernia.*

I once had under my care a patient with hernia humoralis, whose symptoms were severe in an extraordinary degree, and strongly resembled those of a strangulated hernia, being attended with much sickness, and obstinate constipation. A swelling of the testis, accompanied with all the symptoms of strangulated hernia, is recorded by Guincourt. (See *Journ. de Méd. par Corvisart, T.* 16.)

Although I had never seen hernia humoralis attended with symptoms so much resembling those of a strangulated rupture, as in the case, which fell under my own notice, and the patient would not own that he had had any gonorrhœa, yet I remarked some circumstances, which made me avoid an erroneous judgment. In the first place, I could discover no protrusion from the abdominal ring. Secondly; I observed, that there was no tension, nor swelling of the belly, as in common cases of strangulated ruptures. Thirdly, I remarked, that the inflammation of the scrotum did not increase as the symptoms advanced, as it usually does in the latter disease. Fourthly, I took notice, that the pain in the belly was most severe under the false ribs on the right side, though at periods it was certainly very diffused; but it was never augmented by pressure, as always happens in strangulated hernia, peritonitis, enteritis, &c. from all which disorders, too, the absence of tension seemed to distinguish it. Sometimes likewise the pain was entirely in the tumor; sometimes altogether in the abdomen.

HERPES. (from ἕρπω, to creep.)

Nothing could be more confused and undefined, than the idea conveyed by the term *herpes,* as generally employed by medical men before the last few years. In fact, numerous cutaneous diseases, of the most opposite kinds, but which had a tendency to creep, or spread slowly, were designated, as specimens of herpes. Thus, when I first entered the profession, it was common for some of the most eminent surgeons in London frequently to call noli me tangere, or lupus, herpes of the nose; and to apply the same term to tinea capitis, or the porrigo favosa.

Happily, this vague mode of regarding diseases of the skin is beginning to give way to the judicious distinctions proposed by the late Dr. Willan, and so ably perfected by Dr. Bateman. The appellation, *herpes,* is limited by these physicians "to a vesicular disease, which, in most of its forms passes through a regular course of increase, maturation, and decline, and terminates in about ten, twelve, or fourteen days. The vesicles arise in distinct, but irregular clusters, which commonly appear in quick succession, and they are set near together, upon an inflamed base, which extends a little way beyond the margin of each cluster. The eruption is preceded, when it is extensive, by considerable constitutional disorder, and is accompanied with a sensation of heat and tingling, sometimes with severe deep-seated pain, in the parts affected. The lymph of the vesicles, which is at first clear and colourless, becomes gradually milky and opaque, and ultimately concretes into scabs: but, in some cases, a copious discharge of it takes place, and tedious ulcerations ensue. The disorder is not contagious in any of its forms." (See *Bateman's Practical Synopsis of Cutaneous Diseases, p.* 221, 222, *Edit.* 5.) This author notices six species of the complaint: viz. herpes phlyctænodes; herpes zoster; herpes circinatus; herpes labialis; herpes præputialis; and herpes iris.

As most of these cases more properly belong to the physician, than surgeon, I shall briefly describe three of them.

According to Dr. Bateman, the *Herpes Zoster*, or *shingles*, is mostly preceded, for two or three days, by languor, and loss of appetite, rigors, headach, sickness, and a frequent pulse, together with a scalding heat, and tingling in the skin, and shooting pains through the chest and epigastrium. Sometimes, however, the precursory febrile symptoms are very slight. Upon some part of the trunk, several red patches occur of an irregular form, at a little distance from each other, upon each of which numerous small elevations appear clustered together. These, if examined minutely, are found to be distinctly vesicular, and in the course of twenty-four hours, they enlarge to the size of small pearls, and are perfectly transparent, being filled with a limpid fluid. For three or four days, fresh clusters continue to arise, always extending themselves nearly in a line with the first, towards the spine at one end, and towards the linea alba at the other. While the new clusters are appearing, the vesicles of the first lose their transparency, and, on the fourth day, acquire a milky, or yellowish hue, which is soon followed by a blueish, or livid colour, of the basis of the vesicles, and of the contained fluid. They now become somewhat confluent, and flatten, or subside. About this time, they frequently break, and discharge, for three or four days, a serous fluid, which at length, concretes into thin dark scabs. These fall off about the twelfth or fourteenth day, leaving the surface of the subjacent skin in a red and tender state; and when the ulceration and discharge have been considerable, numerous cicatrices, or pits, are left. All the clusters go through a similar series of changes.

Young persons, from the age of twelve to twenty-five, are most frequently affected; although aged persons are not altogether exempt from the complaint, and suffer severely from the pain of it. Summer and autumn are the seasons, in which it is most common. Sometimes it supervenes to bowel complaints, and the chronic pains remaining after acute pulmonary diseases. In the treatment, Dr. Bateman thinks gentle laxatives, and diaphoretics, with occasional anodynes, when the severe deep-seated pains occur, all that is necessary. No external application is requisite, unless the vesicles be abraded by the friction of the clothes, which are then liable to adhere to the parts: in this case, a little simple ointment may be interposed. For a fuller account, see *Bateman's Pract. Synopsis, p.* 226, &c.

Herpes circinatus, or *ringworm*, makes its appearance in small circular patches, in which the vesicles arise only round the circumference: these are small, with moderately red bases, and contain a transparent fluid, which is discharged in three or four days, when little prominent dark scabs form over them. The central area, in each vesicular ring, is at first free from any eruption; but, the surface becomes somewhat rough, and of a dull red colour, and throws off an exfoliation, as the vesicular eruption declines, which terminates in about a week, with a falling off of the scabs. A succession of these vesicular circles usually arise on the face and neck, or arms and shoulders, thus protracting the case for two or three weeks.

The itching and tingling, which are the only inconveniences of the affection, may be relieved by the application of the popular remedy, ink, solutions of the salts of iron, copper, zinc, borax, alum, &c. Some additional interesting observations on other forms of the herpes circinatus, may be found in Dr. Bateman's Synopsis, from which I have extracted the few preceding particulars.

Herpes Præputialis. This local variety of herpes was not noticed by Dr. Willan, and we are indebted to Dr. Bateman for a description of it. The complaint begins with extreme itching, and with some sense of heat in the prepuce, on which one or two red patches occur, about the size of a silver penny. Upon these are clustered five or six minute transparent vesicles. In twenty-four or thirty hours, the vesicles enlarge, become of a milky hue, and lose their transparency; and on the third day, they are coherent, and have almost a pustular appearance. If the eruption is seated on that surface of the prepuce, which is next the glans, so that the vesicles are kept moist, they commonly break about the fourth or fifth day, and form a small ulceration upon each patch. This discharges a little turbid serum, and has a white base, with a slight elevation at the edges; and by an inaccurate, or inexperienced observer it may be readily mistaken for chancre, more especially, if any escharotic has been applied, which produces irritation, and a deep-seated hardness like that of a true chancre. If not irritated, the slight ulceration begins to heal about the ninth or tenth day. When the patches occur on the outside of the prepuce, the duration of the eruption is shorter, and ulceration does not actually take place.

In the treatment, Dr. Bateman recommends the avoidance of all stimulating, and moist, or unctuous applications; and if the complaint be within the prepuce, he advises the interposition of a little bit of dry lint between the sore and the glans.

As this gentleman has truly remarked, this case is particularly deserving of notice, because it has often been considered and treated as a chancre.

For a great deal more valuable information respecting Herpes, I beg leave to refer the reader to the publications of Drs. Willan and Bateman, and also to the article *Herpes*, written by this last able physician for Dr. Rees's Cyclopædia.

HORDEOLUM. (dim. of *hordeum*, barley.) A little tumor on the eyelid, resembling a barley corn. *A stye.* As Scarpa remarks, the stye is strictly only a little boil, which projects from the edge of the eyelids, frequently near the great angle of the eye. Like the furunculus, it is of a dark red colour, much inflamed, and a great deal more painful, than might be expected, considering its small size. The latter circumstance is partly owing to the vehemence of the inflammation, and partly to the exquisite sensibility and tension of the skin, covering the edge of the eyelids. On this account, the hordeolum very often excites fever and restlessness in delicate, irritable constitutions; it suppurates slowly and imperfectly; and, when suppurated, has no tendency to burst.

The stye, like other furunculous inflamations, forms an exception to the general rule, that the best mode, in which inflammatory swellings can end, is resolution. For, whenever a furunculous inflammation extends so deeply as to destroy any of the cellular substance, the little tumor can never be resolved, or only imperfectly so. This event, indeed, would rather be hurtful, since there would still remain behind a greater or smaller portion of dead cellular membrane; which, sooner or later, might bring on a renewal of the stye in the same place as before, or else become converted into a hard indolent body, deforming the edge of the eyelid.

The resolution of the incipient hordeolum may be effected in that stage of it, in which the inflammation only interests the skin, and not the cellular substance underneath, as is the case on the first appearance of the disease. Now repellent, cold applications are useful, particularly ice. But when the hordeolum has affected, and destroyed, any of the cellular membrane underneath, every topical repellent application is absolutely useless, and even hurtful; and the patient should have recourse to emollient anodyne remedies. The hordeolum and eyelids should be covered with a warm soft bread and milk poultice, which ought to be renewed very often. When a white point makes its appearance on the apex of the little tumour, Scarpa says, the surgeon should not be in a hurry to let out the small quantity of serous matter, which exists between the skin and dead portion of cellular membrane. It is better, that he should wait till the skin, within this white point, has become still somewhat thinner, so as to burst of itself, and give ready vent, not merely to the little serous matter, but to all the dead cellular membrane, which constitutes the chief part of the disease. When the contents of the little tumor are slow in making their way outward, through the opening, the surgeon, gently compressing the base of the stye, ought to force them out. After this, all the symptoms of the disease will disappear, and the cavity, left by the dead cellular membrane, in the centre of the little tumor, will be found quite filled up, and healed, in the course of twenty-four hours.

Sometimes, though seldom, this process of nature, destined to detach the dead from the living cellular membrane only takes place incompletely, and a small fragment of yellow dead cellular substance still continues fixed in the cavity, and hinders the cure. In this circumstance, the further employment of emollient poultices is of little or no service. The surgeon should dip the point of a camel-hair pencil in sulphuric acid, and touch the inside of the stye with it, one or more times, until the sloughy cellular membrane comes away. After this, the small cavity remaining will soon close. Should the eyelid continue afterwards a little swollen and œdematous, this affection may be removed by applying the lotio plumbi acet., containing a little spirit of wine. Some persons are often annoyed with this disease. According to Scarpa, this is most frequently owing to a disordered state of the *primæ viæ*, often met with in persons who live on acrid irritating food, and drink too much spirits. (*Scarpa*, *sulle Malattie degli Occhi*, *cap.* 2.) See also, *Guthrie's Operative Surgery of the Eye*, *p.* 107, *&c.*

HOSPITAL GANGRENE. (*Phagedæna Gangrænosa; Putrid or Malignant Ulcer; Hospital Sore; Gangræna Contagiosa.*) A severe and peculiar species of humid gangrene, or rather a combination of this affection, with phagedenic ulceration. It is particularly characterized by its contagious or infectious nature; its disposition to attack wounds, or ulcers in crowded hospitals, or other situations, where many of these cases are brought together; and its tendency to convert the soft parts affected into a putrid glutinous, or pulpy substance, in which no trace of their original texture is discernible. (*Delpech*, *Précis Elem. des Mal. Chir. T.* 1, *p.* 123.) It is generally believed to be communicated from one sore or wound to another, by its contagious nature; but, whether the infection can be transferred only by actual contact, or both in this way, and through the medium of the atmosphere, is a question on which the best authors differ. The first origin of the disease, however, is a mysterious subject, which cannot invariably be explained on any certain principles, as will be hereafter noticed.

From the researches of Mr. Blackadder, it appears probable, that several of the ancient writers, in their descriptions of foul, gangrenous bleeding ulcers, must have alluded to the same kind of disease, which is now usually denominated hospital gangrene. Besides the use of the actual cautery, which, according to the modern French writers, is the surest means of arresting this distemper, several of the ancients appear also to have employed for the cure arsenical applications; as, for instance Ætius, Paulus, Rolandus, Avicenna, Guido, &c. The only doubt, whether these authors actually referred to hospital gangrene, depends upon their not having generally described its contagious nature. But, on this point, I recommend Mr. Blackadder's valuable treatise to be consulted. (P. 76, *&c.*)

Although La Motte made cursory mention of hospital gangrene in 1722, under the name of *pourriture*, and stated, that it had occurred in the Hôtel-Dieu at Paris, yet the first distinct modern account of this disease is contained in the 3d vol. of the posthumous works of Pouteau, published in 1783. In the year 1788, Dussassoy, who succeeded Pouteau as chief surgeon of the Hôtel-Dieu at Lyons, also published a short treatise on the disorder. The first very accurate description of hospital gangrene in the English language, appeared in the 6th vol. of the London Medical Journal, printed in 1785. The account is entitled

"Observations on the Putrid Ulcer, by Mr. Gillespie, surgeon of the Royal Navy." In the edition of Dr. Rollo's work on Diabetes, published 1797, there is a section on this subject, entitled, "A short account of a morbid poison, acting on sores, and of the method of destroying it." In 1799, Sir Gilbert Blane, in the 3d edit. of his book on the diseases of Seamen, gave an account of hospital gangrene under the name of malignant ulcer; and Dr. Trotter, in the 2d vol. of his Medicina Nautica, published in the same year, described that affection by the same appellation. In the 3d vol. of the same work, Dr. Trotter added to his first account several valuable communications, relating to this disease, received from surgeons of the Royal Navy. Mr. John Bell also made hospital gangrene the subject of particular remark, in the 1st vol. of his Principles of Surgery, published in 1801. According to Dr. Thomson, two excellent theses were likewise published on it in the University of Edinburgh; the first entitled, "De Gangrænâ Contagiosâ," by Dr. Leslie in 1804; the second by Dr. Charles Johnson, in 1805, under the title of "De Gangrænâ Contagiosâ Nosocomiale." (See *Lectures on Inflammation*, *p.* 456—458.)

Professor Thomson's account of the subject, published in 1813, contained the fullest history of the disease, at that time collected. Boyer afterwards gave a very fair account of the distemper. (See *Traité des Mal. Chir. T.* 1, p. 320, 8*vo. Paris*, 1814.)

These descriptions were followed by the valuable essay of Delpech, entitled "Mémoire sur la Complication des Plaies et des Ulcères connue sous le nom de Pourriture d'Hôpital;" 1815; some interesting observations by Dr. Hennen, in the London Medical Repository for March, 1815; a paper by Professor Brugmann, of Leyden, in the "Annales de Littérature Med." vol. 19, 1815; and the treatise of Mr. Blackadder, which contains some of the best remarks ever made concerning this affection, and is entitled "Observations on Phagedæna Gangrænosa, 8vo. Edinb. 1818." To these publications are to be added the interesting remarks of Mr. R. Welbank on Sloughing Phagedæna, contained in the 11th vol. of the Med. Chir. Trans.

According to Mr. Blackadder, who is a believer in the doctrine of the complaint being only communicable by the direct application of the infectious matter, when the morbific matter, which produces the disease, has been applied to some part of the surface of the body, from which the cuticle has been removed, as by a blister, one or more small vesicles first appear, which are filled with a watery fluid, or bloody serum of a livid, or reddish-brown colour. The situation of the vesicle is generally at the edge of the sore. Its size is not unfrequently that of a split garden pea, and is easily ruptured, the pellicle, which covers it, being very thin. When the vesicle is filled with a watery fluid, and has not been ruptured, it assumes the appearance of a greyish-white, or ash-coloured slough; but when it contains a dark-coloured fluid, or has been ruptured, it puts on the appearance of a thin coagulum of blood, of a dirty, brownish-black colour. During the formation of the vesicle, there is generally a change in the sensation of the sore, accompanied with a painful feel like that of the sting of a gnat. After a slough is formed, it spreads with more or less rapidity, until it occupies the whole surface of the original sore; and, when left to itself, (which seldom happens,) there is little or no discharge, but the slough acquires daily greater thickness.

"When the formation of the slough has been interrupted, the stinging sensation becomes more frequent and acute; phagedenic ulceration quickly commences; and such is frequently the rapidity of its progress, that even in the course of a few hours, a very considerable excavation will be formed, while the parts in the vicinity retain their usual healthy appearance." The cavity, the edges of which are well defined, is filled with a thick glutinous matter, which adheres strongly to the subjacent parts. When this matter is removed, the surface underneath presents itself of a fine granular texture, which, in almost all instances, is possessed of extreme sensibility, and is very apt to bleed, when the operation of cleaning is not performed with great delicacy. At each dressing, the circumference of the cavity is found enlarged, and if there are more than one, they generally run into each other. The progress of the disease is much quicker in some individuals, than others, but *it never ceases, until the whole surface of the original sore is occupied.* The stinging pain gradually becomes of a darting, or lancinating kind; and *either about the fourth, or sixth day, from the time when the morbific matter had access to the sore, or afterwards, at the period of what may be termed secondary inflammation, the lymphatic vessels and glands are apt to become affected.* The discharge becomes more copious, its colour varying from a dirty yellowish white to a mixture of yellow, black, and brown, depending upon the quantity of blood mixed with it.

"The soft parts, in the immediate vicinity of the sore, daily become more painful, tumefied, and indurated; and, in a great number of cases, particularly in those of plethoric and irritable habits, an attack of acute inflammation speedily supervenes, and is accompanied by a great increase of pain, the sensation being described to be such as if the sore were burning. The period, at which this inflammation begins to subside, is by no means regular. Sometimes, it subsides in the course of two days, and sometimes it continues upwards of five; depending very much on the constitution and previous habits of the patient, as well as the treatment that has been adopted. During its progress, the thick, putrid looking, and frequently spongy slough which is formed on the sore, becomes more and more moist, and of a *pulpy* consistence. (Hence this form of disease is actually named by Gerson, *pulpy gangrene.*) In the course of a few days, a very offensive matter begins to be discharged at its edges. The slough then begins to separate; by and by, it is thrown off, but only to prepare the way for an extension of the disease by a continued process of ulceration, and by a recurrence of the last-mentioned symptoms." (*Blackadder, on Phagedæna Gangrænosa, p.* 28—30.)

The first symptoms, which indicate hospital gangrene in a wound, or ulcer, are, a more or less acute pain, and a viscid whitish exudation on the surface of the granulations, which lose their vermilion colour, and present at sever points spots of a greyish or dirty-white hue, resembling venereal ulcers, or apthæ. These ulcerated points, thus engrafted (as it were) upon the original ulcer, soon spread, and join together, so as to give to the whole surface of the solution of continuity a grey ash-colour. The surface also becomes more or less indurated, and sometimes bleeds. A red, purplish œdematous circle, of a greater, or lesser extent, is next formed in the surrounding skin. Sometimes, when the patient is of a good habit, the causes of infection less active, and the constitution sufficiently strong, the disorder now stops. According to Boyer, it may not even extend to the whole surface of the ulcer. But, most frequently, its progress is extremely rapid and occasionally quite terrifying. The edges of the wound, or ulcer, become hardened and everted, the granulations are large and tumid, being swelled up, as Boyer asserts, with a considerable quantity of gas. They are afterwards detached in the form of soft reddish sloughs, which, very much resemble the substance of the fœtal brain, in a putrid state. From day to day, until either nature alone, or aided by art, puts limits to the disorder, it invades new parts both in breadth and depth, so that its ravages extend to aponeuroses, muscles, blood-vessels, nerves, tendons, the periosteum, and even the bones themselves.

Amongst a number of severe cases, which fell under the notice of Mr. Blackadder, "there was one, in which the half of the cranium was denuded, the bones having become black as charcoal, and the integuments detached posteriorly to the second cervical vertebra, and anteriorly to the middle of the zygomatic process of the temporal bone; and this was originally a superficial wound of the scalp. In another case, the muscles, large arteries, and nerves of both thighs were exposed and dissected, the integuments and cellular substance being entirely removed, with the exception of only a narrow strip of the former, which remained on the outer side of the thighs. This was also originally a simple flesh wound. In other instances, the cavities of the knee, ankle, elbow, and wrist, joints were laid extensively open, and, in one unfortunate case, the integuments and cellular substance, on the anterior parts of the neck, were destroyed, exhibiting a horrid spectacle, the trachea being also wounded." (*On Phagedæna Gangrænosa, p.* 3.)

According to the last experienced author, when the disease attacks an old sore, where a considerable depth of new flesh has been formed, the first thing generally observed is a small dark-coloured spot, usually situated at the edge of the sore. But, he states, that, in several cases of ulcers, the disease, when carefully watched, was found to begin in the form of a vesicle, filled with a livid, or brownish-black fluid, which afterwards burst, and assumed the appearance of the dark-coloured spot, which is commonly first noticed. Mr. Blackadder always found, that, when there had been a considerable bed of new flesh formed, the phagedenic ulceration made comparatively a very slow progress, and put on rather the appearance of mercurial phagedæna, until the morbific matter had found access to the natural texture of the part, when the progress of the disease became suddenly accelerated; acute inflammation supervened; and a large slough was formed. (*Op. cit. p.* 31.) He notices, that when the morbific matter is inserted in a puncture, or scratch, the first progress of the disease bears a resemblance to that of a part inoculated with vaccine matter. The primary inflammation in gangrenous phagedæna commences at the end of the second, or early on the third day; the inflammation is at its height about the sixth; when the scab begins to form in one disease, phagedenic ulceration begins in the other, and, when allowed to proceed, soon affords sufficient proof of the non-identity of the two diseases. (*P.* 33.)

According to Mr. Blackadder, when the disease attacks a recent gun-shot wound, the discharge, two or three days after infection, is found to be lessened, and to have become more of a sanious, than purulent nature. The sore has a certain dry and rigid appearance; its edges are more defined, somewhat elevated, and sharpened; the patient is sensible of a change in the usual sensation in the sore, and complains of the occasional stinging sensation, resembling that produced by the sting of a gnat. At this period, but sometimes a day or two later, the integuments at the edge of the sore become inflamed, and the surface of the sore itself assumes a livid or purple colour, and appears, as if covered with a fine pellicle, such as is formed on a coagulum of blood. (*On Phagedæna Gangrænosa, p.* 33.)

At Bilboa, the disease in cases of wound, is said generally to have commenced with a sudden attack of severe pain in the head and eyes, tightness about the forehead, want of sleep, loss of appetite, a quick pulse, and other febrile symptoms; while, the wound, which had been healthy and granulating, at once became tumid, dry, and painful, losing its florid colour, and assuming a dry and glossy coat. (*Hennen, on Military Surgery, p.* 214, *Ed.* 2.) When left to itself, the above-described pellicle gradually increases in thickness, forming what has been termed a slough. But, Mr. Blackadder observes, that, at this period, the progress of the disease is hardly in any two instances precisely alike. Generally, in the course of from five, to ten, or fifteen days, a thick spongy, and putrid-looking slough is formed over the whole surface of the sore, and which is more or less of an ash, or blackish-brown colour. When the pellicle is destroyed, as frequently happens in the process of cleaning, it is not in every case reproduced; but, an offensive matter begins to be discharged, which becomes daily more copious, is of a dirty yellow colour, and ropy consistence, and is very adherent to the sore. The substance, which formed the apparent bottom of the wound, is raised up, and pushing back the edges, makes the sore appear considerably enlarged. The edges, which are usually jagged, or pectinated, become extremely irritable, of a deep-red colour, and dotted on their inner surface, with numerous small, elevated, and angry-looking points, *which may be considered as one of the characteristic marks of the disease.* The surrounding integuments become indurated and inflamed, assuming, not unfrequently, an ansarine appearance; and the patient complains of a constant burning, lancinating pain. In the vicinity of the sore, the integuments become more and more of a dark-red colour, in consequence of the violence of the inflammation, which is of an erysipelatous nature, and apt to terminate in sloughing, and carry off the patient. However, the inflammatory symptoms are sometimes mild, and in other cases, exceedingly violent; a fact accounted for by differences of constitution. (*Blackadder*, *p.* 34.)

In the hospitals at Bilboa, if the incipient stage was overlooked, the febrile symptoms very soon became aggravated; the skin around the sore assumed a highly florid colour, which shortly became darker, then blueish, and at last black, with a disposition to vesicate; while the rest of the limb betrayed a tendency to œdema. All these threatening appearances occurred within twenty-four hours, and, at this period, also, the wound, *whatever might have been its original shape, soon assumed the circular form.* The sore now acquired hard, prominent, ragged edges, giving it a cup-like appearance, with particular points of the lip of a dirty yellow hue, while the bottom of the cavity was lined with a flabby blackish slough. The gangrene still advancing, fresh sloughs were rapidly formed; the increasing cup-like cavity was filled up and overtopped by them, and the erysipelatous livor and vesication of the surrounding skin gained ground, while chains of inflamed lymphatics could be traced from the sores to the adjoining glands, these exciting inflammation and suppuration, which often furnished a new nidus for gangrene. The face of the sufferer assumed a ghastly anxious appearance: his eyes became haggard and deeply tinged with bile; his tongue covered with a brownish, or blackish fur; his appetite entirely failed; and his pulse was feeble and accelerated. In this stage, the weakness and irritability of the patient was such, that the slightest change of posture, put him to torture, increased by his inability to steady the limb, which, if lifted from the bed, was seized with tremors and spasmodic twitches. (*Hennen's Military Surgery*, *p.* 215, 216, *Ed.* 2.) Authors vary considerably in their descriptions of the state of the tongue. Dr. Hennen found it brownish, or blackish; Delpech whitish, or yellowish, (*Précis Elem. T.* 1, *p.* 125,) and Mr. Blackadder, covered with a white mucus. (*P.* 39.)

It is explained by Mr. Blackadder, that when the disease attacks a large recent wound, the whole surface of the injury is sometimes affected from the first; while, in other instances, the disorder commences on, or near the lips of the sore. When the patient is of an inflammatory diathesis, the sore is generally attacked with acute inflammation between the seventh and fourteenth days; the slough becomes softer, and of a pulpy consistence; matter, of a strong and peculiar odour, and of a dirty brownish grey colour, begins to ooze out at its edges, and becomes daily more copious. The inflammation gradually subsides; the slough becomes loosened, and finally detached, leaving the subjacent muscles, bones, fasciæ, or ligaments, completely exposed. When the constitution is not prone to acute inflammation, the slough remains long adherent; the discharge is very copious, and burrows under the skin, which then mortifies. Sometimes, after the detachment of a slough, florid granulations spring up, and, notwithstanding a slight recurrence of the phagedenic ulceration, the parts heal up by the almost unassisted operations of nature. However, most commonly, after the muscles are exposed, they continue to be gradually dissected; their connecting cellular membrane is completely destroyed, and they are left covered with an offensive, greasy-looking matter.

According to Mr. Blackadder, when a muscle has been wounded, it swells sometimes to a great size, and quickly assumes the appearance of a large coagulum, being altogether deprived of irritability. When it has not been wounded, but has become inflamed, it generally assumes a pale colour, with an appearance as if distended with a fluid, and, occasionally, before losing its vitality, acquires a very surprising bulk; but, when no inflammation has supervened, the muscles become of a pale brick colour, waste away daily, and the patient loses all power in them. As the disease advances, the integuments are undermined and slough; and hemorrhage from small vessels is a common occurrence; but, in a more advanced stage, some of the large vessels are apt to give way, and the bleeding from them frequently destroys the patient.

"When a stump is the site of the disease, and the patient is of a plethoric habit, or accustomed to live freely, the symptoms soon begin to indicate the existence of an intense inflammatory action through its whole substance, the tumefaction, pain, and heat increase rapidly, so that, in a few days, the stump shall have acquired more than twice its former size, being at the same time much indurated, and causing the most excruciating pain. In this state, the patient has, in some instances, become delirious, and has been cut off by an effusion taking place into some of the larger cavities. It more commonly happens, however, that gangrene seizes upon the integuments, and cellular substance; large sloughs are thrown off; and some of the large blood-vessels giving way, the patient sinks under the effects of repeated hemorrhage. For it is commonly found, that the usual modes of stopping hemorrhage, from a stump are, in such cases, either inadmissible, or totally inefficacious.

"Sometimes, the progress of the disease in a stump is more gradual, but in the end nearly as fatal; the inflammation is much less acute; there is comparatively but little tumefaction, and the pain is much less severe; but, the discharge is much more copious, and the cellular substance, connecting the integuments and muscles, is rapidly destroyed. Hemorrhage generally comes on later, than in the preceding instance, but, it is the most common cause of death." (*Blackadder on Phagedæna Gangrænosa*, *p.* 33—39.)

It is observed by another writer, that artery seems to be the texture, which resists most powerfully the destructive action of hospital gangrene; (*Thomson's Lectures*, *p.* 460,) a remark quite at variance with the statement of Delpech; (*Précis Elém. T.* 1, *p.* 129,) but intended to refer, as I conceive, to cases in which the femoral, brachial, or other large artery is seen for several days completely denuded, in the midst of the ravages of the distemper, yet not giving way. I have seen the same thing frequently exemplified in mercurial phagedæna, as well in the groin, as in the arm. As for the smaller arteries, they are quickly destroyed, together with other parts.

"In some rare cases (says Dr. Hennen) I have seen the femoral and axillary artery pulsating awfully, and apparently unaffected with disease; while all the surrounding parts were completely destroyed; but, in a vast majority of cases, the blood-vessels partook of the general disease, in which they were imbedded. They were not only completely separated from their natural connexions, but their coats sloughed away at the immediate point of disease, while the disposition extended far beyond the apparently affected spot. Hence, our ligatures but too often failed on the main branches, and any attempt on the smaller was invariably injurious. We were here naturally induced to tie the artery considerably above the seat of the disease; and this was done once on the femoral, and twice on the axillary artery below the clavicle; the former burst on the third, each of the latter, on the second day afterwards." Dr. Hennen further remarks, that, in general, the great vessels sloughed long after the acute symptoms of the disease had abated, and that, in severe cases, the eleventh day of the disease was always dreaded. (*On Military Surgery*, *p.* 221, *Ed.* 2.) The indisposition of the large vessels to close, when taken up in the common way, appears referrible to three causes, viz. the tendency to rapid ulceration in the arteries in the situation of the ligatures; the formation of no effectual coagulum in the extremity of the vessel, like what happens in other cases of mortification; and the general incapacity of nature in examples of hospital gangrene to establish any process, which can be accompanied with healthy adhesive inflammation.

In the last stage of the disease, as it occurred in the military hospitals at Bilboa, the surface of the sore was constantly covered with a bloody oozing, and, on lifting up the edge of the flabby slough, the probe was tinged with dark-coloured grumous blood, with which also its track became immediately filled. Repeated and copious venous bleedings now came on, which rapidly sunk the patient; the sloughs, whether they fell off spontaneously, or were detached by art, were quickly succeeded by others, and brought into view thickly studded specks of arterial blood. At length, an artery gave way, which was generally torn through in the attempt to secure it with a ligature; the tourniquet, or other pressure was now applied, but in vain; for, while it checked the bleeding, it accelerated the death of the limb, which became frightfully swelled and horribly fetid. Incessant retchings came on, and with coma, involuntary stools, and hiccough, closed the scene. Often, however, the patient survived this acute state of the disease, and sank under severe irritation, absorption of putrid matter, and extensive loss of substance, with common hectic symptoms. (See *Hennen's Mil. Surgery*, *p.* 217, *Ed.* 2.) In the disease at Bilboa, the skin and cellular substance seemed to be the parts originally and principally affected. This, says Dr. Hennen, was obvious, even in the living body; but, on dissection, the disease of these parts was frequently observed to spread much further, than external appearances indicated, as a diseased track was often found running up into the groin, or axilla, and completely dissecting the muscles and great vessels. (*On Military Surgery*, *p.* 219, *Ed.* 2.) When the disease had occupied the outside of the chest, the same gentleman found the lungs in two cases, and the pericardium in a third, covered with gangrenous spots; and, when the parietes of the abdomen had been attacked, he often observed the same appearances on the liver. (*P.* 220.)

Hospital gangrene must be regarded as one of the most serious and dangerous complications, to which wounds and ulcers are liable. When the solution of continuity is large, or of long standing, the disorder commits great ravages, renews its attacks repeatedly, and the relapses prove exceedingly obstinate. The same thing is said to happen, when it affects persons labouring under scorbutic or venereal complaints. Hospital gangrene proves particularly dangerous, and mostly fatal, when it complicates large contused wounds, attended with badly fractured bones. All the soft parts of the injured limb are then frequently observed to be progressively destroyed, and the unfortunate patient falls a victim, either to typhoid symptoms, frequent hemorrhages, or hectic complaints. From what has been stated, however, the disease varies considerably in its severity in different cases, being sometimes of small extent, and even capable almost of a spontaneous cure. Patients have been known to continue afflicted more than a month, and when the duration of the disease was thus lengthened, the cases almost always had a fatal termination. In a few cases, the wound puts on a favourable appearance again between the sixth and ninth days: and, in slight examples, the amendment is manifested between the third and fifth. Whatever may be the period of the complaint, its wished-for termination is always announced by a diminution of pain; the pus acquiring a white colour, and more consistence, and losing its fetid nauseous smell. The edges of the ulcer subside, while its surface becomes less irregular, and puts on more of the vermilion colour. The red, purplish, œdematous circle, which surrounds the disease, assumes a true inflammatory nature, and the solution of continuity, restored to a simple state, heals up with tolerable quickness, even when the destruction of soft parts is somewhat considerable, unless any fresh untoward circumstances occur to interrupt cicatrization. But, sometimes, when the patient is on the point of being completely well again, his condition is suddenly altered for the worse; ulcerated spots make their appearance on the cicatrix, and these spreading in different directions occasion a relapse, which may happen several times.

From numerous cases of this disease, seen by Mr. Blackadder at Passage in Spain, this gentleman made the following conclusions:

1. That the morbid action could almost always be detected in the wound, or sore, *previously to the occurrence of any constitutional affection.*

2. That in several instances, the constitution did not become affected, until some considerable time after the disease had manifested itself in the sore.

3. That when the disease was situated on the inferior extremities, the lymphatic vessels, and

glands in the groin, were observed to be in a state of irritation, giving pain on pressure, and were sometimes enlarged, before the constitution showed evident marks of derangement.

4. That the constitutional affection, though sometimes irregular, was in many cases contemporary with the second, or inflammatory stage.

5. That all parts of the body were equally liable to become affected with this disease.

6. That, when a patient had more than one wound, or sore, it frequently happened, that the disease was confined to one of the sores, while the other remained perfectly healthy, and this even when they were at no great distance from each other. (*On Phagedæna Gangrænosa, p.* 19.)

Thus Mr. Blackadder espouses the opinion, that hospital gangrene is at first a *local,* and not a *constitutional disease,* that is to say not necessarily preceded, or originally accompanied by any diseased action in the system. It is highly important to weigh this distinction well, not only because it is yet the chief point of difference, amongst the best writers on the subject, but because it involves very directly every theory, respecting the causes of the disease, and the great question, whether its ravages are to be resisted principally by local or constitutional means, or by remedies of both descriptions together.

In the hospital gangrene, observed by Dr. Rollo in the artillery hospital at Woolwich, "the action of the poison seemed to be limited and confined to specific effects. *The first were local, producing only a general affection, by a more extensive operation on the sore.* Five or six days, from the appearance of the small ulcer or ulceration, when it had extended over one third of the former sore, with pain and redness in the course of the lymphatics, and the glands, through which they led, with enlargement of them, general indisposition of the body became evident." Delpech, in his interesting memoir, particularly notices, that the constitutional symptoms *always occurred the last in order of succession.*

Mr. Blackadder distinctly declares, that, in no instance, which he had an opportunity of observing, did the constitutional symptoms of gangrenous phagedæna precede the local, unless the case be held an exception, in which a stump became affected, after amputation had been performed, on account of the previous effects of the disease. The period, at which the constitution begins to exhibit symptoms of irritation (he says) is extremely irregular,—sometimes as early as the third, or fourth day, and sometimes even as late as the twentieth. The countenance assumes an anxious, or feverish aspect; the appetite is impaired; the desire for liquids increases; and the tongue is covered with a white mucus. The bowels are generally rather constipated; and the pulse, what may be termed, rather irritated, than accelerated. But, the general symptoms may assume an inflammatory, or typhoid character, according as the causes of one of these modifications may predominate. According to Mr. Blackadder, when an inflammatory diathesis prevails, the system becomes gradually more irritated, until an attack of acute inflammation seizes upon the sore, and which frequently happens about the end of the second week. At this period, the pulse is frequent and sharp, and it is not uncommon for the patient to be seized with one, or more shivering fits, succeeded by a great increase of heat, but seldom, or never terminating in a profuse perspiration. The cold fit is sometimes followed by a bilious discharge from the intestines, and mitigation of the febrile disorder. If the local mischief be not arrested, the strength becomes daily more and more exhausted; the fever loses its inflammatory character; and, unless the patient be cut off by hemorrhage, he falls a victim to extreme debility. When the disease has a typhoid character, the pulse is small and frequent; the appetite and strength gradually fail; and the patient at last sinks, retaining his mental faculties to the last. Not unfrequently diarrhœa hastens the event. (*Blackadder on Phagedæna Gangrænosa, p.* 39, 40.)

The sloughing phagedæna, seen by Mr. R. Welbank, generally in the cleft of the nates, in the groin, or at the inner and upper part of the thigh, in the lowest class of prostitutes, and according to his description, certainly resembling hospital gangrene, was attended, in its early stages, with little or no disturbance of the system; a circumstance which he also mentions as favourable to the doctrine that the disease is of a local nature. (See *Med. Chir. Trans. Vol.* 11, *p.* 365.)

On the other hand, the generality of writers, nay even some of those who represent the disease as always proceeding from a species of infection applied to the wound, take into the account the operation of constitutional causes, as predisposing to, and of course preceding, the local symptoms. Dr. J. Thomson believes, that the constitutional symptoms mostly precede the local. (*On Inflammation, p.* 459.) The same sentiment is professed throughout Dr. Hennen's remarks, who placed reliance chiefly upon internal remedies, and regarded external applications, as merely a secondary object. (*On Military Surgery, p.* 222, *Ed.* 2.) To this part of the subject, I shall return, after adverting to the causes of hospital gangrene.

The hospital gangrene, which occurred in the Artillery Hospital at Woolwich, and was described by Dr. Rollo, did not attack specific sores: venereal, scrofulous, and variolous ulcers were not attacked, although the patients lay in the wards, where the disease prevailed.

Professor Thomson admits, that specific sores are less liable to attacks of hospital gangrene, than common wounds and ulcers; but, he declares, that he has frequently seen it attack cancerous and venereal ulcers. (*On Inflammation, p.* 460.)

Dr. Hennen mentions a remarkable instance, which also proves the possibility of a specific sore becoming affected, and fatal from this cause in forty-eight hours after the patient had first been exposed to the infection. Dr. Hennen relates the fact to prove, that the contagion may be received, without a long residence in a tainted air. The patient, "who had just landed from England, and was under the influence of mercury, employed for a venereal complaint, died within forty-eight hours after his admission, the gangrene having seized on an open bubo in his groin, eroding the great vessels in the neighbourhood, and absolutely destroying the abdominal parietes to a large extent." (*Principles of Military Surgery, p.* 218, *Ed.* 2.)

The effects of hospital gangrene should be carefully discriminated from those of the scurvy. Ulcers attacked with hospital gangrene, are not affected in any degree, like scorbutic ulcers, by the use of vegetable diet and lemon-juice; and they occur among men, who are fed upon fresh meat and vegetables, as readily as they do among those, who have been fed altogether upon salt provisions. (*Thomson's Lectures on Inflammation, p.* 482.) Hospital gangrene is almost always accompanied with severe febrile symptoms; but, "as to fevers (says Dr. Lind), it may indeed be doubted whether there be any such as are purely and truly scorbutic. The disease is altogether of a chronic nature; and fevers may be justly reckoned amongst its adventitious symptoms." (*Treatise on the Scurvy, p.* 106.) In cases of hospital gangrene, the general symptoms of scurvy are also absent, such as soreness and bleeding of the gums, livid blotches and wheals on the fleshy part of the legs, œdematous ankles, &c.

Hospital gangrene (says Boyer) is a species of humid gangrene, which attacks in some degree *epidemically* the wounds and ulcers of patients, who happen to be crowded together in an unhealthy place.

Its occasional causes are; the situation of an hospital upon a low marshy ground; the vicinity of some source of infection; the uncleanliness of the individuals, or of the articles for their use; the crowded state of the wards, especially when they are small and badly ventilated; lastly, every thing that tends to corrupt the air which the patients breathe. An infected atmosphere may produce in the most simple wounds unfavourable changes, partly, as Boyer conceives, by its immediate action on the surface of the wound, but, no doubt, principally, by its hurtful influence upon the whole animal economy. The foregoing causes have also sometimes produced alarming and obstinate gangrenes of an epidemic kind, or, at least, a state of the constitution, under the influence of which all wounds and ulcers constantly took on a bad aspect, and were often complicated with the worst gangrenous mischief. Vigaroux saw such an epidemic disease prevail for twenty months in the two hospitals of Montpelier, and he states, that the most powerful antiseptics were of little avail against the disorder, which often invaded the slightest scratches.

In general, this epidemic species of gangrene is not observed in new-built hospitals, nor in those, which are erected out of the central parts of cities upon high ground. Hospital gangrene may occur in any season; but, it is most common after the sultry heat of summer.

A bilious constitution, mental trouble, unwholesome or insufficient food, a scorbutic diathesis, great debility, and fevers of a dangerous type, are also reckoned by the French surgeons as so many predisposing causes of hospital gangrene.

The observations of Pouteau, and those of some other practitioners, convincingly prove, that hospital gangrene may be communicated to the most simple wound, or ulcer in a subject of the best constitution, and breathing the purest air, by merely putting into contact with such wound, or ulcer, sponges, lint, or charpie, impregnated with the infection of this peculiar disorder. But, this inoculation is conceived to be the more alarming, and to take effect the more quickly, in proportion as patients have been more exposed to the influence of such causes, as are themselves capable of producing the disease, and also in proportion as the kind of constitution predisposes to it.

Although the contagious nature of hospital gangrene has been generally admitted by all the best informed writers on the subject, the doctrine was not considered by Dr. Trotter as having a good foundation. Modern authors, however, have not joined this latter gentleman, and Dr. J. Thomson, Dr. Hennen, Mr. Blackadder, and Mr. R. Welbank, all believe, that the disorder is infectious. "The contagious nature of hospital gangrene (says Professor Thomson) appears to me to be sufficiently proved, 1st, By the fact, that it may be communicated by sponges, charpie, bandages, and clothing, to persons at a distance from those infected with it. 2dly, By its having been observed to attack the slight wounds of surgeons, or their mates, who were employed in dressing infected persons; and that, even in circumstances, where the medical men so employed, did not live in the same apartment with the infected. 3dly, By our being able often to trace its progress distinctly from a single individual through a succession of patients. 4thly, By its attacking recent wounds, as well as old sores, and that in a short time after they are brought near to a patient affected with the disease. 5thly, By our being able to prevent the progress of the disease in particular situations, by removing the infected person, before the contagion, which his sores emit, has had time to operate. 6thly, By its continuing long in one particular ward of an hospital, or in one particular ship, without appearing in other wards, or ships, if pains be taken to prevent intercourse between the infected and uninfected." (*Lectures on Inflammation, p.* 484.) But, although there can be no doubt of the disease spreading partly by its contagious nature, it appears to me equally certain, that the number of cases is also often increased by the continued operation of the same causes, which produced the earliest instance of the disorder in any particular hospital.

It is alleged, that when once a patient has taken the infection, he cannot avoid the consequences, whatever precautions he may adopt. Thus, Boyer informs us, that he has seen hospital gangrene take place in wounded patients, who, in the hope of escaping this epidemic affection, had quitted the infected hospital, and retired to elevated situations, where they breathed the most salubrious air. (See *Traité de Mal. Chir. T.* 1, *p.* 322.)

The bad state of the air of a crowded hospital, as Mr. Blackadder observes, is a ready means of accounting for the origin of phagedæna gangrænosa; but, there are various reasons for considering such explanation not altogether satisfactory; and he mentions a case, in which the wound of a soldier was found affected with the disease, on his first arrival at an hospital, after having been accidentally detained, with two other wounded comrades, for five or six days, partly in an open building, and partly in a boat, quite exposed to stormy weather. (*P.* 45.) Dr. Hennen likewise gives an account of about thirty fresh-wounded men, in whom hospital gangrene first appeared in their journey from Vittoria to the hospital near Bilboa. (*Principles of Military Surgery, p.* 214, *Ed.* 2.) Dr. Rollo also remarked, that some men in quarters were affected with this disease. And, according to Mr. J. Bell, "there is no hospital, however small, airy, or well regulated, where this *epidemic* ulcer is not to be found at times." (*Principles of Surgery, Vol.* 1, *p.* 112.) For a refutation of the opinion, that the disease ever strictly merits the epithets *endemial*, and *epidemic*, I must refer the reader to the observations of Mr. Blackadder. (*P.* 143, 53.) Delpech remarks, that the causes of the disease do not appear to have depended upon the state of the atmosphere (*p.* 25); and in almost every instance, *he traced the propagation of the disorder to the direct application of the morbific matter to the sores.* However, he joins Pouteau in the belief, that it may be communicated through the medium of the atmosphere; an occurrence, which Mr. Blackadder doubts, or, rather considers as very rare, and only possible, where the effluvia are allowed to accumulate in a most negligent manner, so as to resemble a vapour bath, which mode, he would also regard as equivalent to inoculation. (*On Phagedæna Gangrænosa, p.* 156.) On the whole, I am disposed to think the views, which Mr. Blackadder has taken of the manner in which the disease is communicated, the most correct, and that, while particular states of the air and constitution certainly modify the disorder, they cannot generally have any share in giving origin to the disease; I say *generally*, because as various facts oblige us to admit, that hospital gangrene sometimes arises, without having been communicated from any patient previously affected, it is impossible to assert, that the earliest example of it, under such circumstances, may not arise from the operation of some unknown and inexplicable circumstances on the constitution, or in other words, from the state of the system itself. Nor can a doubt be entertained, that, at all events, the disorder is most apt to break out in crowded, badly ventilated hospitals, and in them appear more extensively and malignantly, than in others, which are well regulated, properly ventilated, and healthily situated. But, the idea, entertained by Delpech, that hospital gangrene may originate from the same contagion as typhus, or other diseases, is a mere unsupported, irrational conjecture, quite as destitute of truth, as the suppositions about the endemial and epidemic character of the complaint, independent of its infectious nature. The question, how the first example of the disorder originates, is at present a perfect mystery; but, as it cannot be referred to contagion, or inoculation, we should recollect, that whatever produces it in one individual, may produce it in another, similarly circumstanced, and, on this principle, the disorder may sometimes be formed independently, and at the same time, in a greater or lesser number of patients in the same hospital, as well as spread from these to others by infection.

With the view of preventing the disorder, the wards, in which the wounded are placed, should not be crowded; they ought to be freely ventilated, and, if possible, not communicate. The utmost attention to cleanliness should be paid: and all filth and stagnant water removed. It has been asserted, but, with what accuracy, I cannot determine, that the predisposition of the wounded to this species of gangrene may be lessened by a well-chosen diet, by drinks acidulated with vegetable acids, or with the sulphuric acid, and by the moderate use of wine. The state of the stomach and bowels should be particularly attended to, and, if out of order, emetics and purgatives ought to be immediately employed, and repeated according to circumstances. The dressings should be applied with extreme attention to cleanliness, and too much care cannot be taken to prevent the infectious matter of one wound from coming into contact with another through the medium of sponges, (see *Welbank, in Med. Chir. Trans. Vol.* 11, *p.* 365,) instruments, &c. "Whatever may be the source of this disease (says a late writer) it is at least sufficiently ascertained, that, when it occurs, its propagation is only to be prevented by the most rigid attention to cleanliness, and by insulating the person, or persons affected, so as to prevent all direct intercourse between them and the other patients; for, so far as I have had an opportunity of observing, ninety-nine cases in the hundred were evidently produced by a direct application of the morbific matter to the wounds, dressings, &c.; while others, who were, in every other respect, equally exposed to its operation, never caught the disease. In attempting to prove this by experiment, I have placed three patients with clean wounds alternately between three other patients, severely affected with the disease. They lay in a part of a ward, which was appropriated for patients who were labouring under the disease, and of whom there were at the time a considerable number. Their beds were on the floor, and not more than two feet distant from each other; but, all direct intercourse was forbidden, and they were made fully aware of the consequences that would follow from inattention to their instructions. The result of this trial was, that not one of the clean wounds assumed the morbid action peculiar to the disease, nor was the curative process in any degree impeded." (*Blackadder on Phagedæna Gangrænosa, p.* 46.)

As many experienced writers assert, that the disease may also be communicated from one person to another through the medium of effluvia in the air, I am firmly persuaded that, in the present state of our knowledge of the subject, the cautions, respecting ventilation, cleanliness, (the chief practical deduction from the latter doctrine) are highly necessary and important. This sentiment may be adopted, without implicit faith being placed in the opinion, that the disorder can actually be transmitted from one person to another through contagion in the air, because whether the last idea be true, or not, attention to cleanliness and ventilation must be beneficial to the health, in this, as in every other species of gangrene; and, on this principle, it must be serviceable in diminishing the severity, if not the frequency and extent, of the disease, as I am myself disposed to believe from the consideration of all the evidence adduced. These observations are strengthened by the fact, that it was chiefly in the foul wards of St. Bartholomew's hospital, that the disorder committed its ravages in that institution. (See *(Med. Chir. Trans. Vol.* 11, *p.* 365.) Where circumstances will permit, an entire removal of the patients from the place, in which the disease has either had its first formation, or spread to any extent, appears likewise to be a most beneficial measure. But, when this change of the wards, or hospital, is impracticable, the air, which the patients breathe, should be purified, by renewing it as much as possible, fixing ventilators, and especially by using the oxygenated muriatic acid fumigations, as recommended by Guyton-Morveau, or else those of the nitric acid.

The nitric acid fumigations are made by putting into a glass vessel, on the ground, half an ounce of concentrated sulphuric acid, to which an equal quantity of nitre is to be added *gradatim.* The mixture is to be stirred with a glass tube, when an abundance of white vapour will be produced.

The oxygenated muriatic acid fumigations are made, by mixing three ounces two drams of common salt with five drams of the black oxide of manganese in powder. These two ingredients are to be triturated together; they are then to be put into a glass vessel; one ounce two drams of water are to be added, and then, if the ward, or chamber be uninhabited, one ounce seven drams of sulphuric acid are to be poured upon the mixture all at once; or, gradually, if the patients are there. This quantity will be sufficient for a very large ward.

When one, or more of the patients, afflicted with the disorder, before it has become general, are lying in a badly ventilated part of the ward, the surgeon can partly counterbalance the disadvantage of not having a fresh ward, by causing the patients to be put into a more airy part of the ward, and as far as possible from the quarter, in which they contracted the disease.

With regard to internal medicines, while irritation and febrile heat accompany hospital gangrene, diluent acid drinks are proper, such as nitrated whey sweetened with syrup of violets, lemonade, &c. Blood-letting is admissible in but few instances, not merely because the orifice, made by the lancet, is apt to become gangrenous, but because the fever, which accompanies hospital gangrene, is usually of the typhoid, or asthenic character. *(Thomson, p.* 493.)

Mr. Blackadder, like Dr. Thomson, does not entertain a favourable opinion of venesection, as a general practice, though he would not object to the abstraction of a small quantity of blood, when, owing to the plethoric habit of the patient, *previous treatment*, and other causes, an inflammatory action in the system is present. But, he conceives, that all danger of the disease attacking the wound, made with the lancet, may be obviated, if care be taken, that the arm of the patient, the hands of the surgeon, his lancet, and the subsequent dressings, be perfectly free from contamination, and that the patient be prevented from undoing the bandage, or touching the incision, made with the lancet, before it is cicatrized. *(P.* 135.) Mr. Blackadder thinks, however, that blood-letting should be avoided, as much as possible, particularly when the previous injury has been extensive. "A general debility of the system, is one of the symptoms, which are most to be dreaded; for, when once it takes place, there is no other disease, in which it is removed with greater difficulty." *(P.* 137.) How different these sentiments are from those of Dr. Hennen, who, in speaking of the effects of venesection, when the disorder was accompanied with an inflammatory diathesis, employs the following expressions: "The very patients themselves implored the use of the lancet." For several months "we used no other remedy, either as a cure or preventive."—"We never observed any of the lancet wounds assume a gangrenous appearance, although previously, in almost every other instance, the slightest puncture festered." *(On Military Surgery, p.* 224, *Ed.* 2.) Mr. Welbank also states, that moderate venesection may be adopted with advantage while the disease is superficial, and the constitution not much affected, particularly in plethoric habits. *(Med. Chir. Trans. Vol.* 11, *p.* 368.)

In the beginning of the constitutional attack, Pouteau and Dussassoy particularly recommended emetics, and Mr. Briggs, Dr. J. Thomson, and Dr. Hennen, are all advocates for this practice, though the latter gentleman makes his evidence rather ambiguous, by a subjoined note, in which, he mentions, that want of success, &c. led to the trial of venesection. *(Op. cit.* 222.) As for Mr. Blackadder, he deems the employment of emetics at the commencement of hospital gangrene useful only when the stomach is foul. *(On Phagedæna Gangrænosa, p.* 134.) In the early stage of the case, writers seem all to agree about the utility of purgative and laxative medicines; when there is debility, good generous wine should be allowed, either by itself, or mixed with lemonade, according to circumstances. Bark is in general more hurtful, than useful; Mr. Welbank objects to it generally, on account of the common disposition to diarrhœa in the advanced stages of the disease; *(Med. Chir. Trans. Vol.* 11, *p.* 368;) and Dr. Hennen assures us, that he has seen great harm done by large and injudicious doses of this drug, before full evacuations had taken place, and the sloughs begun to separate. Boyer allows, however, that it may be beneficially given, when the feverish heat has abated, and the debility is very great.

In all stages of this disease, unattended with diarrhœa, acids are proper. The sulphuric acid is that, which is given with most success; but, the acidulous tartrite of potassa is also an excellent medicine. From two drams to half an ounce may be given every day, and the best plan is to make an acid drink with it, which should be sweetened and strained.

In severe cases, attended with a quick and feeble pulse, depression, restlessness, and anxiety, an opiate becomes necessary. "So long as we wish to excite a degree of moisture on the skin, (says Professor Thomson) Dover's powder, or laudanum with antimonial wine, form in general the best opiates." This gentleman, however, is not an advocate for the employment of opium, in the early stage of hospital gangrene, while the heat and other febrile symptoms are at their height. (See *Lectures on Inflammation, p.* 494, 495.) According to Mr. Welbank's experience, narcotics are beneficial, and he has seen a most irritable state of the stomach improve rapidly, and a foul furred tongue become clean, on the administration of large doses of opium at regular intervals. (See *Med. Chir. Trans. Vol.* 11, *p.* 368.) Camphor, in large and frequent doses, was highly praised by Pouteau.

From what has been said of internal remedies, it is evident that none of them can be regarded as means at all to be depended upon, for arresting the ravages of hospital gangrene, however advantageous they may prove in palliating general symptoms, removing particular complications, enabling the system to support the effects of the local disorder for a greater length of time, or, in a few cases, even placing nature in a condition to throw off the diseased parts herself, and communicate to the subjacent living flesh a healthy action.

If credit can be given to several of the authors, who have had the most extensive opportunities of attending to the nature of hospital gangrene, the local treatment is far more effectual, than internal medicines.

"I was told by several of the French surgeons (says a late visiter to Paris), that they did not rely at all on internal means for stopping the progress of hospital gangrene, and that their experience had proved them to be insufficient, if not wholly inefficacious. Dupuytren, in reply to the account I gave him of the practice and opinions of English surgeons on this subject, assured me, that he had no confidence but in local applications, and that internal remedies alone, as far as he had found, did almost nothing. The same remark has been made in a very recent publication on hospital gangrene, *(Delpech, Mém. sur la Complication des Plaies, &c.* 1815,) although it seems to be rather at variance with its being a constitutional and contagious disease, which the author has admitted." (See *Sketches of the Medical Schools of Paris, by J. Cross, p.* 83.)

Perhaps, every antiseptic application that can be mentioned, has been tried as a dressing for wounds, or ulcers, affected with hospital gangrene. All watery applications, and common poultices, and fomentations, are generally condemned, as inefficacious, and even hurtful.

Dussassoy was convinced by the observation of numerous cases, that the best application is powder of bark. He recommends the wound to be covered with several layers of this powder, which are then to be moistened with turpentine. When this composition dries, he asserts, that it forms a fragile sort of coat, at the sides of which and through which, the discharge escapes. After twenty-four hours, the first coat is to be removed, and a fresh one applied. In general, according to this writer, four or five such dressings are sufficient in simple cases, where the disorder is confined to the skin and cellular substance. Healthy inflammation then occurs, the sloughs come away, and the wound puts on a healing appearance. In bad cases, Dussassoy sometimes added one-fifth of powdered muriate of ammonia to the bark. When this treatment failed, the actual cautery was used.

On the subject of bark, as a local application to hospital gangrene, I need only remark, that it is now entirely relinquished, either as possessing no efficacy *(Delpech)*, or even aggravating the symptoms *(Blackadder)*.

The milder forms of the disease appear sometimes to have yielded to the application of the vegetable and diluted mineral acids; viz. lime-juice; lemon-juice; vinegar: and the diluted nitric and muriatic acids. And the same observation may be made, with respect to solutions of the nitrates of silver and mercury. The two latter substances, and the oxygenated muriatic acid, and gas, were found by Dr. Rollo to be capable of effecting a cure. Delpech, in particular, speaks of the benefit derived from the application of strong vinegar, after all the pulpy viscid matter has been carefully wiped away from the surface of the living flesh. The vinegar is then poured on the ulcer, which is to be covered with charpie wet with the same liquid. When the case is too far advanced for this treatment to answer, Delpech tries caustics, especially the nitrate of silver; and, if these fail, he has recourse to the actual cautery, and when the sloughs are very thick, so as to hinder the cautery from acting to a sufficient depth, he prefers thrusting into the sloughs down to the living flesh angular pieces of caustic potash at small distances from each other! *(Précis Elem. des Mal. Chir. T.* 1, *p.* 151.) Surely, this must be far more torturing, and less certain of success, than removing the sloughs, and applying the cautery.

Though the actual cautery is generally admitted to be one of the most powerful means of stopping the progress of hospital gangrene, the surgeons of this country entertain a strong aversion to the practice; and I confess, that my own dislike to it is such as would always lead me to prefer any other treatment, from which equal efficacy would result. At the same time, it must be granted, that if the actual cautery will more certainly arrest some forms of hospital gangrene, than any other known applications, the surgeon's duty is to put out of the question his own prejudices against it, and consider only his patient's welfare. I am far from thinking, however, that while there are such powerful caustics as the undiluted mineral acids, and a dressing so effectual as a solution of arsenic, it can often be absolutely necessary to employ red-hot irons.

The merit of having pointed out in modern times the great efficacy of Fowler's solution of arsenic, or the liquor arsenicalis, of the London Pharmacopœia, as an application to phagedæna gangrænosa, belongs to Mr. Blackadder. In answer to the objection, that the external use of arsenic is not unattended with danger, he assures us, that he has heard but of one instance of hospital gangrene, in which any deleterious effects were supposed to arise from the absorption of the arsenic, and the patient in question was very soon cured of his uneasy, and possibly merely nervous symptoms." *(P.* 50.)

"The first thing to be attended to in every case of disease (says Mr. Blackadder) is *cleanliness,* which, if always of great importance, is, in this instance, indispensable. The surface of the body ought to be made, and kept, perfectly clean, by means of the tepid bath, or otherwise by a plentiful use of soap; and the linen, and bed-clothes, should be frequently changed, particularly when soiled with matter from the sore." In order to make the sore perfectly clean, and free it from the viscous discharge, without producing considerable bleeding, and pain, Mr. Blackadder recommends two large tin hospital teapots to be filled with a weak solution of the subcarbonate of potass. One of these solutions is to be cold; the other tepid; because sometimes one, and sometimes the other, is found most agreeable to the patient's feelings, though the warm is the most effectual in cleansing the sore. The liquid is to be poured over the sore, and received into a basin, which ought to be immediately emptied into another vessel placed at a distance from the patient. During this ablution, the glutinous matter, which adheres to the sore, may be gently detached, by means of small dossils of fine tow, or lint, but these (says Mr. Blackadder) should never be used for two different patients, rigid economy, on occasions such as this, being a very mistaken principle. In these cases, the use of sponges, (he justly observes) ought to be entirely laid aside, as they can seldom be used more than once, with safety. When the sore has been thus cleaned, a piece of fine dry lint is to be spread over its surface, and gently pressed into all its depressions with the points of the fingers. When the lint is removed, a quantity of the discharge will be found adhering to it; and this operation must be repeated with fresh pieces of lint, until the surface of the sore is made perfectly clean and dry.

According to Mr. Blackadder, the solution of arsenic will generally be found strong enough, when diluted with an equal part of water; but, in slight cases, it answered, when weakened with twice its quantity of water; and, in a few examples, it was employed without being at all diluted. Several pieces of lint of the same shape as the sore, but a little larger, are to be prepared: one of these, soaked in the solution, is now to be applied to the cleaned surface of the sore, and renewed every fifteen, or thirty minutes, according to the time in which it becomes dry. When the heat and inflammation are considerable, great relief will be derived from the frequent application of linen cloths, moistened with cold water, which must be kept from weakening the arsenical solution by means of a small piece of oil-skin laid over the pieces of lint. When the disease extends into the track of a gun-shot wound, Mr. Blackadder uses a syringe for cleaning the sore, and introducing the solution. "A slip of fine lint, well soaked in the solution, may also be inserted, by means of a probe, into the bottom of the wound; and when the openings are at no great distance (from each other) and not in the immediate vicinity of the large nerves, and blood-vessels, the lint may be drawn through the wound in the form of a seton. (*P.* 53.) When the pain caused by the application, is very severe, and the constitution is irritable, and debilitated, Mr. Blackadder prescribes an opiate, though he remarks, that this practice will seldom be absolutely necessary. The morbid action in the sore is destroyed by the arsenical solution sooner, or later, in different cases: *the best plan is to continue the application, until an insensible, dark-coloured, dry slough occupies the whole surface of the sore; and until the patient is completely relieved from the burning and lancinating pain.*

After the slough is formed, Mr. Blackadder employs an ointment, composed of equal parts of the oil of turpentine, and the yellow resinous ointment, or of two parts of Venice turpentine to one of the resinous ointment. "These being melted and mixed together are to be poured over the sore, as hot as the patient can possibly bear." A pledget of dry lint, or tow, and a bandage, are then applied; and this dressing may be renewed two or three times a-day, the sore being each time carefully washed with the solution of potass. As soon as any part of the slough is loosened, Mr. Blackadder removes it with a pair of curved scissars. With the view of expediting the separation of the slough, he sometimes employs a linseed-meal poultice, which had the desired effect, but was found to be too relaxing. When it is used, therefore, Mr. Blackadder found it expedient, at each dressing, to touch the new granulations with the nitrate of silver.

After the detachment of the slough, Mr. Blackadder dresses the sore with the above-mentioned ointment cold, or with the addition of a small proportion of the subacetate of copper. The pledget of this ointment is covered with a piece of oil-skin, lightly rubbed over with soap, and a firm bandage is applied to the whole limb. (See *Obs. on Phagedœna Gangrœnosa, p.* 49, *&c. 8vo. Edinb.* 1818.) The author declares, that, after the introduction of the above treatment, (with the exception of stumps attacked with hospital gangrene) he never saw an instance, in which the remedy failed, when applied in time and a proper manner; "that is, before the disease had made such progress, as to preclude all rational hope of success from that, or any other mode of treatment." (*P.* 23.)

In Dr. Rollo's treatise on Diabetes, published in 1797, the opinion is plainly stated, that the progress of hospital gangrene might be stopped by very active topical applications, and, in the same work, Mr. Cruikshank says, that, "if an actual caustic were to be employed, we should have recourse to the strong nitrous acid." According to Mr. Blackadder, the oxygenated muriate of mercury, and the nitrous acid were much recommended, and employed by surgeons in the 16th and 17th centuries, as escharotics in cases of gangrene and foul ulcers. (*P.* 113.) Several army surgeons have informed me, that the undiluted nitrous acid was successfully used as an application to hospital gangrene in the military hospitals at Antwerp, in the year 1815; but, that other strong acids had an equally good effect. Dr. J. Thomson also notices, that "the application of caustic substances, such as the strong mineral acids, the solutions of potass, corrosive sublimate, and arsenic, seemed at Antwerp to arrest the progress of this sore, without exciting inflammation." (*Report of Observations made in the Military Hospitals in Belgium.*)

Delpech was informed by some British surgeons, belonging to the Anglo-Portuguese army in the Peninsula, that the muriatic acid was in common use in the hospitals of that army, as a local application for checking the ravages of hospital gangrene, being employed in a diluted state for slight cases, and in a concentrated caustic form for others.

In St. Bartholomew's hospital, the undiluted nitric acid has been used, with great success, as a local application to phagedenic gangrenous ulcers. "If the disease be not far advanced, (says Mr. Welbank,) I at once apply the undiluted acid, after cleansing the surface with tepid water, and absorbing the moisture with lint. Where, however, there is a thick and pulpy slough, it is better to remove as much of it as possible, with forceps and scissars, before the application is made. The surrounding parts being then protected by a thick coating of lard, or cerate, I proceed to press steadily, and for some minutes, a thick pledget of lint, previously immersed in the undiluted acid, on every point of the diseased surface, till it appears converted into a firm and dry mass. The parts may be then covered with simple dressings, and evaporation kept up by cooling lotions. As the application occasions more or less pain, from half an hour to one or two hours, I have generally given 20 or 30 drops of laudanum at the time of using it. It is always prudent, often necessary, to remove the eschar at the end of 16 or 20 hours." When the patients have become perfectly free from pain, and the parts below the slough are found healthy and florid, Mr. Welbank treats the sore as a common wound or ulcer, though he has found stimulating dressings generally the best, as the ceratum lapidis calaminaris, or a solution of two or three grains of the nitrate of silver in an ounce of distilled water. But, when there is a recurrence of pain, at any point, or over the general surface of the sore, whether the affection be slight or severe, the slough superficial, or deep, he recommends the employment of the undiluted acid again. (See *Med. Chir. Trans. Vol.* 11, *p.* 369.)

Pouteau, Dussassoy, Boyer, and Delpech, all bear testimony to the efficacy of the actual cautery, and they repeat the application of it, until the whole surface of the ulcer is converted into a firm hard eschar. Even the edges of the solution of continuity should not be spared—"*Ils doivent être torréfiés et rôtis pour ainsi dire.*" (*Boyer, Traité des Maladies Chir. T.* 1, *p.* 332.) The latter surgeon then covers the eschar with a thick stratum of bark, moistened with turpentine. This application is to be removed, in twenty-four, thirty-six, or forty-eight hours, and the surgeon is then to judge from the appearance of the flesh, and the quality of the discharge, whether a further repetition of the cautery will be necessary.

Pouteau, Œuvres Posthumes, T. 3, *published* 1783. *Dussassoy, Dissertation et Observations sur la Gangrène des Hôpitaux, &c.* 8vo. *Genève*, 1788. *Moreau et Burdin, Essai sur la Gangrène Humide des Hôpitaux*, 1796. *Observations on the Putrid Ulcer by L. Gillespie, in London Medical Journal, Vol.* 6. 1785. *Rollo on Diabetes*, 1797. *Sir Gilbert Blane on the Diseases of Seamen, Ed.* 3, 1797. *Trotter's Medicina Nautica, Vols.* 2 *and* 3, *published* 1799. *John Bell's Principles of Surgery, Vol.* 1, 1801. *Wolf Ploucquet, De Gangrænâ sic dicta Nosocomiorum, Tub.* 1802. *Leslie, De Gangrænâ Contagiosa, Edinb.* 1804. *Johnston, De Gangrænâ Contagiosa Nosocomiale, Edinb.* 1805. *J. Thomson's Lectures on Inflammation, p.* 456, *et seq. Edinb.* 1813, *and Report of Observations, made in the Military Hospitals of Belgium,* 8*vo. Edinb.* 1816. *J. Hennen, Principles of Military Surgery, p.* 210, *&c.* 8*vo. Edinb.* 1820. *C. J. M. Langenbeck, Neue Bibl.* 2 *B. p.* 611, *&c. Hanover,* 1820. *Mémoire sur la Complication des Plaies et des Ulcères, connue sous le nom de Pourriture d'hôpital, par J. Delpech,* 8*vo. Paris,* 1815. *Also Précis Elémentaire des Maladies Chir. T.* 1, *p.* 123, *&c. Paris,* 1816. *Brugmans and Delpech über den Hospital-brand, übersezt mit Anmerkungen und Anhang von Kieser; Jenna,* 1815. *Boyer, Traité des Maladies Chir. T.* 1, *p.* 320, *Paris,* 1814. *Sketches of the Medical Schools of Paris, by J. Cross, p.* 82, *London,* 1815. *H. Home Blackadder, Observations on Phagedæna Gangrænosa,* 8*vo. Edinb.* 1818; *the best treatise on the subject. R. Welbank, on Sloughing Phagedæna, in Med. Chir. Trans. Vol.* 11. 8*vo. Lond.* 1821; *a valuable little essay, reflecting great credit on its author.* The rest of the subject of *Gangrene* is treated of in the article *Mortification.*

HYDRARGYRIA. A peculiar eruption occasioned by the use of mercury, and named in Dr. Bateman's Synopsis *cezema rubrum.* (See *Mercury.*)

HYDROCELE. (from ὕδωρ, water, and κηλη, a tumor.) The term *hydrocele*, if used in a literal sense, means any tumor containing water; but surgeons have always confined it to a collection of fluid either in the cellular membrane of the scrotum; in a cyst, or the common cellular texture, of the spermatic cord; or in the tunica vaginalis of the testicle.

The celebrated Dr. Alexander Monro of Edinburgh, and Mr. S. Sharp, were almost the only writers, before Mr. Pott, who sensibly and rationally explained the true nature of these diseases.

ANASARCOUS TUMOR OF THE SCROTUM.

The *hydrocele by infiltration* of French writers; *hydrocele œdematodes;* is most frequently only a symptom of a dropsical habit, and very often accompanies both anasarca, and the particular collection within the abdomen, called ascites. Mr. Pott describes it, as "an equal, soft tumor, possessing every part of the cellular membrane, in which both the testicles are enveloped, and consequently it is generally as large on one side as on the other; it leaves the skin of its natural colour; or, to speak more properly, it does not redden or inflame it; if the quantity of water be not large, nor the distention great, the skin preserves some degree of rugosity; the tumor has a doughy kind of feel; easily receives, and for a while retains the impression of the fingers; the raphe, or seam, of the scrotum divides the swelling nearly equally: the spermatic process is perfectly free, and of its natural size; and the testicles seem to be in the middle of the loaded membrane. This is the appearance, when the disease is in a moderate degree. But if the quantity of extravasated serum be large, or the disease farther advanced, the skin, instead of being wrinkled, is smooth, tense, and plainly shows the limpid state of the fluid underneath: it is cold to the touch, does not so long retain the impression of the finger, and is always accompanied with a similar distention of the skin of the penis; the preputium of which is sometimes so enlarged, and so twisted, and distorted, as to make a very disagreeable appearance. These are the local symptoms: to which it may be added, that a yellow countenance, a loss of appetite, a deficiency of urinary secretion, swelled legs, a hard belly, and mucous stools, are its very frequent companions."

As the cellular membrane on one side of the scrotum is a continuation of that, which is situated on the other, and both freely communicate; the accounts, delivered by certain authors, of the possibility of this species of hydrocele being confined to one side of the scrotum is not credited by Boyer. At all events, such a case is extremely rare, and when it happens, is probably induced by the irritation of the urine in infants, or of the friction of the clothes in old persons, only acting upon a part of the scrotum; for occasionally, though not often, the disease is acknowledged to proceed from these local causes. (See *Dict. des Sciences, Med. T.* 22, *p.* 193.)

The cure of the original disease, when it arises from constitutional causes, comes within the province of the physician, and requires a course of internal medicine: but, sometimes, the loaded scrotum and penis are so troublesome to the patient, and in such danger of mortification, that a reduction of their size becomes absolutely necessary. As Mr. Pott observes, the means of making this discharge are two, viz. puncture and incision: the former is made with the point of a lancet; the latter with the same instrument, or with a knife. Wounds in anasarcous, or dropsical habits, are apt to inflame, are very difficultly brought to suppuration, and often prove gangrenous. But, the larger and deeper the wounds are, the more probable are these bad consequences. Simple punctures, with the point of a lancet, are much less liable to be attended by them, than any other kind of wound; they generally leave the skin easy, soft, cool, and uninflamed, and in a state to admit a repetition of the same operation if necessary. Incisions create a painful, crude, hazardous sore, requiring constant care. Punctures seldom produce any uneasiness at all; and stand in need of only a superficial pledget for dressing.

As the cavities of the cellular membrane of the scrotum, all communicate together, a small puncture serves, as well as a large incision, for the discharge of the fluid contained in them, and consequently, upon this ground, no reason exists for making any extensive, painful, and hazardous wound.

With respect to the practice of making punctures, in cases of anasarcous hydrocele, I think, that it should always be avoided as much as possible, because it sometimes happens, that the slightest pricks of the lancet occasion sloughing. The method should only be adopted, when the distention of the skin of the scrotum is such, as absolutely to require the fluid to be discharged. Care should also be taken not to multiply the punctures unnecessarily, nor to let them be made too near together. Boyer had a case, in which the making of very slight punctures in an anasarcous scrotum, was followed by the total destruction of this part, denudation of the testis and cord, and the patient's death, attended with dreadful suffering. (See *Dict. des Sciences Med. T.* 22, *p.* 195—196.)

When the œdematous state of the scrotum is not the effect of a general constitutional disease, but proceeds entirely from a local cause, such as friction, or the irritation of the urine, the mode of treatment consists in the removal of the cause, the use of astringent lotions, and the exhibition of a dose of salts. In elderly subjects, the wearing of a bag-truss is recommended for the prevention of the complaint.

HYDROCELE OF THE SPERMATIC CORD

Is of two kinds; the first is described as an œdematous affection, extending to more or less of the cellular substance around the spermatic vessels, and sometimes named the *diffused hydrocele of the cord;* the second form of the disease is that, in which the fluid is collected in a particular cavity, or cyst, which has no communication with the cavities of the common cellular substance of the cord. This case is denominated accordingly, the *encysted hydrocele of the cord.* The cellular substance, situated behind the bag of the peritonæum, surrounds the spermatic vessels, passes with them through the inguinal ring, and accompanies them to their insertion in the testicle. As Scarpa has likewise explained in his great work on hernia, the spermatic vessels, their cellular sheath, and the tunica vaginalis, are all enclosed in the musculo-aponeurotic sheath of the cremaster. When a *diffused hydrocele* of the spermatic cord is dissected, the sheath of the cremaster is found under the integuments, varying in size and compactness according to the duration and bulk of the disease. Under it appears the cellular covering of the cord, thickened, distended with fluid, and seeming at first somewhat like a hernial sac. When cut, a great deal of serum is discharged, and the tumor sinks and disappears in a greater or lesser degree. The spermatic vessels, which had been previously concealed by the enlarged cellular mass, now become visible. The cells, which, in their natural state, are scarcely perceptible to the unassisted eye, are found to have become vesicles filled with fluid, and some of them are large enough to receive the end of a finger. When the tumor is large and of long standing, the cells are remarked to become more delicate towards its bottom, and in this situation disappear, only one large cavity filled with fluid being here found. Hence, according to Scarpa, a fluctuation is plainly distinguishable at the lowest part of the swelling. The serum contained in the cells is generally limpid; but sometimes yellow, albuminous, or gelatinous. The base of the swelling, however large or old it be, corresponds to the point, at which the spermatic vessels join the testis, or, at most, it extends a very little behind this organ, and, between the two, there is a semicircular groove, which varies in depth and extent. Scarpa further informs us, that if the tunica vaginalis be opened, a dense septum is felt at its inner and lower part, cutting off all communication between this sac and the base of the tumor. (*Memoria sull' Idrocele del Cordone Spermatico. 4to. Pavia,* 1823).

That the cellular membrane, of the cord is often distended with an aqueous fluid, when the scrotum is anasarcous, and the habit dropsical, cannot admit of doubt, and hence it is a frequent attendant on the case, which has been described as the hydrocele œdematodes. But, as I have never seen an instance, in which such disease was restricted to the cellular texture of the cord, I am led to suppose, that it is a very uncommon case. The following is said by Mr. Pott to be the state of the disease, while of moderate size. The scrotal bag is free from all appearance of disease; except that when the skin is not corrugated, it seems rather fuller, and hangs rather lower on that side than on the other, and if suspended lightly on the palm of the hand, feels heavier: the testicle, with its epididymis, is to be felt perfectly distinct below this fulness, neither enlarged, nor in any manner altered from its natural state: the spermatic process is considerably larger than it ought to be, and feels like a varix, or like an omental hernia, according to the different size of the tumor: it has a pyramidal kind of form, broader at the bottom than at the top: by gentle and continued pressure it seems gradually to recede or go up, but drops down again immediately upon removing the pressure; and that as freely in a supine, as in an erect, posture: it is attended with a very small degree of pain or uneasiness; which uneasiness is not felt in the scrotum, where the tumefaction is, but in the loins.

According to Scarpa, its shape is at first nearly cylindrical, and does not become pyramidal till afterwards. However large the swelling may be, the penis never appears so much retracted under the integuments of the pubes as in a common hydrocele of equal size. When the lower part is compressed, the fluid recedes towards the groin slowly and difficultly, whilst in the hydrocele of the tunica vaginalis, the same kind of pressure at once forces the fluid to the apex of the tumor and distends it, and the testis cannot be felt (as in the diffused hydrocele) below the swelling.

When a diffused hydrocele of the cord extends into the ring, it is not easily distinguished from an omental hernia. In both cases, says Scarpa, the tumor is at first of a cylindrical shape, and afterwards becomes pyramidal; both kinds of swelling are soft and flexible; both little, if at all sensible; and both admit of reduction with difficulty. No doubt, the best criterion of the hernia, if it be reducible, will be derived from the circumstance of its generally not reappearing, while the patient continues to lie down, though Scarpa has seen a few exceptions.

While it is small, it is hardly an object of surgery, and may be kept from being troublesome by means of a suspensory; but, when it is large, it is very inconvenient both from size and weight, and according to Pott, the only method of cure which it admits, viz. that of making a free incision into the swelling, is far from being void of hazard. This is especially true, when the disease is complicated with constitutional disorder. Thus Pott and Scarpa have known the inflammation, consequent to an extensive incision, have a fatal termination. As the cavities of the cellular texture, in which this hydrocele forms, all communicate together, it appears to me, that the necessity for a free incision for the discharge of the fluid, is not so manifest, as the observations of Pott would lead us to suppose; and that a moderate opening would be likely to answer every purpose, with much greater safety.

THE ENCYSTED HYDROCELE OF THE SPERMATIC CORD

Is by no means infrequent, especially in children. The same kind of disease also sometimes occurs in the round ligament of the uterus, and accompanies it through the abdominal ring. It was very well known to many of the ancients, and has been accurately described by Albucasis, Celsus, Paulus Ægineta, &c. When Mr. Pott says, that the disease is not infrequent, it ought to be understood, that its frequency, though much greater, than that of the diffused hydrocele of the cord, considered as a distinct disease independent of general anasarca, is not at all equal to that of the hydrocele of the tunica vaginalis. Richerand has calculated, that the average proportion of encysted hydroceles of the cord to those of the latter description, is not more, than as 1 to 200. (*Nosogr. Chir. T.* 4, *p.* 262, *Ed.* 4.) According to Mr. Pott, the swelling is mostly situated at the middle part of the cord, between the testicle and groin, and is generally of an oblong figure. Whether it be large or small, it is generally pretty tense, and consequently the fluctuation of the water within it, not always immediately or easily perceptible. It gives no pain, nor (unless it be very large indeed) does it hinder any necessary action. It is perfectly circumscribed; and has no communication, either with the cavity of the belly above, or that of the vaginal coat of the testicle below it. The testis and its epididymis, are perfectly and distinctly to be felt below the tumor, and are absolutely independent of it. The upper part of the spermatic process in the groin is most frequently very distinguishable. The swelling does not retain the impression of the fingers; and when lightly struck upon, sounds as if it contained wind only. It undergoes no alteration from change of the patient's posture; it is not affected by his coughing, sneezing, &c. and it has no effect on the discharge per anum.

Scarpa observes, that the diagnosis is more difficult, when the encysted hydrocele is of considerable bulk, because the testis is buried, as it were, in the tumour. Here, says he, if that portion of the swelling, which projects forwards and somewhat laterally at its lower part, be softish, smooth, and very sensible, whilst the rest presents the character of a collection of fluid, the first and smaller portion is the testis in its healthy state; and the other portion an encysted hydrocele of the cord. This kind of hydrocele may be known from scirrhus of the testis by its consistence, smoothness, and freedom from pain.

The two diseases, however, with which this kind of hydrocele is most likely to be combined, are, a hydrocele of the tunica vaginalis, and a hernia. The characters, in which it differs from the first, have been already noticed.

According to Pott, the free state of the upper part of the spermatic cord, while the tumor is forming below; the gradual accumulation of the fluid, and consequently the gradual growth of the swelling; the indolent and unaltering state of it; its being incapable of reduction, or return into the belly from the first; its being always unaffected by the patient's coughing, or sneezing; and the uninterrupted freedom of the fecal discharge per anum, will always distinguish it from an intestinal hernia. Its liability to be mistaken for an omental hernia, and its characteristic difference, I have already mentioned.

Mr. Pott met with an encysted hydrocele, situated so high toward the groin, as to render perception of the spermatic vessels very obscure, or even impracticable; but then, the state and appearance of the testicle, and the absence of every symptom proceeding from confinement of the intestinal canal, were sufficient marks of the true nature of the complaint.

The cyst is described by Scarpa as consisting of two layers; first the sheath of the cremaster, and under it the cellular structure of the cord, more or less thickened. The under surface is irregular, fringed, and in some places villous.

In general, the pressure of an encysted hydrocele pushes the testis a little lower in the scrotum, than natural, and rather forwards. Scarpa found this organ, however, in one instance considerably wasted, and adherent to the tunica vaginalis.

Several writers describe this kind of hydrocele, as in fact a common encysted tumor, formed in the cellular substance, between the vas deferens and spermatic vessels. (*Delpech, Précis Elem. des Mal. Chir. T.* 3, *p.* 464.) Yet, since ordinary encysted swellings are very difficult to disperse, there is probably some difference between the two affections, at least, if the observation of Mr. Pott be correct, that, in young children, the encysted hydrocele of the cord frequently dissipates in a short time, especially if assisted by warm fomentation and an open belly.

If it be not absorbed, " the point of a lancet will give discharge to the water; and, in young children, will most frequently produce a cure: but, in adults, the cyst, formed by the pressure of the fluid, does sometimes become so thick, as to require division through its whole length; which operation may in general be performed with great ease, and perfect safety." Mr. Pott says, in general, because it is most frequently so: though he has seen even this, slight as it may seem, prove troublesome, hazardous, and fatal.

The late Sir J. Earle proposed treating this case, in the same way as the hydrocele of the tunica vaginalis, viz. by an injection of red wine and water; which method is often successful. (*On Hydrocele, p.* 154, *edit.* 2.) However, the cure of an encysted hydrocele of the spermatic cord, by means of an injection, is generally regarded by modern surgeons, as less certain and advantageous, than the excision of a part of the cyst. The operation, which is described by Bertrandi, Mr. Hey, Richerand, &c. consists in cutting down to the cyst, and removing the forepart of it, while the portion, closely attached to the cord, is to be allowed to remain. (For additional observations on this species of hydrocele, see the *First Lines of the Practice of Surgery, Vol.* 2, *p.* 121.)

HYDROCELE OF THE TUNICA VAGINALIS.

If the quantity of limpid fluid, which naturally moistens the surface of the tunica albuginea and the inside of the tunica vaginalis, be secreted in an undue quantity, or if regular absorption of it be by any means prevented, it will gradually accumulate, and distend the cavity of the latter membrane, so as to form the present species of hydrocele. The case, in which the fluid is supposed to descend either partly or entirely from the cavity of the abdomen, in consequence of the communication not being shut up in the usual time, between the cavity of the peritonæum and that of the tunica vaginalis, is well known to surgeons under the appellation of a congenital hydrocele; a disease, of which particular notice has been taken in the 2d Vol. of the last edition of the *First Lines of Surgery*, 8vo. *Lond.* 1820, and to which I shall therefore very briefly advert in this article. Hydrocele of the vaginal coat is a disease from which no time of life is exempt: not only adults are subject to it, but young children are frequently afflicted with it: and infants sometimes born with it. (*Pott.*) It is also remarked to be common in old men, and persons who ride a good deal on horseback. (*Delpech Précis Elem. des Mal. Chir. T.* 3, *p.* 177.)

The causes of hydrocele of the tunica vaginalis can scarcely be said to be at all understood; and when Mr. Pott observes, that whatever tends to increase the secretion of fluid into the cavity of that membrane, beyond the due and necessary quantity, or to prevent its being taken up, and carried off, by the absorbent vessels, must contribute to the production of the disease, nearly as much is stated, as can be advanced with safety in the present state of our knowledge. Ruysch had a suspicion, that this hydrocele might arise from a varicose state of the spermatic veins; but, though Mr. Pott acknowledges, that these vessels are very frequently found varicose in patients afflicted with this disorder, he was unable to pronounce what real foundation might exist for the foregoing conjecture, or whether the varicose state of the spermatic veins were a cause, or an effect of the hydrocele. In most instances, the accumulation of fluid takes place, without any evident cause; though, in a few cases, it has appeared to be the effect of a contusion, or of rough long continued friction, of the scrotum. The disease is observed to affect persons of the best health, and most robust constitutions, as well as others, and its existence seems quite unconnected with dropsy, or debility. In short, it may be regarded as a disease entirely of a local nature. As Mr. Pott observes, its production is so slow, and gradual, and at the same time so void of pain, that the patient seldom attends to it, until it is of some size. Sometimes, however, it is produced very suddenly, and soon attains considerable magnitude.

In general, at its first beginning, the tumor is rather round; but, as it increases, it frequently assumes *a pyriform kind of figure, with its larger extremity downward*; sometimes it is hard, and almost incompressible; so much so, that, in some few instances, it has been mistaken for an induration of the testicle: at other times, it is so soft and lax, that both the testicle, and the fluid surrounding it, are easily discoverable. It is perfectly indolent, in itself; and may be rather strongly pressed without pain; though its weight sometimes produces some small degree of uneasiness in the back. According to Mr. Pott, the transparency of the tumor, is the most fallible, and uncertain sign belonging to it: it is a circumstance, says he, which does not depend upon the quantity, colour, or consistence of the fluid constituting the disease, so much as on the uncertain thickness, or thinness of the containing bag, and of the common membranes of the scrotum.

If they are thin, the fluid limpid, and the accumulation made so quick as not to give the tunica vaginalis time to thicken much, *the rays of light may sometimes be seen to pass through the tumor*: but this is accidental, and by no means to be depended upon. The fluid is most frequently of a pale yellow, or straw colour; sometimes it is inclined to a greenish cast; sometimes it is dark, turbid, and bloody; and, sometimes, it is perfectly thin and limpid. According to Boyer, the colour of the fluid makes no difference in the prognosis; and he tells us, that, by means of an injection, he cured a hydrocele that contained a violet-coloured fluid, which deposited a thick sediment. (*Dict. des Sciences Méd. T.* 22, *p.* 214.) When a hydrocele has existed for a very long time, cartilaginous bodies are sometimes found in the fluid. (*Sir A. Cooper*, *Lancet*, *Vol.* 2, *p.* 79.)

With respect to Mr. Pott's remarks on the transparency of the swelling, as a symptom of hydrocele, they are correct, inasmuch as the absence of this sign is no proof, that the disease is not of this nature; since thickness of the tunica vaginalis, and, as ought also to have been admitted, the opaque quality of the fluid, sometimes prevent the rays of a candle from passing through the swelling. But, on the other hand, it should have been explained by Mr. Pott, that *when the transparency is present*, *it is one of the surest marks of this species of hydrocele.*

A thickened state of the vaginal coat is chiefly met with in old cases, and according to Sir Astley Cooper, in patients who have long resided in hot climates. (See *Vol. cit. p.* 46.)

It is next noticed by Mr. Pott, that in the beginning of the disease, if the water has accumulated slowly, and the tunica vaginalis is thin and lax, the testicle may easily be perceived; but if the said tunic be firm, or the water accumulated in any considerable quantity, the testis cannot be felt at all. In most cases, the spermatic vessels may be distinctly felt at their exit from the abdominal muscle, or in the groin; which will always distinguish this complaint from an intestinal hernia. But, in a few examples, the vaginal coat is distended so high, and is so full, that it is extremely difficult, nay, almost impossible, to feel the spermatic cord: and the same kind of obscurity is sometimes occasioned by the addition of an encysted hydrocele of the cord; or by the case being combined with a true enterocele.

In a hydrocele of the tunica vaginalis, *the swelling is first noticed at the lower part of the scrotum*, whence it ascends in front of the testicle and spermatic cord. The progress of the disease is generally so slow, that six or even eighteen months elapse, before the tumor approaches the abdominal ring. And, amongst other characters of the case, are to be noticed the disappearance of the corrugations of the scrotum by the effect of the distention; inclination of the raphe to the opposite side; a diminished appearance of the penis, from a good deal of its integuments being drawn over the hydrocele, when this is bulky; the great lightness of the swelling, in relation to its size; and the possibility of feeling *a fluctuation*, when the fingers of one hand are applied to one side of the tumor, and the surgeon slightly taps with the fingers of his other hand upon an opposite point of the swelling.

With respect to the fluctuation, however, it is, as Boyer remarks, sometimes evident, sometimes obscure, and, in other instances, not distinguishable at all. (*Dict. des Sciences Méd. T.* 22, *p.* 200.) These differences depend much on the quantity of fluid, and the thickness or thinness of the vaginal coat.

In the hydroceles of children, the testis occupies a lower situation, than the same organ in the hydroceles of adult persons, and the swelling passes further up towards the abdominal ring. The hydrocele, in fact, is in them situated rather in front of the cord, than the testis, which is always at the lower and back part of the swelling. (See *Dict. des Sciences Méd. T.* 22, *p.* 199.) The common situation of the testis is two thirds of the way down the tumor, as its posterior part. But, as Sir Astley Cooper has correctly explained, a great deal of irregularity, in this respect, is met with, the testis being sometimes in front of the hydrocele; a circumstance arising from the existence of adhesions between the middle and outer coat of that organ at its forepart, previously to the formation of the hydrocele. The testis is sometimes found at the bottom of the swelling, as is exemplified in a preparation shown by the same gentleman, where the fluid had been prevented from descending below and in front of the testis, by the middle and outer coats of that organ being so connected together by the adhesive inflammation. He has one specimen, in which the fluid was situated only at the sides of the testis, adhesions having prevented its accumulation at other points; and another, in which the hydrocele seems, as if it had arisen from the tunica vaginalis, in the same manner as an aneurismal sac is occasionally formed from the coats of an artery. (See *Lancet*, *Vol.* 2, *p.* 78.) These facts prove the necessity of always endeavouring to learn the precise situation of the testis by manual examination, before an operation is attempted. When the surgeon presses rather strongly on that organ, he will feel the part much firmer, than the rest of the tumor, and the patient complains of a severe and peculiar pain.

A hydrocele of the tunica vaginalis may be complicated with disease of the testis, hernia, cirsocele, hydrocele of a hernial sac, or encysted hodrocele of the cord.

A collection of fluid in the tunica vaginalis, complicated with a scirrhous or chronic induration and enlargement of the testicle, is well known under the name of *hydro-sarcocele;* a case, which should be carefully discriminated from a simple hydrocele, " one of the marks of the latter being the natural, soft, healthy state of the testicle: and the characteristic of the former, being its diseased and indurated enlargement."

Mr. Pott does not mean that, in a true simple hydrocele, the testicle is never altered from its natural state. He admits the contrary, and that it is often enlarged in size, and relaxed in structure, and that the spermatic vessels are frequently varicose. But, the testicle is much indurated. These two diseases are extremely unlike each other, and require very different treatment. That which would cure a simple hydrocele, would dangerously aggravate the hydro-sarcocele.

Mr. Pott observes, that it may, and does, sometimes become necessary to let out the water from the vaginal coat of a testicle, in some degree diseased; but this should always be done with caution, and under a guarded prognostic; lest the patient be not only disappointed, by not having that permanent relief, which, for want of better information, he may be induced to expect; but be also (possibly) subjected to other unexpected inconveniences from the attempt.

According to Richerand, a hydrocele may be known from a sarcocele by the following circumstances: in a sarcocele, the tumor mostly retains the shape of the testicle, being oval, and a little flattened at the sides, and its size becomes considerable in a short time, without ascending so near the abdominal ring, as a hydrocele does, when of the same magnitude. A large hydrocele leaves no interspace between that opening and the tumor, so that it is difficult to take hold of, and lift up the spermatic cord; but, in a sarcocele, there is always a space between the tumor and the ring, where the cord can be distinctly felt. Lastly, in a sarcocele, the tumor is always opaque, and its weight, in reference to its size, much more considerable, than that of a hydrocele. (*Nosogr. Chir. T.* 4, *p.* 267, *Ed.* 4.) The latter disease generally only produces inconvenience by its bulk, or the excoriations sometimes caused between the scrotum and the thigh; but, a diseased testis occasions dragging pains in the loins and neighbouring hip. The hardness is not a symptom which can be trusted alone, as a criterion of a diseased testicle; for when a hydrocele is extremely distended, it often feels so indurated as to deceive practitioners of great experience, and a thickened, hardened state of the tunica vaginalis may facilitate the mistake. In some instances of *hydro-sarcocele*, the nature of the disease sometimes remains questionable, until the evacuation of the fluid gives the surgeon a fair opportunity of ascertaining the diseased state of the testicle.

The complication of a hydrocele of the tunica vaginalis with an encysted one of the spermatic cord, may generally be known by the swellings having begun at two different points, and by a kind of constriction between them. The latter symptom, however, is not infallible, because the tunica vaginalis of a common hydrocele is sometimes more or less contracted at the middle of the tumor, which is thus made to appear as if there were two distinct pouches.

When there are two swellings, and one admits of being pushed into the abdominal ring, the case is probably complicated with a rupture. (See *Hernia.*)

The size of a hydrocele, and the thickness of the tunica vaginalis, are generally in a ratio to the time, which the disease has continued. Sometimes the latter membrane acquires nearly a cartilaginous hardness; and portions of it have been found in an ossified state; the only circumstance, in which any free excision of it is now accounted necessary. A hydrocele has been known to contain four pints of fluid. (*Voigtel, Handbuch, der Pract. Anat. B.* 3, *p.* 388.)

TREATMENT OF THE HYDROCELE OF THE VAGINAL COAT.

A hydrocele is by no means a dangerous complaint, though its weight and size are a disagreeable incumbrance, and the patient is always obliged to wear a bag-truss, in order to prevent a painful extension of the spermatic cord. Troublesome excoriations are also frequently caused by the friction of the tumor against the inside of the thigh; and when the swelling is very large, it draws over itself the integuments of the penis, which appears buried, as it were, in the tumor, and its functions are seriously interrupted. Hence, the greater number of patients are very anxious for relief.

Cases are sometimes met with, in which an accidental inflammation and sloughing of the scrotum are followed by the discharge of the fluid, an obliteration of the cavity in which it had collected, and a permanent cure. (See *Lancet, Vol.* 2, *p.* 81.) The accidental rupture of a hydrocele by violence, however, does not always lead to a radical cure; one instance is mentioned by Sir Astley Cooper, in which the fluid collected again; and another is quoted by him, in which the blow only changed the hydrocele into hæmatocele. (*Op. cit. p.* 83.)

"The methods of cure (says Pott) though various, are reducible to two, (viz.) the palliative, or that which pretends only to relieve the disease in present, by discharging the fluid; and the radical, or that which aims at a perfect cure, without leaving a possibility of relapse. The end of the former is accomplished by merely opening the containing bag in such manner as to let out the water: *that of the latter cannot be obtained, unless the cavity of that bag be abolished, and no receptacle for a future accumulation left*; (which proposition, though generally true, is subject to exceptions, as the observations of Mr. Ramsden and Mr. Wadd, published since Mr. Pott's time, tend to prove.) One may be practised at all times of the patient's life, and in *almost* any state of health and habit: the other lies under some restraints and prohibitions; arising from the circumstances of age, constitution, state of the parts, &c.

"The operation, by which the fluid is let out, is a very simple one. The only circumstances requiring our attention in it, are, the instrument wherewith we would perform it; and the place or part of the tumor, into which such instrument should be passed.

"The two instruments in use, are the common bleeding-lancet and the trocar.

"The former having the finer point, may possibly pass in rather the easier, (though the difference is hardly perceptible,) but is liable to inconveniences, to which the latter is not. The trocar, by means of its cannula, secures the exit of the whole fluid without a possibility of prevention; the lancet cannot. And therefore it frequently happens when this instrument is used, either, that some of the water is left behind; or that some degree of handling and squeezing is required for its expulsion; or, that the introduction of a probe, or a director, or some such instrument, becomes necessary for the same purpose. The former of these may in some habits be productive of inflammation: the latter prolongs what would otherwise be a short operation, and multiplies the necessary instruments; which, in every operation in surgery, is wrong. To which it may be added, that if any of the fluid be left in the vaginal coat, or insinuates itself into the cells of the scrotum, the patient will have reason to think the operation imperfect, and to fear, that he shall not reap even the temporary advantage which he expected. The place where this puncture ought to be made, is a circumstance of much more real consequence; the success of the attempt, the ease, and even sometimes the safety of the patient, depending upon it.

As the testicle is usually situated at the upper and back part of the cavity of the hydrocele, or according to Sir Astley Cooper, about two-thirds of the way downwards at the posterior part of the swelling, the trocar should generally be introduced at the forepart of the tumor, and directed obliquely upwards. However, this rule is subject to all the difference, which must proceed from the great varieties sometimes met with in the position of the testicle, and already specified. Nothing can be more certain, than the truth of Sir Astley Cooper's remark, that the trocar can never be introduced with safety, unless the exact situation of that gland has been first ascertained. Whether the operation be done for the palliative or radical treatment, the trocar is to be withdrawn the instant the cannula enters the tunica vaginalis; but care must be taken to hinder the tube from slipping out, or rather to prevent the tunica vaginalis from slipping off it, which is best guarded against by holding the tube steadily within the puncture, and keeping the tunica vaginalis tense by grasping the tumor at its back part, until the operation is finished. (See *Lancet*, *Vol.* 2, *p.* 81.)

After performing this operation, a bit of lint and soap plaster is generally applied; and if the scrotum has been considerably distended, it is to be suspended in a bag truss.

In most people, the orifice heals in a few hours, (like that made for blood-letting;) but in some habits and circumstances, it inflames and festers; this festering is generally superficial only, and is soon quieted by any simple dressing; but it sometimes is so considerable, and extends so deeply, as to affect the vaginal coat, and by accident produce a radical cure. Mr. Pott also saw it prove still more troublesome, and even fatal: but then the circumstances both of the patient, and of the case, were particular. Two examples are also mentioned by Sir Astley Cooper, in which gangrene arose from the puncture, and ended fatally: the patients were elderly persons, who had imprudently ventured to walk out the day after the operation. *(Lancet, Vol.* 2, *p.* 82.*)* Hence, the prudence of advising quietude in bed for a few days, when the patients are of advanced age, or of irritable constitutions.

"Wiseman and others have advised deferring the puncture, till a pint of fluid has collected. When there is a sufficient quantity, however, to keep the testicle from the instrument, there can be no reason for deferring the discharge; and the single point on which this argument ought to rest, is this: Whether the absorbent vessels, by which the extravasation should be prevented, are more likely to reassume their office, while the vaginal coat is thin, and has suffered but little violence from distention; or after it has been stretched and distended to ten or perhaps twenty times its natural capacity; and by such distention is (like all other membranes) become thick, hard, and tough? Mr. Pott thinks the probability so much more on the side of the former, that he should never hesitate a moment about letting out the water, as soon as he found, that the puncture could be made securely. And from what has happened within the small circle of his own experience, he is inclined to believe, that if it was performed more early than it generally is, it might sometimes prevent the return of the disease."

The foregoing passage deserves to be particularly recollected, because it evidently implies a belief by Mr. Pott himself, that, under certain circumstances, a radical cure may be effected, though the cavity of the tunica vaginalis be not obliterated; an opinion since promulgated, as I have already said, by Mr. Ramsden, Mr. Wadd, and Mr. Kinder Wood. Indeed, it appears probable, that generally when a hydrocele is permanently cured, by means of such external applications, as do not excite inflammation, but operate by quickening the action of the absorbent vessels, the cavity of the tunica vaginalis is not destroyed; and there can be but little doubt of the same thing, whenever what is termed a spontaneous cure happens, as it sometimes does in young subjects. It used also to be the doctrine of Desault, that injections did not obliterate the cavity of the hydrocele by adhesion, but only brought about a change in the vessels of the tunica vaginalis. This conclusion is reported by Boyer to be erroneous, who had an opportunity of dissecting the scrotum after a hydrocele had been radically cured, and the cavity was found obliterated. (See *Dict. des Sciences Méd. T.* 22, *p.* 206.) Now, although our present information leads us to regard the latter as the common result, it does not authorise us to reject the inference made by Desault; in fact, Sir A. Cooper dissected a case, which he cured several years previously by an injection: yet, there were only a few adhesions, and the removal of the disease must be abscribed to some change effected in the vessels of the tunica vaginalis. (See *Lancet*, *Vol.* 2, *p.* 84.)

The palliative cure is sometimes deemed most eligible for very old persons. Its repetition will be necessary once every six months, or even much more frequently, if the fluid collect again very rapidly, and produce great distention, as sometimes happens. It should in general be performed at least once on those, who determine to undergo a radical one, as it gives an opportunity of examining the state of the testis, and also of permitting the cavity to be filled again only to such a size, as may be thought to be best calculated to insure success in any future operation. *(Sir J. Earle on Hydrocele*, *p.* 13, *Ed.* 2.*)*

Upon the subject of performing the operation of tapping hydroceles, Scarpa offers some useful cautions. The analogy, which exists between large scrotal herniæ and hydroceles of considerable size, led this writer to suspect, that, in the latter disease, the displacement and separation of the vessels of the spermatic cord from each other might also happen. Careful investigations, made upon the dead subject, fully justified the conjecture. In all considerable hydroceles, he found the spermatic vessels so displaced and separated, and that the artery and vas deferens were ordinarily situated on one side of the tumor, and the veins on the other. Sometimes these vessels all extended over the lateral parts of the tumor, as far as its anterior surface, principally towards the bottom.

It is well known, that, in many instances, the operation of puncturing a hydrocele has been followed by a large extravasation of blood within the tunica vaginalis; but, Scarpa informs us, that until lately, he was unacquainted with any case of this kind, which was well detailed and authentic enough, to be cited as an example of injury of the spermatic artery in the puncture of a hydrocele. This learned Professor, however, has had such a fact recently communicated to him by Gasparoli, a distinguished surgeon of Pallanza, who, in introducing the trocar into the lower part of the swelling, had the misfortune to injure the spermatic artery, and the patient was afterwards castrated. The wound of this vessel was most clearly proved by the particulars of the case, as detailed in Scarpa's work, to which I must refer the reader.

"From the accurate knowledge, (says Scarpa) which we now have upon this pathological point, such an accident may be avoided, by observing the rules, which are elsewhere given, for opening the sac of a very large scrotal hernia. In this last operation, as well as that of puncturing an old and voluminous hydrocele, care must be taken to introduce the instrument at a considerable distance from the bottom of the tumor, that is to say, a little below its middle part, and on a line, which would divide the swelling longitudinally into two perfectly equal parts. Experience proves, that, for the purpose of completely emptying a hydrocele, it is unnecessary to make the puncture very near the bottom of the tumor. The corrugation of the scrotum, and a slight pressure made by the surgeon's hand, will suffice for discharging all the fluid contained in the tunica vaginalis, even when the puncture is made at the middle part of the swelling." (*Scarpa, Traité des Hernies*, p. 64—68.) On account of the lower situation of the testicle in the hydrocele of a child, than in that of a grown-up person, these directions of Scarpa will also be of value.

RADICAL CURE OF THIS HYDROCELE.

Besides the employment of external applications, wherewith a permanent cure has occasionally been accomplished, on the principle of absorption, six different operations have been practised for the same purpose; viz. incision: excision; the application of caustic; the introduction of a tent; the employment of a seton, and the injection of a stimulating fluid into the cavity of the tunica vaginalis.

The principle, on which the success of these plans is commonly believed to depend, is the excitement of such a degree of inflammation within that cavity, as leads to the production of adhesions, or granulations, whereby its obliteration is affected, and, of course, no receptacle for a future accumulation of fluid remains.

In the preceding columns, however, I have noticed the possibility of a cure, even though the cavity may not be completely annihilated.

All the above plans are not equally eligible. Some of them, indeed, are now quite exploded; and some, which are still practised by a few, are not more successful, though certainly more severe, than one, which will be presently recommended; while others are very uncertain in their effect, as well as painful.

Incision.

Making an incision, so as to lay open the cavity containing the fluid, is the most ancient method, being described by Celsus. Paulus Ægineta says, the incision is to commence at the middle of the tumor, and be carried to the upper part of it, in a line parallel to the raphe. This incision is only to go through the integuments; the bag, which contains the water, is then to be opened, and part of the sides of the sac taken away. A director is next to be introduced, and a division of the tunica vaginalis made to the bottom of the swelling. The cavity is afterwards to be dressed with lint, and healed by granulations. Hildanus, Dodonæus, Wiseman, Cheselden, Heister, and Sharp, all coincide in stating the dangerous and even fatal consequences sometimes following this mode. Mr. B. Bell, who preferred this operation to every other one, acknowledges, that he has seen it produce great pain and tension of the abdomen, inflammation, and fever. Pott observes, that it can never be said to be totally void of danger, and that it bears the appearance of an operation of some severity. This eminent surgeon abandoned the method, during the last twenty-six years of his life. Sir A. Cooper mentions one case, in which it proved fatal in an elderly person. (*Lancet*, *Vol.* 2, *p.* 86.) Severe as it is, it has also been known to fail, as Sabatier and Earle have seen.

Excision.

Albucasis gave the first clear account of this operation, though Celsus has certainly mentioned removing some of the sac. White and Douglas used to adopt this method. The latter advises making two incisions, so as to form an oval, from the upper to the lower part of the tumor; dissecting off the oval piece of the scrotum, and then making an opening into the sac, and enlarging it with scissors. The tunica vaginalis was next to be entirely cut away, close to where it was connected with the spermatic vessels. The cavity was afterwards filled with lint. Sir James Earle justly notices, that this plan must have been tedious, exquisitely painful in the performance, and, as subsequently treated, attended with violent and dangerous symptoms. Sir Astley Cooper informs us, that the last time he saw this operation performed, a violent inflammation and sloughing of the scrotum ensued. (See *Lancet*, *Vol.* 2. *p.* 84.) In modern days, excision is only sanctioned, when the tunica vaginalis is more or less in an ossified state, for a mere thickening of it does not prevent the success of milder plans of treatment. With respect to a mode of excision, recently proposed by Mr. Kinder Wood, it differs entirely from the ancient method, inasmuch as it is perhaps the mildest of every plan, yet suggested for the radical cure, since it simply consists in puncturing the hydrocele with an abscess lancet, drawing out a little bit of the sac with a tenaculum, and cutting it off. (See *Med. Chir. Trans. Vol.* 9, *p.* 33.) But, further experience is requisite to determine, whether this very easy plan is as certain as that with an injection. Whether the cavity is obliterated or not, as Mr. Kinder Wood himself believes, appears also still questionable.

Caustic.

Paulus Ægineta advises destroying the skin with a cautery of a particular form, dissecting off the eschar, and then cauterizing the exposed membrane. Guido di Cauliaco is, perhaps, the first who described the application of caustic for the cure of hydrocele. Wiseman practised this method. Dionis advises it; but De la Faye and Garengeot make objections to it. Mr. Else has left the best account of the manner of using caustic. He recommends laying "a small caustic upon the anterior and inferior part of the scrotum, which is intended to affect, and, if possible, penetrate through the tunica vaginalis."

The objections to the employment of caustic are, its causing an unnecessary destruction of parts, and producing a tedious painful sore. The action of caustic can never be so regulated as to make an opening with certainty through the tunica vaginalis, so that either its application must sometimes be repeated, or else a lancet, or trocar, used after all. Its success is also less sure, than that of an injection. In one case, operated upon by Boyer, the disease returned; and in another example, in the practice of the same surgeon, the cure was accomplished at a great risk, as it was long dubious, whether the testis would be saved. (*Dict. des Sciences Med. T.* 22, *p.* 210.) An instance of death from the use of caustic is mentioned by Sir A. Cooper in his valuable lectures. (See *Lancet*, *Vol.* 2, *p.* 85.)

Tent.

This was first mentioned by Franco. The operation consists in making an opening into the tunica vaginalis, and keeping the wound open with a tent of lint, linen, or sponge, so as to make the cavity suppurate, in which the water was contained. Paré, Guillemau, Covillard, Ruysch, Heister, and Marini, have all described the plan, with some variations, one of which consisted in smearing the tents with irritating substances. Dr. A. Monro senior devised the plan of keeping a cannula in the tunica vaginalis, so as to bring on a cohesion of the parts, without suppuration. Fabricius ab Aquapendente, however, has made allusion to some surgeons before his time, who used to keep the wound open a few days with a cannula. Mr. Pott tried the cannula, but found it very inconvenient, as its inflexibility hurt the testis whenever the patient moved with inattention, and, consequently, he preferred a tent, or bougie, though he speaks of the plan as a very uncertain one.

Of late, Baron Larrey, in consequence of having seen several instances, in which the symptoms, following the use of an injection, were violent, and one case, in which a fatal peritonitis was produced, has recommended exciting the necessary degree of inflammation by keeping a short piece of an elastic gum catheter in the puncture, which instrument also serves afterwards to let any fluid escape from the tunica vaginalis. (*Mém. de Chir. Militaire*, *T.* 3, *p.* 409, *&c.*) This author, of course, speaks of the plan as having fully answered his expectations; but, I much doubt whether it has any particular superiority over several of the former methods of employing the tent; methods, which the wisdom, arising from experience, has long since rejected.

Seton

Was first mentioned by Guido di Cauliaco, in 1498, as a means of curing the hydrocele. In modern times, Pott preferred it to every other method, if we except injection, of which, according to Sir J. Earle, he expressed his approbation before his decease. Sir A. Cooper still retains a preference to the seton for children, on account of its application being more easy in them, than the employment of injection. (*Lancet*, *Vol.* 2, *p.* 85.) Mr. Pott found, that the best mode of making the seton was as follows. He employed three instruments: the first was a trocar, the cannula of which was about one-fourth of an inch broad. The second was what he called the seton-cannula, which was made of silver, was just small enough to pass with ease through the cannula of the trocar, and five inches long. The third instrument was a probe six inches and a half long, having at one end a fine steel trocar point, and, at the other, an eye, which carried the seton. The seton consisted of so much white sewing-silk, as would just pass easily through the cannula, and yet fill it. The thickness of the seton, however, was not so great in the latter part of his practice. Having pierced the inferior and anterior part of the tumor with the trocar, withdrawn the perforator, and discharged the water, Mr. Pott used to pass the seton-cannula through that of the trocar, to the upper part of the tunica vaginalis, so as to be felt there. The probe, armed with the seton, was next conveyed through the latter cannula, and its point pushed through the upper part of the tunica vaginalis, and scrotum. The silk was then drawn through the cannula, until a sufficient quantity was brought out of the upper orifice. The two cannulæ being withdrawn, the operation was finished.

Injection.

Dr. Monro attributes the first use of injections for the radical cure of hydroceles to an army-surgeon of his own name, who employed spirits of wine. This produced a cure, but the inflammation was so violent, that he afterwards tried a milder injection, which consisted of wine. However, Lambert, in his *Œuvres Chir.* published at Marseilles, early in the seventeenth century, advised injecting a solution of sublimate in lime water, and he has related cases of success. Mr. S. Sharp also made trial of spirit of wine, which cured the hydrocele, but not without causing dangerous symptoms, and two subsequent abscesses in the scrotum. (*Operations of Surgery.*) Douglas, Le Dran, and Pott, all disapprove of injections, in their works; though Sir James Earle informs us, that the latter lived to alter his opinion on the subject.

The violence of the inflammatory symptoms, consequent to the first employment of injections for the radical cure of hydroceles, arose from the fluids used being too irritating. Sir James Earle, at last, preferred wine for several reasons. He found, that it had been used with success in France; its strength is never so great as to render it unsafe; and it may be readily weakened. However, as the strength and other qualities of port wine vary considerably, Sir A. Cooper prefers using a solution of the sulphate of zinc, ʒj to a pint of water. (*Lancet, Vol.* 2, *p.* 87.)

"I have commonly used (says Sir James Earle) about two-thirds of wine to one-third of water; if the parts appeared insensible, and no pain at all was produced by the first quantity thrown in, I have withdrawn the syringe, and added to the proportion of wine; on the contrary, if the complaint was recent, and the parts irritable, I have increased the proportion of water, so that I have hitherto been principally guided by the degree of sensation, which the patient has expressed. I have lately used pure water mixed with wine, and found it answer as well as when astringents were added." (*P.* 103, *Treatise on the Hydrocele, Ed* 2.) In the preface, the author says, that he has long disused the pipe with a stop-cock, which he once employed, on account of not being well able to spare a hand, during the operation, to turn it, and its consequently being found awkward. A pipe, one end of which is made to fit into the cannula of a trocar, the other adapted to receive the neck of an elastic bottle, with a valve, or ball, in the centre of the pipe to permit the entrance, and prevent the exit, of the injection, will be found infinitely more convenient and useful. (*Earle.*) When the hydrocele is very large, Sir James recommends simply letting out the fluid, and waiting till the tumor acquires a more moderate size before attempting the radical cure by injection.

It appears from Sir James Earle's interesting cases, that a cure may be accomplished in this manner, even when the tunica vaginalis is considerably thickened. In the course of a month, Boyer cured a patient with an injection, even though the testicle was enlarged. (See *Dict. des Sciences Méd. T.* 22, *p.* 214.) Similar cases are also reported in the Parisian *Chir. Jour.* The following is the common mode of operating; the hydrocele is to be tapped with a trocar at its anterior and inferior part, and, when the whole of the fluid is evacuated, the cavity of the tunica vaginalis is to be distended to its former dimensions with the above injection. This is to be allowed to remain in the part about five minutes, upon the average, after which it is to be discharged through the cannula. The patient usually feels some pain in the groin, and about the kidneys, on the injection being introduced: which symptoms are rather desirable, as they evince, that the stimulus of the fluid is likely to have the wished-for effect of exciting the necessary degree of inflammation. This plan, which was brought to a high pitch of perfection by the late Sir James Earle, may be deemed almost an infallible means of obtaining a permanent cure; and being, at the same time, mild, is mostly preferred in England, France, and Germany.

The treatment after the operation is exactly like that of the common swelled testicle (see *Hernia Humoralis*), consisting of the use of fomentations, poultices, leeches, saline purges, and, above all, of a bag truss for keeping up the scrotum. However, a strict antiphlogistic treatment need not be adopted, unless the inflammation become too violent, because a certain degree of it is necessary for the cure. Sometimes, Sir A. Cooper even recommends his patients, when the inflammation is not brisk enough, to take wine, live well, and walk about. According to Boyer, the occasional failure of the treatment with injections, is owing to the premature discontinuance of spirituous applications, and the too quick substitution of emollients for them, as well as the plan of not letting the injection remain in the tunica vaginalis long enough. (See *Dict. des Sciences Méd. T.* 22, *p.* 213.)

One caution it is necessary to offer before taking our leave of this subject; it has sometimes happened, during the operation, that the cannula has slipped out of the tunica vaginalis, and its inner mouth become situated in the substance of the scrotum, in which event the operator, if he persists in propelling out the injection, will fill the cellular texture of the part with a stimulating fluid, which may cause abscesses, sloughing, and other unpleasant symptoms, without entering the cavity of the tunica vaginalis, or producing a radical cure of the hydrocele, which, however, I have known happen from this cause, as I have elsewhere related. (See *First Lines of Surgery, Vol.* 2.) When such an accident happens, it is better to defer the operation, till a sufficient quantity of fluid has collected again. Sometimes, when the injection is strong, a great deal of it has passed into the cellular membrane, and the constitution is irritable, the mischief produced ends in the patient's death. Many such cases are on record, and two are noticed by Sir A. Cooper. (See *Lancet, Vol.* 2, *p.* 89.)

Hydroceles have been cured by applying to the scrotum a solution of muriate of ammonia in vinegar and water. (*Keate.*) But the application frequently creates a good deal of pain and irritation, and, in grown-up persons, does not often succeed, to say the best of it. (*Earle.*) However, in young persons and children, the employment of brisk purgatives, discutient lotions, and a suspensory bandage, mostly proves successful, as is confirmed by the testimony of Sir Astley Cooper. (*Lancet, Vol.* 2, *p.* 83.)

Distending the tunica vaginalis with air, cold water, or even the fluid discharged, has sometimes effected a radical cure. (See *Supplement to Ploucquet, Tub.* 1814, *p.* 103.)

A case is mentioned by Sir A. Cooper, in which milk was injected, on the supposition of its being a mild, unirritating fluid: however, very severe inflammation followed, and an abscess in the tunica vaginalis; when an opening was made, the milk came out in curds.

There is a particular case, that has been called the *congenital hydrocele*, by which is implied a collection of water in the tunica vaginalis, with a communication between the cavity of this membrane and that of the peritonæum. Desault used to cure this disease by a red wine injection. After the protruded viscera had been returned into the belly, and while the opening between that and the inside of the tunica vaginalis was carefully compressed and closed by a trusty assistant, Desault, after letting out the water in the common way, used to throw in the injection. The method, it is said, succeeded, without causing the perilous consequence, one might *à priori* expect, viz. inflammation of the peritonæum.

This kind of hydrocele has not been described by many writers. The case is easily distinguished by the fluid being capable of being pushed into the belly. By means of a vinous injection, Desault cured a boy both of a congenital hydrocele and hernia. (See *Œuvres Chir. de Desault, T.* 2, *p.* 442.)

The method, which I should recommend, is the constant application of a truss; by which means Sir A. Cooper has known a cure very successfully accomplished. (See *Lancet, Vol.* 2, p. 80.)

This subject of congenital hydrocele has been more particularly considered in my other work.

For many other important remarks, concerning hydroceles, I am obliged to refer to the 2d vol. of the last edition of the *First Lines of the Practice of Surgery*, 1820. *Monro on the Tumors of the Scrotum, in the Edinb. Med. Essays, Vol.* 5. *John Douglas, A Treatise on Hydrocele, 8vo. Lond.* 1755 *; and Answer to Remarks on that Work, 8vo. Lond.* 1758. *Pott on the Hydrocele : Else on the Hydrocele, 8vo. Lond.* 1776 *; and the Works of Joseph Else, 8vo. Lond.* 1782. *W. Dease, on the Different Kinds of Hydrocele, 8vo. London,* 1798. *Keate ; B. Bell, on Hydrocele, Sarcocele, &c. 8vo. Edinb.* 1794. *Sir James Earle, Treatise on the Hydrocele, 2d Ed. 8vo. Lond.* 1803. *Schreger Chirurgische Versüche, B.* 1, *8vo. Nurnberg,* 1811 ; *a cure effected by the injection of air, p.* 306. *Bertrandi, in Mém. de l'Acad. de Chir. T.* 3 ; *and in Trattato delle Operazioni di Chirurgia, Nizza,* 1763. *Desault, Remarques, &c. sur diverses espèces d'Hydrocéle : Œuvres Chir. T.* 2. *S. Sharp's Treatise on the Operations, and his Critical Inquiry. J. Howard, Obs. on the Method of Curing the Hydrocele by means of a Seton, 8vo. Lond.* 1783. *Sabatier, Médecine Opératoire, T.* 1, *Ed.* 2. *Scarpa, Traité des Hernies, p.* 64, *&c. Larrey, Mémoires de Chir. Militaire, T.* 3, *p.* 409, *&c. T. Ramsden, Practical Observations on the Sclerocele, &c. 8vo. Lond.* 1811. *W. Wadd, Cases of Diseased Bladder and Testicle, 4to. Lond.* 1815. *Kinder Wood, some Observations on the Cure of the Hydrocele of the Tunica Vaginalis, without procuring an Obliteration of the Sac, in Med. Chir. Trans. Vol.* 9, *p.* 38, *8vo. Lond.* 1818. *A. Scarpa, Memoria sull' Idrocele del cordone spermatico. 4to. Pavia,* 1823.

HYDROPHOBIA. (from ὑδωρ, water, and φοβος, fear. *A dread of water.*) This being, for the most part, a striking symptom of the fatal indisposition which results from the bite of a mad dog, and some other animals affected in the same way, the disease itself has been named *hydrophobia*. Some have used the more general term, *hygrophobia*, from ὑγρον, liquid. But strong objection has been made to both these terms, because derived from a symptom, which does not exclusively belong to the disease, nor constantly exist in it.

The old writers, as we learn from Cælius Aurelianus, used the terms *aërophobia*, or *a dread of air*, and *pantophobia*, or *a fear of all things*, since the impression of cold air sometimes excites terror, and the disorder is marked by a singular degree of general timidity and distrust. Others called it *phobodipson* (διψως, signifying thirst,) because the patient is *thirsty*, yet *fears* to drink. Several modern authors. however. objecting to any appellation expressive only of one symptom, denominate the disease *rabies*, and *rabies canina*, or canine madness. The French call it *la rage*.

With respect to hydrophobia, or the dreadful indisposition produced by the bite of a dog, or other animal, affected with rabies, or by the application of some of the secretions of such animal to a part of the body, the first clear mention of it is generally considered to be that made by Aristotle (*Hist. Animal. lib.* 7, *cap.* 22); but, he could have had but very erroneous notions upon the subject, since he sets down man as incapable of receiving the distemper from the bite of a rabid dog.

Concerning the antiquity of hydrophobia, however, I particularly refer to Dr. Hecker's Observations, who thinks the fact clearly proved, that the disease existed at least 400 years before Christ, and even in the most remote periods. (See *Journ. für Chir. von C. F. Graefe, &c. B.* 2, *p.* 325, *&c.*)

With respect to a name for the disorder, as the patient does not commonly betray any tendency to fury, while the dread of water is really a customary attendant on the complaint, the terms *rabies* and *la rage* seem strictly even more exceptionable, than the word hydrophobia. At the same time, in order not to imbibe confused notions, whatever name be thought fittest for the illness arising in the human subject from the bite of a mad dog, and some other animals similarly affected, it is necessary to understand well, that hydrophobia, *in the sense of a horror of water, or other liquids*, is an occasional symptom of many diseases, and neither exclusively confined to the indisposition caused by the bite of a rabid dog, or certain other animals, nor even constantly attendant upon it. And, with the same view of avoiding perplexity, all hydrophobic complaints may be arranged in two general divisions :

1. The first comprising all cases not ascribable to the bite of a rabid animal, or the application of some of its secretions to a part of the body.

2. The second, comprehending the examples, preceded by one of those occurrences.

The cases, included in the first of these divisions, are subdivided into the *symptomatic* and *idiopathic*, or *spontaneous*. By *symptomatic hydrophobia* is understood an aversion or dread of liquids, presenting itself as an occasional symptom of various diseases, as of certain inflammatory, febrile, and nervous disorders, hysteria, epilepsy, injuries of the brain, (*Trecourt, in Recueil Périodique, &c. T.* 6 ; *Acta Naturæ, Curios. Vol.* 2, *Obs.* 205,) the operation of particular poisons; (*Villermay, Traité des Mal. Nerveuses, T.* 1, *p.* 90 ; *Harles über die Hundiswuth, Frankf.* 1809 ; *Schmiedel, Diss. de Hydrophobia ex usu fructuum fagi, Erlang.* 1762, *&c.* ;) gastritis, pneumonia, hepatitis, angina, &c. &c. In many of the instances of symptomatic hydrophobia, the aversion, or dread, of fluids, occurs on the same day as the cause upon which it depends, or a few days afterwards; and, for the most part, may be cured with the disease, which has given rise to it, or even independently of it. On the contrary, the hydrophobia from the bite, or infection, of a rabid animal, does not come on till a long time after the occurrence of the cause, and, when once formed, has hitherto proved incurable. Whatever analogy, therefore, may be imagined to exist between symptomatic hydrophobia and rabies, they differ essentially in their causes, progress, degree of curability, and also in the treatment required. (See *Dict. des Sciences Méd. T.* 4, *p.* 38.)

Spontaneous or *idiopathic* hydrophobia, denotes the questionable form of the complaint, sometimes supposed to be induced by violent mental commotion, anger, fright, &c. unpreceded by any other primary disease, to which it can be referred as a symptom.

Numerous facts upon record leave no doubt, concerning the reality of symptomatic hydrophobia; but, perhaps, none of the cases adduced by Raymond (*Mém. de la Soc. Royale de Méd. T.* 2, *p.* 457), Roupe (*Nova Acta Physico-Méd. T.* 4, or Pouteau (*Essai sur la Rage*, *Lyons*, 1763), in proof of the possibility of a spontaneous idiopathic form of the disease in the human subject, are sufficiently unequivocal to remove all suspicion, either that the complaint had been preceded by another primary disease (*Dict. des Sciences Méd. T.* 22, *p.* 333), or had been the result of an unobserved, or forgotten occasion, on which the infection was received from handling a dog, or cat, never suspected at the time to be affected with rabies. Here a wrong conclusion is the more apt to be made, in consequence of the disease being communicable without any bite to fix the patient's attention, and not commencing sometimes for months after the unnoticed receipt of the infection. Thus, Francis Stannier died, in Nov. 1787, with symptoms of hydrophobia, though it was not known that he had ever been bitten by a mad dog (*Lond. Med. Journ. Vol.* 9, *p.* 256); yet, what safe inference can be drawn from this case, when the above-mentioned circumstances are recollected, and it is known that the man was often drunk, and in the streets at night? These and other considerations even throw a doubt upon a part of the cases, recorded as instances of symptomatic tetanus, and they lead the generality of modern writers to incline to the sentiment of Dr. J. Hunter, that a disease similar in its nature to what is produced by the bite of a mad dog, never arises *spontaneously* in the human subject. (See *Trans. of a Soc. for the Improvement of Med. and Chir. Knowledge, Vol.* 1, *p.* 299—303.) Many of the symptomatic cases, however, or those in which more or less aversion, or dread of liquids, is evinced as an effect of another disease, are too well authenticated to admit of doubt. In the *Dict. des Sciences Med. T.* 22, *art. Hydrophobie,* may be found a great deal of information, likely to interest such readers as wish to follow up the subject of the symptomatic forms of the disease. However, in looking over some of the cases there detailed, a suspicion will sometimes arise in an intelligent mind, that the disorder was mistaken; for it will be noticed, that sometimes pain shooting up the limbs preceded the general indisposition, while the rapidity of the disease, and the appearances found on dissection, corresponded precisely to what is usually remarked in hydrophobia. In particular, one patient is described as a man habituated to drinking, and, as a *sportsman, to dogs also;* he died on the third day, and on dissection, the stomach and intestines were found inflamed, and even gangrenous in several places, the œsophagus and lungs also participating in the inflammation. (*Commerc. Litter. Noremb.* 1748, *Hebd.* 5.)

Animals of the dog kind, including the wolf and the fox, are most frequently the subject of rabies; and certain writers have maintained, that although it may be received and propagated by other animals, yet it always originates in some of the canine race. (*Hillary on Diseases of Barbadoes, p.* 246.) However, it is asserted, that the disease sometimes originates spontaneously in cats, that is to say, without their having been previously bitten by another rabid animal; but the moderns do not incline to the belief, that it ever has been known to commence in this manner in other animals, though such an assertion is made by Cœlius Aurelianus, Porphyrius, Avicenna, Valeriola, Vander Wiel, &c. not only with respect to man, but horses, asses, camels, hogs, bullocks, bears, monkeys, and even poultry. (See *Dict. des Sciences Méd. T.* 47, *p.* 45.)

It is interesting to inquire, what animals are capable of communicating rabies, and what animals of receiving it? As far as our knowledge yet extends, it appears, that animals of the canine species, with perhaps those of the feline race, are the only ones in which this disorder ever arises spontaneously, and they may transmit it to animals of their own kind, to other quadrupeds, and to man. The experiments, made by Dr. Zincke, tend to prove also that birds, at least the common fowl, may have the disease communicated to them. (*Neue Ansichtien der Hundswuth, &c.* 8*vo. Jena,* 1804.)

But, though it be well known, that animals of the dog and cat kinds can propagate the disorder, it is not settled, whether it can be communicated by other animals. In a memoir, read to the French Institute, M. Huzard explained, that herbivorous quadrupeds, affected with rabies, are incapable of transmitting the disease; a position subsequently confirmed by additional experiments and observations made in the veterinary school at Alfort. Professor Dupuy could never communicate the distemper to cows and sheep, by rubbing their wounds with a sponge, which animals of the same class, already labouring under the disease, had had in their mouths; though the same experiment, made with a sponge which had been bitten by a rabid dog, propagated rabies by a kind of inoculation. Dupuy has likewise seen, amongst several flocks, sheep affected with rabies, yet the distemper was never communicated by them to other sheep, notwithstanding the latter were bit in parts stripped of wool. Dr. Gillman inoculated two rabbits with the saliva of a rabid pig; but the disease was not communicated to them. (*On the bite of a Rabid Animal, p.* 38.) On the other hand, Mr. King, of Clifton, is stated to have communicated rabies to a fowl, by inoculating it with the saliva of an ox, which had just fallen a victim to the disease. (*J. Ashburner, Diss. de Hydrophobia, p.* 29.) The author of the article *Rage* (*Dict. des Sciences Méd.*) observes, respecting this singular case, that, as it is accompanied with no details, doubts must remain, whether the fowl actually died of rabies. A fatal instance of hydrophobia from the bite of a rabid badger, has been lately recorded, though not with such precision as to leave no doubts about the nature of the case. (See *Hufeland's Journ. for* 1821.)

As for some extraordinary cases, in which the disease is alleged to have been communicated to the human subject by the bites of birds, or injuries done with the claws of animals, they are generally dismissed by modern writers, with the inference, that the complaint, thus transmitted, was not true hydrophobia or rabies. This conclusion is made, with respect to the cases of this kind, reported by Cælius Aurelianus and Bader, and the notorious example mentioned by A. Baccius of a gardener, who died of the bite of a cock, which, according to some, was rabid, according to others, merely enraged. Hildanus also details an instance, in which a young man was scratched on the great toe by a cat: and some months afterwards, was attacked with hydrophobia (*Obs. Chir. Cent.* 1, *Obs.* 16); but, as a modern writer observes, if the patient were really affected with rabies, it is conceivable that the cat's claw, with which the scratch was made, might have been wet with the animal's saliva. (*Dict. des Sciences Méd. T.* 47, *p.* 47.)

Another question of considerable importance is, whether, hydrophobia, that is to say rabies, can be communicated from one human being to another? or, whether, in man, the disease is infectious or contagious? Many attempts have been made, in vain, to communicate the distemper to several kinds of animals, by inoculating them with the saliva of patients who had perished of the disease. These experiments were made in this country by Gauthier, Vaughan, Babington, &c.; but no infection was the consequence. In France, Giraud inoculated several dogs with the saliva of a man in the convulsed stage of hydrophobia, but none of them afterwards took the distemper. (*Bosquillon, Mém. sur les Causes de l'Hydrophobie, in Mém. de la Soc. d'Emulation, 5me année.*) M. Girard, of Lyons, collected some of the frothy saliva the instant it was discharged from a patient's mouth, and he inserted some of it into eight punctures, made on the inside of a dog's four legs: yet, six months after this inoculation, the animal had not suffered the slightest inconvenience. (*Essai sur le Tetanos Rabiens, p.* 29.) A similar experiment was made on three dogs by M. Paroisse, who kept the animals between three and four months afterwards, during all which time they continued quite unaffected. (*Bibl. Méd. T.* 43.)

Dr. Bezard published the following experiments: Pieces of the flesh of a person who had died of hydrophobia, were smeared with his saliva, and given to a dog; another dog was suffered to eat the salivary glands; and a third, the sides of a wound. In three other dogs, incisions were made, the cut parts were then inoculated, and sewed up. Not one of these six animals became affected with rabies. (See *Mém. et Obs. lus à la Soc. Méd. Philanthropique, première année,* 1807, *p.* 17.)

The preceding experiments only furnish negative results; but one, to which we shall now advert, tends to establish a contrary opinion. On the 19th June, 1813, in the Hôtel-Dieu, at Paris, Magendie and Breschet took some of the saliva of a man, who died a few minutes afterwards of hydrophobia, and, by means of a bit of rag, they conveyed this saliva to the short distance of twenty paces from the patient's bed, and inoculated with it two healthy dogs. One of the dogs became rabid on the 27th of July, and bit two others, one of which was attacked with complete rabies on the 26th of August. (*C. Busmont;* see *Collect. des Thèses, in 4to. de la Faculté de Paris,* 1814.) It is remarked, in the work from which I have collected these particulars, that the foregoing is one of the best authenticated experiments on the subject; for, in addition to the consideration of the talents and characters of the experimenters themselves, the facts were witnessed by numerous medical students. And notwithstanding the objections which have been urged against the account, (see *Journ. Gén. de Méd. T.* 52, *p.* 13,) the main points are declared to be entitled to credit. (See *Dict. des Sciences Méd. T.* 47, *p.* 48. Also *Journ. de Physiologie, par F. Magendie, T.* 1, *p.* 42.)

With these relations, it is proper to notice certain cases, too credulously promulgated as proofs of the possibility of the disease being communicated from one human being to another. Neither the instance of the maid-servant, who died merely from seeing her mistress vomit, while labouring under hydrophobia (*Mich. Ettmuller, Op. Med. T.* 2); the case of the peasant's children, *which all died on the seventh day,* as is alleged, from embracing their dying father; the example of a woman contracting hydrophobia from her husband, as detailed by Mangor (*Acta Soc. Reg. Hafniens, V.* 2, *Obs.* 32, *p.* 408); nor other cases of a similar tenor; are now regarded as proving any thing more, than that the patients, supposed to have caught the disease by contagion, fell victims either to violent affections of the mind and nervous system, or illnesses accidentally taking place soon after the death of a near relation, or mistress. It is clear enough also, that some of the cases were, at most, only instances of symptomatic hydrophobia.

With regard to another opinion, that the bite of a man, or other animal, when merely enraged, may bring on hydrophobia, it is now entirely discarded as erroneous. The cases in support of it, recorded by Cl. Pouteau, Mangetus, Malpighi, Zuinger, Le Cat, &c. when critically examined, only prove, that the patients were affected with tetanus, or symptomatic hydrophobia, not arising from any infection; for, neither the mode of attack, nor the progress of the symptoms, in any of the examples which are related with sufficient minuteness, lead to the inference, that the patients actually died of rabies. (See *Dict. des Sciences Méd. T.* 47, *p.* 49.)

Wrong notions, of a very dangerous tendency, have been generally entertained, in regard to the disease, as it appears in the canine race. The writer of the article *Dog*, in Dr. Rees's Cyclopædia, appears to have had extensive opportunities of observing the disorder in dogs: from his remarks, I have collected the following information.

The peculiar symptom, which characterises the complaint in the human subject, has been applied to the disease in the dog, and has occasioned it to be called by the same name, hydrophobia. This is a palpable misnomer; for, in no instance, does there ever exist any dread of water; on the contrary, dogs are in general very greedy after it. Such unfounded supposition has often conduced to a very fatal error: for, it being the received opinion, that no dog is mad, who can lap water, many persons have been lulled into a dangerous security. Another equally false and fatal idea has prevailed, that every mad dog must be wild and furious; but, this is so far from being true, that in the greater number of instances, there is very little of that wild savage fury, that is expected by the generality of persons. "Hence," says this author, "as it is evident, that the term hydrophobia, characterizing the affection in the dog, is a misnomer, so it is evident, that the term madness is equally so. In no instance, have I ever observed a total alienation of the mind; in very few, have the mental faculties been disturbed. The disposition to do mischief is rather an increased irritability, than absence of sense: for, in most instances, even those that are furious, they acknowledge the master's voice, and are obedient." The symptom, which is most frequently first observable, in a rabid dog, is a certain peculiarity in his manner; some strange departure from his usual habits. In a very great number of instances, the peculiarity consists in a disposition to pick up straws, bits of paper, rag, threads, or the smallest objects which may happen to be on the floor. This is said to be particularly common in small dogs. "Others again show an early peculiarity by licking the parts of another dog. In one instance, the approach of the disease was foretold, by our observing a very uncommon attachment in a pug-puppy, towards a kitten, which he was constantly licking; and likewise the cold nose of a healthy pug, that was with him. An attachment to the sensation of cold appears in many cases, it being very common to observe them (the dogs) licking the cold iron, cold stones, &c. Some dogs, early in the disease, will eat their own excrement, and lap their own urine." An early antipathy to strange dogs and cats is very commonly observed, but particularly to cats. As the disease advances, the affected dogs bite those with which they are domesticated, and, lastly, the persons around; but, except in a moment of irritability, they seldom attack the human subject. The irratability, that induces them to bite, is very strong; but is devoid of wildness. It is more like peevishness than fury. A stick held up at them always excites their anger in a violent degree, and throughout the disease, there is generally a wonderful impatience of control, and the animals are with great difficulty frightened. (See *art. Dog, in Rees's Cyclopœdia.*)

To this passage the following remarks may be added:—Dr. John Hunter calculated, that out of every dozen of rabid dogs, about one evinces no particular tendency to bite. That these animals, and wolves also, have no particular dread of fluid, is proved by facts. Thus, a rabid wolf, at Frejus, swam across several rivers. (*Darluc, Recueil Périod. d'Obs. Vol.* 4.) Duboueix has seen mad dogs drink without difficulty, and plentifully. *(Hist. de la Soc. de Méd. an.* 1783.*)* Rabid animals will sometimes eat as well as drink. Thus, the wolf which bit so many persons at Meyne, in 1718, was found in the morning devouring a shepherd's dog. And Dr. Gillman speaks of a dog, which was not deemed rabid, because it eat and drank well: but, as it seemed indisposed, it was killed, though not before it had bit a man, who fell a victim to hydrophobia. *(On the Bite of a Rabid Animal, p.* 15.*)*

When a dog bites a person, it should not be immediately killed, but merely chained up, because, by destroying it at once, the possibility of ascertaining whether it was rabid, is prevented, and great alarm is thus kept up in the minds of the wounded person and his friends. If the animal be affected with rabies, it will perish in a few days. At the veterinary school at Alfort, when a dog has been bit, it is usual to chain it up, for at least fifty days, before it is restored to its master, about six weeks being considered the period when a dog generally becomes rabid after being bitten.

For additional details, relating to the disease as it appears in the dog, I must refer to the above-mentioned paper. Enough, I hope, has been said to make the reader aware, that mad dogs are not particularly characterised by an inability to lap water, or any degree of fury. These animals, when actually affected with rabies, from their quiet manner have even not been suspected of having the disorder, and have been allowed to run about, been fondled, and even slept with. (See *Mem. of Swedish Acad.* 1777.)

The causes of this peculiar distemper in dogs are at present unknown, and little more than conjecture prevails upon the subject. It is not positively known, whether rabies sometimes originates spontaneously in these animals, though I believe this opinion is at present gaining ground; or, whether, like small-pox, in the human species, it is propagated only by contagion. That the disease is frequently imparted, in consequence of one dog biting another, every body well knows. Yet, there are many instances, in which this mode of propagation cannot be suspected. Several facts render it probable, that among dogs, the disease is often communicated by contagion. It is observed, that in insular situations, dogs are seldom affected, and this circumstance is ascribed to such animals being in a kind of quarantine. The celebrated sportsman, Mr. Meynell, secured his dogs from the malady, by making every new hound perform a quarantine before he was suffered to join the pack. (See *Trans. for the Improvement of Med. and Chir. Knowledge, Vol.* 1, *art.* 17.) Great heat was very commonly supposed to be an exciting cause of the disease in dogs; but, without much foundation. "A very hot climate, or one exposed to the extremes of heat and cold; a very hot and dry season; feeding upon putrid, stinking, and maggotty flesh; want of water; worms in the kidneys, intestines, brain, or cavities of the nose," are set down by Boerhaave as causes of the disease. *(Aphorism* 1134.*)* We learn from Dr. J. Hunter, that, in the hot island of Jamaica, where dogs are exceedingly numerous, not one was known to go mad during forty years. *(Trans. for the Improvement of Med. Knowledge, loc. cit.)* Cold weather has also been set down as conducive to rabies amongst the canine race, as is suggested, because the ponds being frozen, these animals cannot quench their thirst. *(Le Roux.)* That neither of these sentiments, about heat and cold being the cause of the origin of the disease in dogs, is correct, will be manifest enough to any body who has patience to look over the volume of the *Mem. de la Soc. Royale de Méd.* devoted entirely to the consideration of rabies; and from the investigations of M. Andry, *(Recherches sur la Rage,* 8vo. *Paris,* 1780,*)* it appears, that January, the coldest month in the year, and August, the hottest, are those, which furnish the fewest instances of hydrophobia. On the contrary, the greatest number of rabid wolves is in March and April; and that of dogs, affected with spontaneous rabies, in May and September.

According to Savary, dogs never go mad in the Island of Cyprus, nor in that part of Syria, which is near the sea; and Volney assures us, that these animals enjoy the same fortunate exemption both in the latter country, and in Egypt. (*Voyage in Syrie*, *T.* 1.) The traveller Brown also declares, that, in Egypt, they are never, or very rarely, attacked with rabies.

"Although (says Baron Larrey) hydrophobia is more frequent in warm, than temperate climates, it is not observed in Egypt, and the natives assured us, that they knew of no instance, in which this disease had manifested itself, either in man, or animals. No doubt this is owing to the species and character of the dogs of this country, and their manner of living.

"It is remarked, that the Egyptian dogs are almost continually in a state of inaction: during the day, they lie down in the shade, near vessels, full of fresh water, prepared by the natives. They only run about in the night-time; they evince the signs and effects of their love but once a year, and only for a few instants. They are seldom seen coupled. On our arrival, there was a vast number of these animals in Egypt, because they were held, like many others, in great veneration, and were never put to death. They do not go into the houses; in the day-time, they remain at the sides of the streets, and they only wander into the country at night, in order to find any dead animals, which happen to be unburied. Their disposition is meek and peaceable. and they rarely fight with each other. Possibly, all these causes may exempt them from rabies." (*Larrey in Mém. de Chir. Militaire*, *T.* 2, *p.* 226.)

This observation, about the exemption of the Egyptian dogs from rabies, is a very ancient one, having been made by Prosper Alpinus. (*Rer. Ægyptiarum*, *lib.* 4, *cap.* 8.) According to Barrow, the dogs in the vicinity of the Cape of Good Hope, and in Caffraria, very rarely go mad. (*Travels into the Interior of Africa.*) Several authors assert, that rabies never occurs in South America. (*Bibl. Raisonnée*, 1750. *Van Swieten Comment. in Aphor.* 1129, *Portal*, *&c.*) L. Valentin declares, that it is exceedingly rare in the warm regions of America, but common in the northern part of that continent. (*Journ. Gén. de Méd. T.* 30.) Dr. Thomas, who resided a good while in the West Indies, never saw, nor heard of a case of rabies there; (*Practice of Physic*;) and Dr. B. Moseley states, that the disorder was not known in those islands, down to 1783. On the other hand, the disease sometimes happens in the East Indies, though not with such frequency, as at all to justify the doctrine about heat being the cause of its production. The silence of Hippocrates proves, that in his days, hydrophobia must have been very rare in Greece; and, as the disorder is not mentioned in the scriptures, an inference may be made, that it could not be so common in the hot tracts of the globe, inhabited by the Hebrews, as in the temperate climates of Europe and America.

Neither can the sentiment be received as correct, that rabies is more frequent in the north, than in the temperate parts of Europe; for, De la Fontaine particularly notices how extremely rare it is in Poland. (*Chir. Méd. Abhandl. Breslau*, 1792.) The disease is reported to be very common in Prussian Lithuania; but mad dogs are seldom, or never heard of, at Archangel, Tobolsk, or in the country north of St. Petersburgh.

In Mr. Meynell's account, which was communicated to him by a physician, it is asserted, that the complaint never arises from hot weather, nor putrid provisions, nor from any cause except the bite; for, however dogs have been confined, however fed, or whatever may have been the heat of the season, the disorder never commenced, without a possibility of tracing it to the preceding cause, nor was it ever introduced into the kennel, except by the bite of a mad dog. (See *art. Dog*, *in Rees's Cyclopædia.*)

Dr. Gillman endeavours to prove, that the disease in dogs is probably excited independently of particular climates, of putrid aliment, of deficiency of water, of want of perspiration, or, of the worm under the tongue, to which causes it has been at different times ascribed; and he expresses his belief, that it originates somewhat like typhus in the human subject, and is not always produced by inoculation, or by means of a bite. He thinks, that it may be occasionally brought on by the confinement of dogs, without exercise, in close and filthy kennels; and that the success of Mr. Trevalyan, as related by Dr. Bardsley, in clearing his kennel of the disease, by changing even the pavement, after other means of purification had failed, affords presumptive evidence in favor of the opinion; and, consequently, this author thinks, that the method of quarantine, adopted by Mr. Meynell, and recommended by Dr. Bardsley, on the supposition, that the disease originates exclusively from contagion, will not be a sufficient preventive alone; and he infers, from some facts, reported by Mr. Daniel, that the poison sometimes lies dormant in dogs four, five, and six months; and, consequently, that the period of two months is not a sufficient quarantine. (See *Gillman's Diss. on the Bite of a Rabid Animal.*)

In opposition, however, to some of the sentiments contained in the foregoing passage, it should be known, that Dupuytren, Magendie, and Breschet, have purposely kept many dogs for a long time in the most disgusting state of uncleanliness, let them even die in this condition for want of food and water, or even devour each other, yet without exciting rabies. (*Dict. des Sciences Méd. T.* 47, *p.* 53.) Yet Professor Rossi, of Turin, is said to have produced this, or some similar disease, in cats, by keeping them shut up in a room. (*Mém. de l'Acad. Imp. de Turin*, 1805, *à* 1808, *p.* 93, *de la Notice des Travaux.*) On the whole, I consider it well proved, that neither long thirst, hunger, eating putrid flesh, nor filth, will occasion the disease in the canine race. At Aleppo, where these animals perish in great numbers from want of food and water, and the heat of the climate, the distemper is said to be unknown. Nor is rabies found to attack dogs and cats with particular frequency during the copulating season, and therefore, the œstrus veneris cannot be admitted to have any share in its production, as some writers have been disposed to believe. (See *Dict. des Sciences Méd. T.* 47, *p.* 55.)

Although most writers believe in the reality of a poison, or specific infectious principle, in cases of rabies, the fact has been questioned, or absolutely rejected by others. Bosquillon considered the disease always as the effect of fear, or an impression upon the imagination. This view of the matter is far from being new, and has been ably refuted by many authors, and especially by M. Desault, of Bordeaux, who remarks, that horses, asses, and mules, *quibus non est intellectus*, had died rabid the very year in which he wrote; and, it is observed by Dr. J. Vaughan, that an infant in the cradle is sometimes attacked, while many timorous children escape.

Another notion has partially prevailed, that rabies does not depend upon any virus, but upon the continuance of an irritation in the bitten parts, affecting the whole nervous system. (*Percival; J. Mease; Girard; &c.*) But, this doctrine confounds rabies and tetanus together, and can only apply to the symptomatic non-infectious hydrophobia from an ordinary wound, or laceration.

The facts, in proof of the reality of a peculiar infectious principle in cases of rabies, are too numerous to leave any doubt upon the subject. Twenty-three individuals were bit one morning by a female wolf, of whom thirteen died in the course of a few months, besides several cows, which had been injured by the same animal. How could all these unfortunate persons have had similar symptoms, and especially a horror of fluids, had they not been all under the influence of some cause, besides the bites? The patients who died were bit on the naked skin; while in the others, who escaped infection, the bites happened through their clothes, which no doubt intercepted the saliva, the vehicle of the virus. In the Essay by Le Roux, mention is made of three persons, bit by a rabid wolf near Autun, in July, 1781, and, notwithstanding mercurial frictions, they all died of hydrophobia. Of ten other individuals bit by a wolf, nine died rabid. (*Rey, Mém. de la Soc. Royale de Méd. p.* 147.) Twenty-four persons were injured in the same manner near Rochelle, and eighteen of them perished. (*Andry, Récherches sur la Rage, Ed.* 3, *p.* 196.) On the 27th January, 1780, fifteen individuals were bit by a mad dog, and attended at Senlis by the commissioners of the French Royal Society of Physic; ten had received the bites on the naked flesh, and five through their clothes. Of the first ten, only five lost their lives, three of them dying of decided rabies between the 27th of February, and the 3d of April; and the other two between the 29th of February, and the 18th of March. Unless the opinion be adopted, that the disease is caused by an infectious principle, a sort of inoculation, it would be impossible rationally to explain the cause of so many deaths from the bites of rabid animals. If the idea, that rabies originates from fear, or nervous irritation, were true, how could we account for there being such a difference between the usual consequences of the bite of a healthy dog, and those of the bite of one affected with rabies? Healthy dogs are incessantly quarrelling, and biting each other in the streets, yet their wounds are not followed by rabies; and as a modern author remarks, if hydrophobia were referrible to nervous irritation derived from the wounded part, how does it happen, that, amongst the thousands of wounded after a great battle, hydrophobia is not seen instead of tetanus. (*Dict. des Sciences Méd. T.* 47, *p.* 61.) But, if it were yet possible to entertain a doubt of an infectious principle in hydrophobia, this possibility would be removed by the reflection, that the disease may be communicated to healthy animals by inoculating them with the saliva of certain other rabid animals. In fact, as I have stated, the bites of such animals are in every point of view only an inoculation; and the same remark may be extended to the numerous instances on record, in which the disease arose in the human subject, as a consequence of a rabid dog, or cat, (not suspected to be in this state at the time) having been played with, fondled, or suffered to lick the naked skin, in which there was at the moment some slight scratch, entirely overlooked.

Many of the ancient writers not only believed in the hydrophobic virus, or infectious principle, but even in its diffusion through the blood, flesh, and secretions in general; and this hypothesis was professed by Boerhaave, Van Swieten, Sauvages, F. Hoffman, &c. but, in proportion as the humoral pathology lost ground, the foregoing idea was abandoned, and the opinion adopted, that the infection is confined to the saliva, and wounded part, in which it has been inserted.

The tales of some old authors would lead one to think, that hydrophobia may be communicated by eating the flesh of a rabid animal. (*Fernelius, De Obs. Rer. Caus. et Morb. Epidem. lib.* 2, *cap.* 14; *Schenckius; Mangetus, &c.*) But, respecting these accounts, it is remarked, that they are not entitled to much confidence; for, it is certain, that rabies never begins as is stated, with regard to some of the cases in question, a few hours after the application of its cause, and its early stage is never characterized by any fury, or disposition to bite. And, besides, how can such relations be reconciled with the practice of the ancients, who, according to Pliny, employed the liver of the mad dog, or wolf, as a remedy? Palmarius also fed his patients for three days with the dried blood of the rabid animal. (*Mém. de la Soc. de Méd. p.* 136, *et le No.* 178.) The flesh of a bullock, which had been bit by a mad dog, and afterwards died rabid, was sold to the inhabitants of Medola near Mantua, yet none of them were attacked with hydrophobia. (*Andry, Récherches sur la Rage, &c. p.* 30.) Dr. le Camus informed Larrey, that he had eaten the flesh of animals, which died rabid, but he suffered no inconvenience from the experiment. And, it is stated in the letter of Dr. L. Valentin, that certain negroes in the United States of America had no illness from eating the flesh of pigs, which had died of rabies. (*Journ. Gén. de Méd. T.* 30, *p.* 417.) As for the question, whether the blood is infected? It is generally considered to be settled in the negative, notwithstanding the account given by Lémery of a dog, which was attacked with rabies, as is said, from lapping the blood of a hydrophobic patient, who had been bled. (*Hist. de l'Acad. Royale des Sciences*, 1707, *p.* 25.) Dupuytren, Breschet, and Magendie, were never able to communicate rabies by rubbing wounds with blood taken from mad dogs; and they even several times injected such blood into the veins of other healthy dogs, yet none of these latter animals were attacked with rabies, though they were kept for a sufficient length of time to leave no doubt upon the subject. (See *Dict. des Sciences Méd. T.* 47, *p.* 63.)

A point of greater practical interest, than the former, is, whether the drinking of the milk of an animal, labouring under rabies, is attended with any risk of communicating the disease? It is asserted by Timæus, that a peasant, his wife, children, and several other persons, were seized with hydrophobia, in consequence of drinking the milk of a rabid cow; and that the husband and eldest child were saved by medical treatment; but, that the wife and four of the children died. It is further stated, that three or four months afterwards, the maid and a neighbour, who had partaken of the milk of the same cow, also died of hydrophobia. (*Cons.* 7, *Obs.* 33.) In opposition to this account, however, several facts, reported by other writers of greater credit, tend to prove, that hydrophobia cannot be communicated by the milk of a rabid animal. (*Nova Acta Nat. Cur. Vol.* 1, *Obs.* 55; *Baudot, in Mém. de la Soc. Royale de Méd. an.* 1782 *et* 83, *T.* 2, *p.* 91.)

The cases, reported by F. Hoffman and Chabert, with the view of proving the possibility of infection, through the medium of the semen, are of no weight, because, on a critical examination of them, it will be found, that the infection of the women is stated to have taken place very soon after their husbands had been bit, which is quite at variance with the established character of the disease, as it never commences, and of course cannot be propagated in any manner, soon after the receipt of the bite. Besides, these histories are refuted by others of greater accuracy. (See *Baudot in Mém. de la Soc. Royale de Med. an.* 1782, *&c., p.* 92; *Rivallier, Vol. cit. p.* 136, 211; *Bouteille, p.* 237; *Boissière, in Journ. Gén. de Méd. T.* 17, *p.* 296.)

Neither can hydrophobia be imparted by the breath, notwithstanding the statements of Cælius Aurelianus, and some other old writers. A nurse, mentioned by Dr. J. Vaughan, repeatedly kissed a hydrophobic infant, which she had suckled, and exposed herself incessantly to its breath, but without the least ill effects. The fear which has also been entertained of the disorder being receivable from the application of the patient's perspiration to the skin, is not founded upon any authentic facts.

Does the infectious principle of rabies reside in the salivary secretion, or in the mucus of the trachea and bronchiæ? The common belief is, that, in hydrophobia, the salivary glands are considerably affected. But, it has been remarked by a modern writer, that if these glands exhibit no morbid alteration during the whole course of the disorder; if they are found healthy after death; if the air-passages are the seat of inflammation; if the saliva does not constitute the frothy slaver about the lips; and if such slaver, wherewith the disease may be communicated by inoculation, is derived from the inflamed windpipe and bronchiæ, and consists of mucus converted into a kind of foam by the convulsive manner in which the patient breathes, there is some reason for questioning, whether the saliva, strictly so called, undergoes the alteration generally supposed? (See *Dict. des Sciences Méd. T.* 47, *p.* 66.) However, this writer is not exactly correct, when he describes the frothy secretion about the mouth, as being altogether composed of mucus from the trachea, since a great part of it is unquestionably true saliva and mucus secreted in the fauces and mouth. In the stomachs of dogs, which died rabid, Dr. Gillman constantly observed traces of inflammation, and he once tried to communicate the disease to two rabbits, by inoculating them with matter taken from pustules found in the stomach of a rabid dog; but no infection took place. (*On the Bite of a Rabid Animal, p.* 32.)

According to Professor Rossi, of Turin, the nerves "before they grew cold, participated with the saliva in the property of communicating rabies." He asserts, that he once imparted the disease by inserting in a wound a bit of the sciatic nerve, immediately after it had been taken from a living rabid cat. (See *Mém. de l'Acad. Imp. de Turin, Sciences, Phys. et Mathém. de* 1805 *à* 1808, *part* 93, *de la Notice des Travaux.*)

After all which has been stated, concerning the hypothesis of the infectious principle of hydrophobia being more or less diffused through the solids and fluids of a rabid animal, and not being restricted to the saliva, perhaps the safest conclusion to be made is, not to reject the opinion altogether, but to consider it as at present requiring further proof. And from observations of what happens in the human subject, the same inferences should not always be drawn, as from experiments on animals, which are liable to be attacked with spontaneous rabies of a decidedly infectious character. (See *Dict. des Sciences Méd. T.* 47, *p.* 67.)

Although many cases are to be met with in the records of medicine and surgery, tending to convey an idea, that the mere application of the saliva of a rabid animal to the sound entire skin of the human subject, may give rise to hydrophobia, the assertion is contrary to general experience, and liable to a reflection which must overturn the hypothesis; viz. the slightest prick, scratch, abrasion, or broken pimple on the surface of the body, such as would not be likely in many instances to excite notice, may render the application of the saliva to the part a positive inoculation.

Instances are also reported, the tenor of which is to prove, that the hydrophobic virus may take effect through a sound mucous membrane. (*Palmarius, de Morbis Contag.*; *Portal, Obs. sur la Rage, p.* 131; *Matthieu in Mém. de la Soc. Royale de Méd. p.* 310, *&c.*) But, that this does not happen in the human subject is tolerably well proved by the consideration, that formerly a class of men made it their business to suck the wounds, caused by the bites of rabid animals; yet none of them contracted hydrophobia from this bold employment. (*Bosquillon, Mém. de la Soc. d'Emulation, T.* 5, *p.* 1.) The example of the nurse, who repeatedly kissed a child without the least ill effect, while it was dying of rabies, as recorded by Dr. J. Vaughan, has been already noticed. However, if hydrophobia were apparently to arise in any rare instance from the application of the slaver of a rabid animal to the inside of the lips, no positive inference could be drawn from the fact, unless the means were also possessed of ascertaining, that there were no slight abrasion about the gums, or within the mouth, previously to such application.

For the hydrophobic virus to take effect, therefore, it is generally, if not always necessary, that the infectious saliva be either applied to an abraded, wounded, or ulcerated surface. In the case of a bite, the teeth are the envenomed weapons, which at once cause the solution of continuity, and deposit the infection in the part. But, the mere abrasion of the cuticle, and the application of the infectious saliva to the denuded cutis, will often suffice for the future production of the disease. As the mode of communication, therefore, is a true inoculation, it follows, that the danger must depend very much upon the quantity of infectious matter conveyed into, or applied to the part, the effectual manner in which the saliva is lodged in the flesh, the extent and number of the wounds, and particularly the circumstance of the teeth of the rabid animal having passed through no clothes, by which the saliva might possibly be effectually prevented from entering the wound at all. Hence, bites on the hands and face are well known to be of the most dangerous description, especially those on the face, the hands being sometimes protected with gloves.

From what has been observed, however, it is not to be concluded, that the disease always follows, even when the animal, which inflicts the bite, is decidedly rabid, and some of its saliva is actually applied to the wounded, or abraded parts. On the contrary, experience fully proves, that out of the great number of individuals often bit by the same mad dog, and to whom no effectual prophylactic measure is extended, only a greater or lesser number are afterwards attacked with hydrophobia. When this difference in the fate of the individuals cannot be explained by the intervention of their clothes, the thickness of the cuticle at the injured part, the small size and superficial nature of the bite, the ablution of the part, or some other mode, in which any actual inoculation may have been rendered ineffectual, it can only be referred to some unknown peculiarities, or differences in the constitutions of the several individuals. The latter conjecture seems more probable, when the fact is recollected, that some animals are more susceptible of rabies, than others, and some appear to resist the infection altogether.

Dogs are more susceptible of the infection, than the human species. Four men, and twelve dogs, were bit by the same mad dog, and every one of the dogs died of the disease, while all the four men escaped, though they used no other means of prevention but such as we see every day fail. There is also an instance of twenty persons being bit by the same mad dog, of whom only one had the disease.

Dr. Heysham has defined hydrophobia to be an aversion and horror at liquids, exciting a painful convulsion of the pharynx, and occurring at an indeterminate period after the canine virus has been received into the system. Dr. Cullen places it in the class *neuroses*, and order *spasmi*, and defines it a loathing and great dread of drinking any liquids, from their creating a painful convulsion of the pharynx, occasioned most commonly by the bite of a mad animal. Others have suggested the following definition, as more complete: melancholy, dread of cold air, of any thing shining, and particularly of water; often arising from the bite of a mad animal. (*Parr's Med. Dict.*) However, the latter definition is, perhaps, equally objectionable, because there is not invariably a dread of shining bodies. (See *Dr. Powell's Case, p.* 8.) While some authors represent it as a nervous disorder, others, amongst whom is Boerhaave, consider it as one of an inflammatory nature. In many systems of surgery, hydrophobia is treated of with poisoned wounds, of one species of which it is strictly the effect.

With regard to the symptoms of hydrophobia, they are generally tardy in making their appearance, a considerable, but a very variable space of time usually elapsing between their commencement and the receipt of the bite. Out of a table of 131 cases, none of the patients became ill before the eleventh day after the bite, and only three before the eighteenth. It is pretended by Pouteau, that one patient was bit by a dog in the morning, and was attacked with hydrophobia at three o'clock in the afternoon. But, as this account was communicated to the author a long time after the occurrence, and not by a medical man, it deserves little confidence. Another case, adverted to by Mead, is deprived of all its importance by the same consideration. These examples, as well as another reported by Astruc, in which the patient is said to have had hydrophobia in less than three days, after being wounded on the temples, can at most be regarded only as specimens of symptomatic hydrophobia. (*Dict. des Sciences Méd. T.* 47, *p.* 74.) There appears to be no determinate period, at which the disorder makes its attack after the bite; but, it is calculated, that the symptoms most frequently commence between the 30th and 40th day, and that after this time the chances of escape increase. Of 15 patients, whose cases Trolliet was acquainted with, seven were attacked between the 14th and 30th days; five between the 30th and 40th; two a little beyond the latter period; and one after 14 weeks. In May 1784, 17 persons were bit by a rabid wolf near Brive, of whom 10 were afterwards attacked with hydrophobia; viz. one on the 15th day after the bite; one on the 18th; one on the 19th; one on the 28th; one on the 30th; one on the 33d; one on the 35th: one on the 44th; one on the 52d; and the last on the 68th day. (*Hist. de la Soc. Royale de Méd. p.* 209.) Fothergill and Mosely mention cases, in which the disease began four months after the bite; and M. Matthey, of Geneva, details an instance, in which the interval was 117 days. (*Journ. Gén. T.* 54, *p.* 275.) Haguenot knew of a case, in which the interval, between the bite and the commencement of the illness, was five months. (*Portal, p.* 183.) Dr. J. Vaughan mentions an interval of nine months; Mead, of 11; Galen, Bauhin, and Boissière, of a year; Nourse, of 19 months; and R. Lentilius, of three years.

Dr. Bardsley, of Manchester, has recorded a case, in which the most careful inquiries tended to prove, that the patient had never suffered the least injury from any animal, except the bite, inflicted twelve years previously to the commencement of hydrophobia, by a dog apparently mad. (*Mem. of Liter. and Phil. Society of Manchester*, *Vol.* 4, *Part* 2, *p.* 431.)

A merchant of Montpelier, is also stated to have been attacked with hydrophobia ten years after the bite of a rabid dog, which also bit the patient's brother, who died hydrophobic on the 40th day after the accident. (See *Dict. des Sciences Méd. T.* 47, *p.* 75.) Here may also be found references to cases, in which the interval is alleged to have been 18, 20, and even 30 years. It is certainly difficult to attach any credit to these very late periods of attack. Dr. J. Hunter considers 17 months, and Dr. Hamilton 19, the longest interval, deserving belief. (*On Hydrophobia, Vol.* 1, *p.* 113.) Exposure to the heat of the sun, violent emotions of the mind, and fear, are believed to have considerable influence in accelerating the commencement of the symptoms. That mental alarm is also of itself sometimes capable of bringing on a simple hydrophobia, totally unconnected with infection, is incontestable; a case, which has not always been duly discriminated. A most convincing proof of this fact is recorded by Barbantini, in the Italian Journ. of Physic, Chemistry, &c. for January and February, 1817. A young man was bit by a dog, which he fancied was mad, and on the 5th day he evinced symptoms of hydrophobia, of which he was nearly dying, when the dog, which had bit him, was shown to him perfectly well, and the intelligence tranquillized him so effectually, that he was quite well four days afterwards. Mr. John Hunter is said to have mentioned in his Lectures a very similar case, in which be believed the patient would certainly have died, if the dog, which inflicted the bite, had not been found, and shown to the patient perfectly well. (See *Journ. Gén. de Méd. T.* 41, *p.* 215.) It is to the effects of terror, that several modern writers are disposed to refer the instances of very late attacks of hydrophobic symptoms after the period when the patients were bitten; though, unless the intellects be changed in the mean time by other causes, it is difficult to conceive, why the alarm should not have the greatest effect earlier, while the impression of the danger is undiminished by time. The idea, that the symptoms begin sooner after the bite of a wolf, than that of a dog, is not adopted by a writer, who has taken great pains to collect information on the present interesting disorder. (See *Dict. des Sciences Méd. T.* 47, *p.* 77.)

Cullen has divided the disease into two stages, the hydrophobia *simplex* and *rabiosa*; or the *melancholy* and *raving* stages of some other writers. But, as the early stage is frequently unattended with any thing, like melancholy, it is best merely to adopt the distinction of the *first* and *second* stages; one comprehending the effects of the disorder previously to the occurrence of a dread, or decided aversion of liquids; the other, the subsequent changes. The wound, if treated by common methods, usually heals up at first in a favourable manner. At some indefinite period, and, occasionally, long after the bitten part seems quite well, a slight pain begins to be felt in it, or the neighbouring parts, now and then attended with itching, but generally resembling a rheumatic pain. If the bite took place on the finger, the pain successively extends from the hand to the forearm, arm, and shoulder, without any redness or swelling in these parts, or any increase of suffering from pressure or motion of the limb. In a great number of instances the trapezius muscle, and the neck, on the same side as the bite, are the points to which the pain principally shoots. The cicatrix, in the meanwhile, begins to swell, inflames, and often festers and discharges an ichorous matter. These uneasy painful sensations recur from time to time, and usually precede any dread of water several days; and, they are a just reason for apprehension. Sometimes pains of a more flying, convulsive kind, are felt in various parts of the body. As the disease advances, the patient complains of the pain shooting, from the situation of the bite, towards the region of the heart. Sometimes, instead of pain, there is rather a feeling of heat, a kind of tingling, or even a sensation of cold, extending up to the chest and throat. Occasionally no local symptoms take place: thus Sabatier, in giving account of several cases, remarks it as worthy of notice, that the bitten parts did not become painful previously to the accession of the fatal symptoms: nor did any swelling, or festering occur. (See *Mém. de l'Institut. National, T.* 2, *p.* 249, *&c.*)

Dr. Marcet particularly observed, that the pain follows the course of the nerves, rather than that of the absorbents. In the case which he has related, as well as in one of the cases, detailed by Dr. Babington, there was pain in the arm and shoulder, but without any affection of the axillary glands; and in another case, (see *Medical Communications, Vol.* 2,) the pain, occasioned by a bite in the leg, was referred to the hip and loins, without any affection in the inguinal absorbents. (*Medico-Chir. Trans. Vol.* 1. *p.* 156.) Of the accuracy of the foregoing statement, by Dr. Marcet, there is no doubt: the observation, however, in regard to the irritation not affecting the absorbents, was long ago anticipated by several authors, who urged the freedom of the lymphatic glands from disease, as an argument that the disorder did not depend upon the absorption of any virus. It is also noticed by others, who inclined to the belief, in the absorption of the infectious principle. "Resorptionem virus ope systematis lymphatici fieri verisimillimum videtur; neque tamen nec vasa lymphatica, nec glandulæ vicinæ stimulo morboso, vel tumore adfici videntur; quod in aliis resorptionibus virulentis fieri solet." (*Callisen Syst. Chirurgiæ Hodiernæ, Vol.* 1, *p.* 595, *Hafniæ*, 1798.)

Pain and heaviness are felt in the head. Sometimes, the headach is at first very severe; sometimes but slight; but, in the latter case, it often becomes intense, general, and accompanied with a sense of pressure upon the temples. In certain instances, the patient's sleep lasts a good while, though disturbed by dreams; while, in other more frequent examples, he is continually restless. The intellectual functions generally seem increased; the memory stronger; the conception more ready; the imagination more fertile; and the conversation more animated. However, some patients are silent, and dejected, and, when questions are put to them, the answers are short and peevish. But the greater number are active, lively, and talkative. At the same time, the organs of sense betray signs of increased sensibility; and the eyes, which are very open and bright, avoid a strong light. Sometimes, the pupil is found to be considerably dilated. Extraordinary pains are felt about the neck, trunk, and limbs. It is not uncommon, also, for the patient to evince great anxiety, or to fall into a state of dull despair, and melancholy. These last symptoms, of which great notice is taken by writers, are particularly ascribable to the effect of fear. The disorder of the organs of digestion is sometimes manifested in various ways, though it is far from being so frequent and striking, as the affections of the head, which precede it. The disorder referred to, consists at first in loss of appetite; nausea; vomiting; and afterwards constipation, and sometimes cholic. In the first stage of the disease, the pulse is generally somewhat more frequent and strong, than in health, and the countenance appears more animated.

The above symptoms precede the second stage, or that of decided rabies, only by a few days, usually four or six, though sometimes but two, or three. (*Dict. des Sciences Méd. T.* 47, *p.* 78.)

The second stage of hydrophobia commences with the first manifestation of the dread, or aversion of liquids. The ungovernable agitation and distressing sense of suffocation excited by the sight of liquids, the attempt to drink, or even the mere idea of drinking, is unquestionably the most remarkable symptom of the disorder. The patient is also frequently attacked with the same kind of commotion and suffering from other causes, such as the least agitation of the air, or exposure to a strong light. Indeed, some patients are so much affected by a blast of wind, that they have been known to endeavour to elude it by walking with their backs towards it; (*Hist. de la Soc. Roy. de Méd. p.* 157;) while others scream out whenever the window or door of their room is opened. (*Morgagni, De Sed. et Caus. Morb. Epist.* 8, *No.* 28.)

Dr. Marcet, in relating the case of the patient affected with hydrophobia, observes, that "on our proposing to him to drink, he started up, and recovered his breath by a deep convulsive inspiration; yet, he expressed much regret, that he could not drink, as he conceived it would give him great relief, his mouth being extremely parched and clammy. On being urged to try, however, he took up a cup of water in one hand, and a tea-spoon in the other. The thought of drinking out of the cup appeared to him intolerable; but, he seemed determined to drink with the spoon. With an expression of terror, yet, with great resolution, he filled the spoon, and proceeded to carry it to his lips; but before it reached his mouth, his courage forsook him, and he was forced to desist. He repeatedly renewed the attempt; but, with no more success. His arm became rigid and immoveable, whenever he tried to raise it towards his mouth, and he struggled in vain against this spasmodic resistance. At last, shutting his eyes, and, with a kind of convulsive effort, he suddenly threw into his mouth a few drops of the fluid, which he actually swallowed. But, at the same instant, he jumped up from his chair, and flew to the end of the room panting for breath, and in a state of indescribable terror." (See *Med. Chir. Trans. Vol.* 1, *p.* 158.) Even the splashing or running of any liquid causes a great deal of inconvenience. As the system becomes more and more affected, the patient loses his sleep entirely, and has frequent and violent fits of anxiety and loud screaming, from slight causes. The woman, whom Dr. Powell attended, was often attacked in this way, in consequence of so trivial a circumstance as a fly settling on her face. The noise of teacups, or the mention of any sort of drink, greatly disturbed her, though she was not at all agitated by the sound of her urine. The currents of air entering her room, whenever the door opened, became very distressing to her, and this more and more so. The pain in her neck became so great, that she could scarcely bear it to be touched; but she made use of a looking-glass without the inconvenience, which hydrophobic patients usually suffer from the sight of shining bodies. Dr. Powell states, that the paroxysms, which this poor woman suffered, resembled those of hysteria, and increased in duration as the disorder lasted. "She described their commencement to be in the stomach, with a working and fulness there, and that a pricking substance passed up into her throat and choked her; she screamed suddenly, and grasped firmly hold of her attendants, as if voluntarily; and muscular convulsions came on, which were sometimes more, sometimes less general and violent. The causes from which these paroxysms arose, were extremely slight; the passage of a fly near her face, the attempt to swallow a pill, a stream of air, the sight of oil or wine, or any other liquids, even the sound of water, and other such circumstances, were sufficient; she now also complained of inconvenience from light, which was accordingly moderated. The effect of sounds was peculiar; for, though in the subsequent stages, their influence became more general, at this period the effect was rather proportionate to the ideas they excited in her mind, than to their violence. Bells, and other strong noises, did not agitate her, but the clatter of earthenware, the noise of a distant pump, or any thing connected with liquids, produced the paroxysms in all their violence." She could swallow fresh currants with less resistance than any thing else, taking care that they were perfectly dry. Her mind had, till now, been quite calm and composed, and her conversation and behaviour proper, during the intervals of the convulsive attacks. But Dr. Powell was obliged to discontinue the pills of argentum nitratum, in consequence of the sufferings, which the attempt to swallow them regularly brought on. Fifteen grains of this substance had been given without any sensible effect. The fits, and the irritability to external objects, increased. The pain shot from the back of the neck, round the angles of the jaws, the chin, and throat. At length, the paroxysms became more frequent, and, indeed, might be said to come on spontaneously: seven occurred in one hour. She looked pale and exhausted, and a tremor and blueness of her lips and fingers were observable; her pulse became weaker and more rapid, and her scalp so tender, that touching it brought on convulsions. She had, latterly, eructations of wind, and spit up some thick viscid saliva. Her urine now came away involuntarily, and she was more and more irritable and uncontrollable. Indeed, she passed two hours in almost constant convulsions; became extremely irritable and impatient of every thing about her; complained of failure of her sight; wished to be bled to death; her words were fewer and interrupted; she struck, and threatened to bite, her attendants; had copious eructations of air; discharged an increased quantity of viscid saliva with much convulsive effort; said the affection of her throat and stomach had quite left her; and continued in a general perspiration, with a weak pulse from 140 to 150. She afterwards bit some of the attendants, and was therefore confined with a waistcoat. From this period, she had lost all control over her mind, and continued for almost four hours in a paroxysm of furious insanity. She now swallowed, with an effort, near half a pint of water: but this was, in a few seconds, vomited up, with some mucus, and a greenish fluid. In this violent raving state, she continued till within two hours of her death, which took place forty-seven hours after the first marked occurrence of hydrophobia. In the course of the case, she swallowed once, or twice, a little porter; and also some cinnamon-water, with tinct. opii; but they were always vomited up. (*Dr. Powell's Case of Hydrophobia.*)

It is by no means uncommon for a period to occur, when the horror of liquids undergoes a considerable diminution, or even entirely ceases; the patient quenching his thirst, and this sometimes as well as if he were in perfect health, and so as to raise doubts of the existence of rabies. But, after a few hours, the dread of fluids comes on again, and with it the convulsive paroxysms, which now become general, violent, and incessant. Dr. Cayol attended a girl, labouring under rabies, who was never affected with any very great dread of liquids, nor an absolute inability to swallow them, though she certainly disliked them, and swallowed them with difficulty. (*Journ. de Méd. Chir. &c. Avril,* 1811, *p.* 241.) Nay, patients are sometimes seen who can manage to swallow red wine and broth, though their aversion to water is already beyond all control; and other patients can sometimes look at a liquid in a black pot without inconvenience; though any fluid offered to them in a glass will bring on a violent paroxysm of spasm and sense of suffocation. The sight of tears has even been enough to bring on the attack. (See *Dict. des Sciences Méd. T.* 47. *p.* 79.)

The question has sometimes been entertained, whether rabies can ever exist quite unattended throughout its course with a dread of liquids? The possibility of such a case was believed by Mead, and others, and an instance is recorded by Mignot, in which the patient died, without having manifested any sign of hydrophobia. (See *Hist. de la Soc. Roy. de Méd. an* 1783, 2*me Part. p.* 48.) However, it is asserted, that a careful perusal of this case must produce a conviction, that the disorder was not rabies; and it is added, that when the histories of this disease on record are critically investigated, none will be found complete, which do not make mention of a more or less decided aversion to fluids. It also appears from facts, referred to, that the dread of liquids does not depend upon the pain, which the patient has already suffered from his attempts to drink, as it sometimes occurs before any such attempt has been actually made. (*Vol. cit. p.* 80.)

An inclination to bite was evinced in the case recorded by Dr. Powell; and also in another reported by Magendie. Yet, this disposition is far from being usual; and it never presented itself in any of the cases, which fell under the observation of the author of the article *Rage* in the foregoing publication, or P. Desault, Duchoisel, Dr. J. Vaughan, Sabatier, Dupuytren, &c. And, even when the patient's imagination is so disordered, that he cannot help biting, he commonly warns the bystanders to avoid the danger. The frothy slaver, which is voided with considerable and repeated efforts, is a symptom, which is said not to commence before the respiration begins to be convulsive. As the disease advances, there is no remission of the sputation, necessary to clear the throat of this viscous secretion; and, at the approach of death, when it cannot be expelled, it collects in the mouth, and covers the patient's lips.

The symptoms of what is termed cerebral excitement become stronger and more marked in the second stage of the disease. The eyes, the brightness of which is still further increased, appear, as it were, inflamed; the patient never shuts them again; and, as the daylight and brilliant colours are offensive, he prefers darkness. The hearing becomes very acute, and, as well as the sight, is troubled with hallucinations. The touch is extremely fine; the speech abrupt and rapid; and the conversation energetic, and often expressive of the most touching sentiments. (*Dict. des Sciences Méd. T.* 47, *p.* 12.)

Dr. Marshall made a very just distinction, between the real convulsions which came on towards the termination of the case in death, and the strong sudden action of the muscles, excited in the course of the disorder by the light, the sight of liquids, and the feel of the air. (*The Morbid Anatomy of the Brain, &c. p.* 88.) Convulsions and hiccough, in fact, are the symptoms of dissolution.

Delirium is far from being a constant symptom, and only happens the last day of the disorder. Neither is it always without remissions; for the patients, affected with it, sometimes give rational replies. Every case upon record, where delirium is described as being one of the first symptoms, or as coming on with the dread of liquids, is set down on good authority, not as true rabies, but a symptomatic hydrophobia, attended with mania.

The dread of swallowing liquids, though the most singular symptom of the disease, constitutes but a small part of it. It is true, that none, or very few recover, who have this symptom, yet, they certainly do not die, in consequence of the difficulty of swallowing liquids; for, the human body could easily exist double the time, at the end of which the disease usually proves fatal, without food, or drink. Besides, the sick can often swallow substances, that are nourishing, in a pulpy state, without, however, having their life thereby at all prolonged. It is not, therefore, the difficulty, or impossibility of swallowing liquids; but the effects of the poison upon the constitution at large, which occasion death. *(Dr. J. Hunter in Trans. for the Improvement of Med. Knowledge, Vol.* 1, *p.* 305.)

The extreme sensibility of the sick to all impressions, appears in the displeasure which they express at even the air blowing upon them; in their dislike to a strong light; in their aversion to new faces, or even the sight of their friends and relations; and in the terror they express at being touched, which throws them into convulsions. In a case related by Magendie, the slightest noise, and even the merely touching of the patient's hair, excited convulsions of incredible violence. As the disease advances, the mind is more and more filled with dreadful fears and apprehensions. (*Op. cit. p.* 307.)

In the second stage, the epigastrium, as well as the chest, is the seat of considerable pain; the patient is constipated, but the urine is plentiful and high-coloured. Before a certain period, the pulse is generally strong, regular, and a little accelerated; but, towards the end of the case, it becomes small, irregular, feeble, and rapid. (See *Dict. des Sciences Méd. T.* 47, *p.* 83.)

The duration of life, from the appearance of hydrophobia till death, varies from thirty-six hours to four or five days: the most common period is from two to three days. *(Dr. J. Hunter, Op. cit. p.* 308.) The event is said to be directly caused by asphyxia, or the cessation of respiration. Of ten persons, who were bitten by the same animal, nine died on the second and third day, from the commencement of the horror of fluids, and only one on the fifth day. There is an account of a child at Senlis, who lived nine days, but the description of the case, and the circumstance of fourteen worms being found in the intestines, may raise doubts about the nature of the disease. (See *Hist. de la Soc. Roy. de Méd. p.* 155, 209.)

Whatever may be the resemblance found between tetanus and hydrophobia, with regard to the rapidity of their course, their causes, and some of their symptoms, the following considerations, as a modern writer observes, will always serve for the discrimination of one disorder from the other: tetanus attacks the muscles of the jaw, which remains motionless, while in rabies, the jaw is not only moveable, but incessantly moving, in consequence of the efforts unremittingly made by the patient to free his mouth from the thick saliva, with which it is obstructed. In this last disorder, the muscles are alternately contracted and relaxed; but, in tetanus, they always continue rigid. Tetanus is rarely attended with any aversion to liquids, and the patient may be kept for a long time in a bath without inconvenience; and the paroxysms are neither excited nor increased by a vivid light, a noise, the patient's being touched, or the sight of water, or shining surfaces. In addition to these differences, it is to be remembered, that tetanus is most frequent in warm climates, and that it mostly comes on a few days after the receipt of a local injury, and may occur as a complication of any kind of wound, even that which is made in a surgical operation. (See *Dict. des Sciences Méd. T.* 47, *p.* 68.)

On the subject of prognosis, with respect to the bite inflicted by a rabid animal, and its effects, as evinced in the decided form of rabies, there are several things worthy of attention. According to some writers, small wounds are not less dangerous than others, and an attempt is made to account for the fact, by the more copious hemorrhage from larger wounds, and the frequent neglect of lesser injuries. Perhaps, another reason is, that, the virus is more likely to be confined in a wound with a small orifice, than in one which is ample and admits of being more effectually washed. The more numerous the wounds are, the greater is the risk. If it be inquired, what is the average number of persons attacked with rabies, out of a given number who have received bites?—the question can only be answered by referring to the extremes. Thus, Dr. J. Vaughan speaks of between twenty and thirty individuals, bit by a mad dog, of whom only one was afterwards attacked with rabies; and Dr. J. Hunter tells us of an instance, in which out of twenty-one persons bit, only one became affected. (See also *Fothergill in Med. Obs. and Inq. Vol.* 5, *p.* 195.) On the other hand, out of fifteen persons, bit by a mad dog, and taken care of at Senlis, three at least were seized with the disorder. *(Hist. de la Soc. Roy. de Méd. p.* 130.) Of seventeen others, bit by a wolf, ten were attacked; (*ib. p.* 130;) and of twenty-three, bit by a she-wolf, thirteen died of rabies. (*L. F. Trolliet, Nouveau Traité de la Rage, &c. Obs. Chirurg. &c. No.* 25.)

Two important facts should always be recollected, viz. the disease may often be prevented; it can hardly ever be cured. Experience has fully proved, that when hydrophobia once begins, it generally pursues its dreadful course to a fatal termination, the records of medicine furnishing very few unequivocal, and well authenticated, cases to the contrary. Hence, the imperious necessity of using every possible means for the prevention of the disorder.

Probably, however, many things which possess the character of being preventive of hydrophobia, have no real claim to such reputation. I would extend this observation to all internal medicines, mercurial frictions, and plunging the patient for a considerable time under water.

The instances, in which a prevention is inferred to have taken place by different writers, in consequence of such means, may all be very rationally ascribed to other circumstances. Facts already cited sufficiently prove, that, out of the great number of persons, frequently bitten by the same dog, only a limited proportion is commonly affected. The hydrophobic poison is known to reside in the saliva of the animal; consequently, the chance of being affected must greatly depend upon the quantity of this fluid which is insinuated into the wound; and, if the teeth of the animal should have previously pierced a thick boot, or other clothing, before entering the skin, the danger must obviously be much diminished. Many patients wash and suck the wound, immediately after its occurrence, and thus, no doubt, very often get rid of the poison. Even when it is lodged in the wound, it may not be directly absorbed, but be thrown off with the discharge. All prudent patients submit to excision of the bitten part. Now, under each of the above circumstances, escapes have frequently occurred, while internal medicines, half drowning or salivating the patients, had also not been neglected, so that all the efficacy of preventives has too often been most unjustly ascribed to means, which probably never yet had, and never will have any, beneficial effect whatever. What confirms the truth of the preceding statement is these facts; that, persons bitten by the same animal, have sometimes been treated exactly on the same plan; some of them escaped the disease; others had it, and of course, perished: on other occasions, some of the patients, bitten by the same animal, have been treated in a particular way, and have escaped hydrophobia; while others bitten at the same time by the animal, also never had any constitutional effects, although they took no medicines, nor followed any other particular plan.

If to these reflections be added the consideration, that it is frequently doubtful, whether the bite has actually been inflicted by a truly rabid animal, and that the mental alarm, will sometimes bring on a symptomatic hydrophobia, it is easily conceivable, how mistaken a person may be, who believes, that he has prevented the disorder, and how unmerited is the reputation of the means, which he has employed for the purpose.

The bite of a naturally ferocious beast has often been thought to be attended with more risk, than that of an animal, naturally tame; and hence, the bite of a wolf is said to be more frequently followed by rabies, than that of a dog. This proposition is admitted to be true; but, the explanation is erroneous. The true reason of the difference is, that a wolf usually seizes the face, and inflicts a deeper bite; while a dog only snaps as he runs along, and mostly bites through the clothes. (See *Dict. des Sciences Méd. T.* 47, *p.* 88.) The bite of a rabid animal may be rendered much more dangerous by being situated near a part, or an organ, which increases the difficulty or risk, of adopting an effectual mode of removing the whole of the flesh, in which the virus may be lodged. Thus, bites near the large arteries, the eyes, the joints, &c. are of a more serious description than others. Dr. J. Hunter rated the hazard in some degree by the vascularity of the bitten parts. The prognosis will always be more unfavourable, when no proper measures have been applied to the bite soon after its infliction, and perhaps the risk may be increased by certain causes not having been duly avoided, which, as already stated, are thought to have a tendency to accelerate the attack of rabies. The exact time after a bite, when the prevention of rabies is no longer practicable, is quite an undetermined point; but every fact, known upon the subject, evinces in an urgent manner, the necessity of adopting preservative measures without the least delay.

In almost all the dissections of patients, who have died of rabies, certain indications of inflammation have been perceptible, more frequently, in some part of the space between the pharynx and the cardiac orifice of the stomach, in the stomach itself, in the lungs, the choroid plexus, and membranes of the brain. (See *Med. Repository, Vol.* 3, *p.* 51.) M. Trolliet opened with the greatest care, six bodies of persons, destroyed by this disease. The mouth and fauces in each subject were first examined, and found of a pale greyish colour, scarcely lubricated with mucus, and quite free from all frothy matter. All the salivary glands seemed perfectly healthy. When the larynx, trachea, and bronchiæ were opened, they appeared to have been the seat of inflammation, the traces of which were the most marked low down, where the mucous membrane was of the colour of wine-lees. In four of the bodies, frothy mucus was perceived in the bronchiæ, larynx, and trachea. Trolliet infers from these appearances, that the frothy matter, seen about the mouths and lips of patients affected with rabies, is secreted by the inflamed mucous membrane of the bronchiæ, and that it is this secretion, and not the real saliva, which contains the hydrophobic poison. (*Nouveau Traité de la Rage, &c.*) In giving an account of a dissection, Faure also long ago remarked, that the frothy matter was only met with in the air-passages, that the salivary organs were unaffected, and that the saliva itself did not contribute to the formation of the thick slaver, which appeared to have issued from the chest. (*Hist. de la Soc. Roy. de Méd. ann.* 1783, *p.* 39.) From the preceding observations, and those of Mignot de Genety (*Vol. cit. p.* 54), Morgagni (*De Sedib. et Caus. Morb. Epist* 8, *art.* 20, 25, 30), Darlue (*Journ. de Méd. de Vandermonde, T.* 4, *p.* 270); B. Rush; and Dupsey (*Obs. Inédites, No.* 138) it would appear:

1. That the mouth, strictly so called, and the salivary glands are without any alteration.

2. The mucous membrane of the air-passages is affected with inflammation, which in its highest degree extends from the division of the bronchiæ to the pharynx. When the inflammation is of less extent, the pharynx appears sound; and when yet more limited, it is usually not to be traced in the larynx. The point, where it seems to commence and is most strongly marked, is at the lower part of the trachea, or in the bronchiæ. Lastly, when none of these parts are found inflamed, the lungs themselves present vestiges of inflammation.

With respect to the theory of Trolliet, wherein the hydrophobic poison is said to be contained in the mucous secretion voided from the lungs, and to be the product of inflammation of the membrane of the bronchiæ, and not derived from the salivary glands, the question requires the confirmation of experiment; for, though the salivary glands are not the seat of pain, swelling, &c. it by no means follows, that their secreting process may not have been subject to some peculiar modification, on which the production of the hydrophobic virus depended. Thus, severe and obstinate ptyalisms often occur, and yet there is no manifest change in the state of the salivary glands. According to Van Swieten and Mead, there are also sometimes no morbid appearances either in the head, fauces, chest, or stomach. (*Comment. in Boerh. T.* 3, *p.* 562.)

In three cases, out of six, the lungs were found emphysematous, that is to say, their interlobular substance was distended with air, and the pleura pulmonalis raised into a great number of transparent vesicles on the surface of the lungs. In a fourth instance, the emphysema was not observed in the lungs themselves, but in the cellular substance between the two layers of the mediastinum; and under the muscles of the neck. Morgagni also noticed vesicles of air on the surface of the lungs of a person, that died of hydrophobia. (*De Sed. et Caus. Morb. Epist.* 8, *art.* 30.) M. Trolliet presumes, that this emphysema is occasioned by the rupture of one of the air-cells, in the convulsive efforts of respiration, as sometimes happens when a foreign body is lodged in the larynx. (See *Cases by Louis and Lescure in Mém. de l'Acad. de Chir. T.* 4, *p.* 538; *T.* 5, *p.* 527.)

The lungs were of a deep red colour in all the six subjects dissected by Trolliet, and they were observed to be gorged with blood in cases reported by numerous writers: as Bonet (See *Van Swieten, T.* 3, § 1140); Boerhaave (*Op. Omn. p.* 215); Morgagni (*De Sedibus et Caus. Morb. Ep.* 8, *art.* 23, *&c.*); Mead, Darlue (*Recueil Périod. &c. T.* 3 *and* 4); Faure (*Hist. de la Soc. Roy. de Med. p.* 39); De la Caze (*ib. p.* 69); Portal, Oldknow, Balfingall (*Edinb. Med. and Surg. Journ.*); Marshall (*Morbid Anatomy of the Brain, &c. p.* 69); Gorey (*Journ. de Méd. Chir. T.* 13, *p.* 83); Ferriar (*Med. Hist. and Reflections, &c.*). "Pulmones in quinque nigri ex toto, aut magnâ parte (says Morgagni), in quatuor magnâ item ex parte sanguine pleni." With respect to the state of the organs of the circulation, in three of the cases dissected by Trolliet, a good deal of air escaped from the heart and aorta. Morgagni is supposed to be the only other writer, who has noticed a similar occurrence (*Epist.* 8, *No.* 30), and who also in another case saw air escape from beneath the dura mater. (*Ib. No.* 23.) In two of Trolliet's cases, some gelatinous clots were found in the heart and large vessels; but the great mass of blood was black, and very fluid in the heart, arteries and veins, as in subjects, who have died of asphyxia. In all the six cases, traces of inflammation were noticed in the brain, or its membranes. The sinuses were filled with a dark-coloured fluid blood; and the pia mater was much injected, and of a brownish hue. The same appearances were found above the cerebellum, and the vessels on the investment of the medulla spinalis were considerably enlarged. The surface of the cerebrum was also studded with scarlet spots, which appeared to arise from blood effused from the small vessels of the pia mater into its cellular substance. In two subjects, blood was extravasated towards the base of the brain in larger quantity. The plexus choroides was gorged with blood, and of a brown colour. Besides these and other changes, Trolliet remarked, in two of the cases, a thickening of the pia mater. The substance of the brain was generally softer than usual; but the fluid in the lateral ventricles was not in large quantity, though, in two cases, it had a bloody tinge. The late Dr. Marshall believed that in rabies, the brain was the part principally affected. (*Op. cit. p.* 145.)

Hufeland conjectured, that, in hydrophobia, the medulla spinalis is the part, originally affected, whence the effects of the disease are propagated to the nerves of the trunk. (*Bibl. Med. T.* 55, *p.* 395, *&c.*) Dr. R. Reid believed, that an alteration of the spinal marrow was essentially concerned in the disease. (*On the Nature, &c. of Tetanus and Hydrophobia,* 8vo. *Dublin,* 1817.) A case was also published by M. Matthey, of Geneva, in which a quantity of serum was found within the spinal canal. (*Journ. Gen. de Méd. T.* 54, *p.* 279.) See on this subject some observations by Dr. Abercrombie. (*Edinb. Med. and Surg. Journ. Vol.* 14, *p.* 66.)

According to Trolliet, the traces of inflammation in the digestive organs are not so constant as in the lungs and brain. In none of the six cases dissected by him, was there any appearance of inflammation in the pharynx, though some parts of the alimentary canal were affected in this manner. The cases recorded, however, in which the digestive organs presented considerable morbid appearances, are very numerous. Thus Joseph de Aromatarius, Darlue (*Recueil Périod. T.* 3, *p.* 189, *et T.* 4, *p.* 270), Sauvages (*p.* 107), Professor Rossi, M. Gorci (*Journ. de Méd. Chir. &c. T.* 13), and Dr. Powell (*Case of Hydrophobia*), found inflammation either in the pharynx, or œsophagus, or both these tubes. Dr. Powell's words are "the œsophagus was rather redder, than natural, and covered with a thin layer of coagulable lymph." A similar coat of lymph was also found by Oldknow (*Edinb. Med. and Surg. Journ. Vol.* 5, *p.* 280), Ballingall (*Op. cit. Vol.* 11, *p.* 76), Dr. Ferriar: (*Med. Hist. &c. Vol.* 3, *p.* 27.) In dogs, Dr. Gillman found the pharynx and œsophagus in a state of inflammation. (*On the Bite of a Rabid Animal, p.* 13, 23, 26, 44.) It is conjectured, that in many of these instances, the inflammation extended to the œsophagus from the trachea and bronchiæ. (*Dict. des Sciences Méd. T.* 47, *p.* 98.) Inflammation of the mucous membrane of the stomach, and small intestines, has likewise been very generally noticed, as may be seen by referring to the accounts published by Morgagni, Powell, Oldknow, Ferriar, Ballingall, Marshall, &c. In dogs, the same fact was remarked by Dr. Gillman, (*p.* 13, 31, 44); sometimes, however, according to this last author, no vestiges of inflammation, nor any other morbid appearances, are discoverable in the examination of animals, that have died of rabies. (*P.* 83.) Dupuytren is stated to have found the mucous membrane of the stomach and bowels inflamed in several places, and even almost gangrenous. (*Dict. des Sciences Méd. T.* 47, *p.* 98.)

From recent investigations, made at the veterinary school at Alfort, by Professor Dupuy, the following are the usual morbid appearances, noticed in the dissection of dogs, horses, cows, and sheep, destroyed by rabies. 1. The lungs and brain universally gorged with blood. 2. Greater or lesser marks of inflammation in the mucous membrane of the bronchiæ, trachea, larynx, throat, œsophagus, stomach, and frequently even in that of the bowels, vagina, uterus, and bladder. 3. The air passages filled with frothy mucus. 4. A collection of serum in the ventricles of the brain, and sometimes even between the membranes, covering the spinal marrow. 5. An unusual redness of the investment of the pneumogastric and trisplanchnic nerves. (See *Dict. des Sciences Méd. T.* 47, *p.* 99.)

Happily, surgery possesses one tolerably certain means of preventing hydrophobia, when it is practised in time, and in a complete manner. Every reader will know, that the excision of the bitten parts is the operation, to which I allude.

Indeed, as hydrophobia is often several months before it begins, the wounded parts should, perhaps, always be cut out, even though they are healed, and some weeks have elapsed since the accident, provided no symptoms of hydrophobia have actually commenced. The operation should be done completely; for a timorous surgeon, afraid of cutting deeply enough, or of removing a sufficient quantity of the surrounding flesh, would be a most dangerous one for the patient. All hopes of life depend on the prevention of the disorder; for, in the present state of medical knowledge, none can rest upon the efficacy of any plan, except the extirpation of the part. For this purpose, caustics have sometimes been employed. However, as their action can never be regulated with the same precision as that of the knife, and, consequently, they may not destroy the flesh to a sufficient depth, excision should always be preferred. The latter method is also the safest, for another important reason, viz. the part, and poison lodged in it, are removed from the body at once; but, when the cautery or caustic is used, the slough must remain a certain time undetached. Some surgeons are not content with cutting out the part: but, after the operation, fill the wound with the liquor ammoniæ, or cauterize its surface, for the sake of greater security. How late excision may be done with any prospect of utility I am not prepared to say; but, there are practitioners, who deem excision right, even when heat, irritation, or inflammation is observed in the bitten part. (See *Med. Repository*, *Vol.* 3, *p.* 54.)

Cases present themselves, in which it is even preferable to amputate the limb, than attempt to extirpate either with the knife, or cautery, the whole of the bitten parts; an endeavour, which could not be accomplished with any degree of certainty. Thus, as Delpech observes, when the hand, or foot, has been deeply bitten in several places, it is obvious, that it would be impossible to make caustic, (or the cautery) certainly reach every part, which the saliva of the rabid animal may have touched. Besides, the mischief resulting both from the injury, and the other proceedings together, might be such as to afford no prospect of saving the limb, or at least, of preserving it in a useful state. (See *Précis Elem. des Mal. Chir. T.* 2, *p.* 133.) I have known of one, or two cases, in which the patients lost their lives, in consequence of the excision, or destruction of the bitten parts not having been attempted, on account of the surgeon's reluctance to cut tendons, or wound a large artery, as one of those at the wrist. In such cases, however, the fear of rendering a muscle useless, or of wounding an artery, is no justification of leaving the patient exposed to a danger, so surely fatal, as that of the hydrophobic virus, if it once affect the constitution. The artery should be exposed for a sufficient length, and secured with two ligatures, when the requisite extirpation of the parts between them may be safely performed.

When once the hydrophobic symptoms have commenced, there is little or no hope of saving the patient, the disease having almost invariably baffled every plan of treatment, which the united talents of numerous medical generations have suggested. All the most powerful medicines of every class have been tried again and again; mercury; opium; musk; camphor; arsenic; the nitrate of silver; cantharides; belladonna; ammonia; plunging the patient in the sea; bleeding; &c. &c.

The inefficacy of opium is now generally acknowledged: in the space of fourteen hours, Dr. J. Vaughan gave one patient fifty-seven grains of opium, and also half an ounce of laudanum in a glyster, but the fatal termination of the disease was not prevented. Dr. Babington even prescribed the enormous quantity of 180 grains in eleven hours, without the least amendment, or even any narcotic effect. (*Med. Records and Researches*, *p.* 121.) On the very first day, that rabies decidedly showed itself in a man, who had been bit by a mad dog, Dupuytren injected into the vena saphena, by means of Anel's syringe, two grains of the extract of opium dissolved in distilled water, and as a degree of calm appeared to be the result, four grains more were thrown into the cephalic vein. The patient remained perfectly tranquil three hours longer; but the symptoms afterwards recurred with increased violence. The next morning, about six or eight grains more were dissolved, and thrown into the circulation; but, all was in vain, as the patient died in three quarters of an hour after the last injection. (See *Dict. des Sciences Med. T.* 47, *p.* 131.) By Dr. Brandreth, a solution of the acetate of morphine has been recently tried, without success. (See *Edinb. Med. Journ. No. LXXXII. p.* 76.)

As for belladonna, its employment for the prevention and cure of hydrophobia is very ancient, its external use for this purpose having been mentioned by Pliny, and its internal exhibition, with the same view, by Theod. Turquetus in a posthumous work published in 1696. (See *Praxeos Medicæ Syntagma*, *&c.*) In 1763, belladonna was recommended by Schmidt as a remedy for hydrophobia, and in 1779 by J. H. Munch. (See *Richter's Chir. Bibl.*) It has so frequently failed, that, in this country, very little confidence is now put in it; but, in Italy, it is still employed, and some cases, published by Brera, where it was exhibited in very powerful doses, in conjunction with the warm bath, and mercurial friction, tend to show, that it will sometimes arrest the disease, in its incipient state. (*Mem. Soc. Ital. Scienza Modena, T.* 17.)

A few years ago, the public hope was raised by the accounts given of hydro-chlorine, or oxymuriatic acid. Wendelstadt even published the story of an Englishman, who allowed himself to be bit several times by a mad dog, and then saved himself by washing the bites with this acid. And, still more recently, Brugnatelli, in the Italian Journ. of Physic, Chemistry, &c. (*T.* 9, *p.* 324) has published some observations, tending to prove its efficacy. The bites are washed with it, and then covered with charpie wet with it. And, when the symptoms commence, if it cannot be swallowed in a fluid form, Brugnatelli gives bread pills imbued with it. For a child eight years old, the dose is ℈ij, four, or five times a day, but gradually increased. According to Orfila, hydro-chlorine was long since recommended by Cluzel, as an internal remedy for hydrophobia. (*Sécours à donner aux personnes empoisonées*, *&c.* 8vo. *Paris*, 1818, *p.* 153.) With regard to Brugnatelli's cases, they are said to be so destitute of precision, that no inference can be drawn from them. (*Dict. des Sciences Méd. T.* 47, *p.* 119.) In order to give hydro-chlorine a fair trial, it was used internally and externally on seven patients in the Hôtel Dieu at Lyons in 1817. The bites were washed and bathed with it, and some of them also cauterized; and each patient took daily a dram of the acid, made into an agreeable sweetened drink. All these unfortunate individuals afterwards died of rabies, though the treatment was begun the day after the receipt of the wounds. (*L. F. Trolliet, Nouveau Traité de la Rage, &c.*) The excision of the bites 70 hours after their infliction, and washing the wound with oxymuriatic acid, did not, in Dr. Johnson's case, prevent the disease. (See *Edinb. Med. and Surg. Journ. Vol.* 15, *p.* 212.) In America, the plant scutelleria laterifolia has been lately extolled as a certain specific for hydrophobia. (See *A History of Scutellaria Laterifolia, as a remedy for preventing and curing Hydrophobia, by Lyman Spalding, M. D. New York,* 1819.) And, M. Marochetti, of Moscow, has described a new treatment, which consists in giving large doses of genista tinctoria, or butcher's broom, and pricking with a lancet, and then cauterizing with a hot needle some little pustules said by him to form at the orifices of the sub-maxillary glands, between the third and ninth day from the period of the bite, the mouth being afterwards well gargled with the decoct. genistæ. M. Magendie, West, and various English practitioners, however, have not been able to discern these sublingual pustules, possibly, in consequence of their having looked for them too late, that is, after the accession of the constitutional disorder; for it appears that M. Magistel, of Saintes, has noticed such pustules in several patients. Some arose on the 6th day, others later, and the latest on the 32d day. Of ten persons bitten, whom M. Magistel attended, five died, notwithstanding the strict adoption of Marochetti's treatment. (See *Journ. Gen. de Med.*) M. Villermé also observed a transparent pustule under the left side of the tongue, in the case of a female, on the eighth day from the bite. (*Revue Med., Anderson's Quarterly Journ. Vol.* 1, *p.* 124.) The prussic, or hydrocyanic acid has likewise been proposed, on account of its reputed antispasmodic properties; but, some experiments, made with it on dogs by Dupuytren, Magendie, and Breschet, furnish no results in favour of its being likely to prove useful in the present disorder. (See *Dict. des Sciences Méd. T.* 47, *p.* 132.) Indeed, the following statement, if correct, leaves little hope, that any effectual medicine for hydrophobia will ever be discovered. "The most active substances, the most powerful narcotics, (says M. Magendie,) have no effect upon man, or animals attacked with rabies; I do not merely speak of substances introduced into the stomach, and the operation of which may be prevented or diminished by so many circumstances; I speak of substances injected into the veins, and the effects of which must be equally prompt and energetic. For instance, I have several times introduced into the veins of rabid dogs very strong doses of opium, (10 grains) without producing the least narcotic effect, while a single grain of the watery extract, injected into the veins of a healthy dog, immediately makes him fall asleep, and often continue so eight or ten hours. The same phænomena are remarked in our own species: M. Dupuytren and I injected into the radial vein of a young man labouring under hydrophobia, about eight grains of the gummy extract of opium, without any apparent result. We have also seen mad dogs bear the introduction of prussic acid into their veins, without an instant remission in the progress of their disorder." (*Journ. de Physiologie, T.* 1, *p.* 41.) M. Magendie frequently noticed in his experiments, that an artificial aqueous plethora, manifestly enfeebles all the functions of the animals subjected to it, and especially those of the nervous system. Hence, he was led to think that some benefit might arise from it in a case, where the activity of the nervous system is at its greatest height. His idea received encouragement also from considering, that, in hydrophobia, the patient takes no drink to replace the fluid separated from the circulation by the cutaneous and pulmonary perspiration, and that after venesection, the blood seems as if it hardly contained any serum. The experiment was first tried on a rabid dog, from which about a pound of blood was drawn, and then 60 oz. of water injected into the left jugular vein, about 10 or 12 oz. of blood, mixed with water, however, being purposely allowed to flow out during the latter part of the operation. The animal, which had previously been quite furious, now became tranquil; but, five hours afterwards, it was attacked with difficulty of breathing, which ended fatally in half an hour. (*Vol. cit. p.* 44, *&c.*) On the 15th of October, 1823, M. Magendie injected a Paris pint of water, heated to 30 deg. Reaumur, into the veins of a man's arm, who was labouring under hydrophobia in an advanced and violent form. Directly after the operation, the patient, from being furious, became tranquil; the pulse fell from 150 to 120, then to 100, and, in twenty minutes, to 80. The convulsive motions ceased, and the patient drank a glass of water without any difficulty. Notwithstanding a hemorrhage from the bowels, he continued to improve till the 5th day, when he was seized with acute pains and swelling of the wrists, knees, and elbows, and threatened with an extensive abscess of the leg, the consequence of the lodgment in the foot of two pieces of lancets, broken in the attempt to bleed him, while he was suffering violent paroxysms in a previous stage of the disorder. Despondency and mental agitation again came on, and he died early on the 9th day from the experiment. On dissection, the swelled joints were found filled with pus; the mucous membrane of a part of the small intestines reddened by the expansion of veins; several small ulcerations in the ileum where it joins the cœcum; the blood in a decidedly putrefied state; the heart and large vessels distended with gas; air under the peritoneal coat of the stomach and intestines; posterior part of the lungs a little swelled; trachea sound, but the bronchiæ red. Magendie considers this case on the whole very favourable to the practice; and when it is reflected, that the patient underwent, directly after the experiment, a great and sudden change for the better, lived eight days after the injection, and then possibly died rather from other accidental complaints, it must be acknowledged, that the method is well deserving of further trials. I would also particularly recommend its adoption in an earlier stage, and while the patient is less reduced, than the one on whom the experiment was lately made and failed, in one of the Borough hospitals. By Dr. Rossi, of Turin, the trial of galvanism was suggested. (*Alibert, Nouveaux Elémens de Thérapeutique, T.* 2, *p.* 436, *Ed.* 4); yet, the only fact brought forward, as an encouragement to persevere with the last means, appears to a modern author, from its symptoms and progress, not to have been a case of true rabies. (*Dict. cit. T.* 47, *p.* 126.) The rapid and powerful effects of the bite of a viper on the whole system, and perhaps the idea, that the operation of this animal's venom might counteract that of the hydrophobic virus, led some experimenters to try what would be the result of subjecting patients, affected with rabies, to the bite of that kind of snake. The project, however, was attended with no success. Three cases of this description were communicated to the Royal Society of Medicine (*Hist. p.* 201); two additional ones were recorded by Dr. Gilibert, physician to the Hôtel Dieu at Lyons, (*Advers. Méd. Pract. p.* 257); and Viricel, surgeon of the same hospital, repeated the experiment on a child, which yet fell a victim to hydrophobia. Other trials are also said to have been made in France and Germany with no better success. Dr. de Mathiis, in the year 1783, let a viper bite a rabid dog on the throat. The dog's head was attacked with considerable swelling, the hydrophobia ceased, and, according to some accounts, the animal perfectly recovered; but, according to other statements, though it drank freely as soon as its head had swelled, it only survived the experiment a few hours. (See *Dict. des Sciences Méd. T.* 47, *p.* 126.)

Some facts, which occurred, a few years ago, in the East Indies, tended for a time to raise an expectation, that a copious abstraction of blood might be the means of preserving patients actually attacked with this fatal disorder. Mr. Tymon, assistant surgeon of the 22d Light Dragoons, tried successfully the method of taking away at once an immense quantity of blood from the patient. "I began by bleeeding him (says Mr. Tymon) *until scarcely a pulsation could be felt in either arm.*" Opium was afterwards given, and the patient salivated with mercury. (See *Madras Gazette of Nov.* 23, 1811.)

Although in the observations, annexed to this case by Dr. Berry, there are some circumstances, which render it probable, that the case was really hydrophobia: yet, as the successful termination of it is an event so extraordinary, I much regret, that some desirable information is omitted. For instance, we have no account of any pain or changes in the bitten part, or limb, at the first coming on of the indisposition. The early constitutional symptoms are not described, and the violent spasms, screaming, &c. are the first things mentioned. Some particulars of the dog would also have been interesting.

Such information, indeed, becomes still more essential, when we find it stated, that another man, Serjeant Jackson, was also bitten by the same dog, and had hydrophobia *in a mild form*, from which he recovered under the use of mercury, blisters to the head, and cathartic injections, without any recourse to bleeding at all. This last case is even more contrary than the former, to what general experience teaches; because mercury, blisters, and injections, have been tried a thousand times unavailingly; while, perhaps, blood-letting, *in the manner practised by Mr. Tymon*, is a new treatment. Dr. Shoolbred, of Calcutta, published a second case of hydrophobia cured by bleeding ad deliquium animi, and afterwards exhibiting calomel and opium. The patient, being threatened with a relapse, was largely bled again. The whole of the success is imputed by Dr. Shoolbred to the venesection. But this gentleman is not so sanguine as to believe, that bleeding will cure every case of hydrophobia. It is probable, that there is a period, beyond which its curative effect cannot extend, and, therefore, it is upon the first appearance of unequivocal symptoms of the disease, that, he thinks copious bleeding affords a prospect of success, while the delay of only a few hours may prove fatal. He observes, that the medical profession, taught by numerous disappointments, admit very cautiously the claims of any new practice to general adoption. If several patients in hydrophobia, therefore, should happen to be bled in an advanced stage of the disease, and die, (as they inevitably would do, whether they had been bled or not,) such cases would be quoted against the new practice, as failures. But Dr. Shoolbred rightly contends, that numerous failures in an advanced stage of the disease, can form no just ground for the rejection of a remedy, which has incontestably effected a cure in an earlier stage of the disorder. He insists upon the necessity of making a large orifice in the vein, so as to evacuate the blood quickly, which must be allowed to flow, without regard to quantity, ad deliquium animi.

Dr. Shoolbred was well aware, that bleeding is cases of hydrophobia had often been tried. But, says he, owing probably to the evacuation not having been pushed far enough, when used in the early stage of the disease; or to the period for its beneficial employment having elapsed; the cases, in which it was tried, afforded little, or no encouragement to the continuance of the practice.

Since the preceding cases, the effect of bleeding has had the fairest trials made of it, and some of the reports are in favour of its occasional utility. (See *Particulars of the successful Treatment of a Case of Hydrophobia, by R. Wynne*, 8vo. *Shrewsbury*, 1813; *Also Edmonstone in Lond. Med. Repository, Vol.* 3, *p.* 93.) In almost every instance, however, it fails in hindering the usual melancholy event. (See *Kerrison's Case and Obs. in Med. Repository, Vol.* 2, *p.* 197.) This unpleasant truth, I think, receives confirmation from the fact, that the practice is far from being new.

Dr. Mead, who was very confident, that he had found an infallible preventive of the disease *in a little liverwort and black pepper*, aided by bleeding and cold bathing before the commencement of the course of medicine, says, "as to all other ways of curing the hydrophobia, I own I have not been so happy as to find any success from the many I have tried. Bathing at this time is ineffectual. *I have taken many large quantities of blood*; have given opiates, volatile salts, &c. All has been in vain, *because too late.*" Notwithstanding his disappointment, he concludes, "If any relief could be expected in this desperate state, I think it would be *from bleeding, even ad animi deliquium*," *&c.*

The doctrines of Boerhaave also led him and his pupils to recommend and practise bleeding in hydrophobia. " The distemper (says he) is to be treated as one highly inflammatory, upon the first appearance of the signs which denote its invasion, by *blood-letting from a large orifice, continued till the patient faints away*; and soon after by enemata of warm water and vinegar, &c." and he adds, "that this practice is supported by some small number of trials." But the particulars of this successful practice, are not given.

Dr. Shoolbred finds, that a trial of it was made at Edinburgh, more than sixty years ago by Dr. Rutherford, who took away gradually sixty ounces of blood from a patient, who had already been bled the same morning. As the patient lived forty-eight hours after the large bleeding, the method was probably tried somewhat early in the disease; and the case may therefore be set down as a fair instance of a failure of the practice. The trials, which have been made in this country of the practice of bleeding, in cases of hydrophobia, since the receipt of the above reports from India, I am sorry to say, have not confirmed its efficacy.

Bleeding was also recommended in cases of hydrophobia, by Poupart. (See *Hist. de l'Acad. Royale des Sciences, pour l'année* 1699, *p.* 48.) The practice is likewise mentioned in the *Medical Essays of Edinburgh, Vol.* 5, *part* 2, § 5; *and in the writings of Dr. Rush.* See also *Dr. Burton's Case, Phil. Mag. August*, 1805.

Early excision, or amputation of the bitten parts, the injection of warm water into the veins, and bleeding ad deliquium in the early stage, are the plans, which have most evidence in their favor. It was observed by a critical writer before the experiment of injecting water had been made, " That experience authorises the placing confidence in bleeding ad deliquium; on vomiting; and perhaps on the use of atropa belladonna; and, on tobacco exhibited as a glyster. That it is probable, advantage would result from the combined employment of bleeding, vomiting, (see *Dr. Satterly's Obs. in Medical Trans. Vol.* 4,) and purging in the early part of the disease. That analogy recommends the trial of spirit of turpentine in the convulsive stage of the disease." (*Med. Repository, Vol.* 3, *p.* 54.) In one case, in which oil of turpentine was copiously given both in electuary and glysters, the patient died on the fourth day. (*Same Work, No. for October*, 1822.) *Jos. de Aromatarius, De Rabie Contagiosa*, 4to. *Francof.* 1626. *Sauvages sur la Rage*, 12*mo. Paris*, 1771. *James on Canine Madness*, 8vo. *Lond.* 1780. *Mead on the Bite of a Mad Dog. Jos. S. Dalby, The Virtues of Cinnabar and Musk, against the Bite of a Mad Dog*, 4to. *Birmingh.* 1764. *J. Heysham, De Rabie Canina, Edinb.* 1777. *B. F. Münch, De Belladonna, Frank. Del. op.* 1. *D. P. Layard, Essay on the Bite of a Mad Dog, 2d Ed.* 1763. *R. Hamilton, Remarks on Hydrophobia, 2 Ed. 2 Vols.* 8*vo. Lond.* 1798. *Medical Museum, Vol.* 2. *Lond. Med. Trans. Vols.* 2 *and* 4, *Ed.* 2. *Med. Obs. and Inq. Vol.* 3; *and Fothergill in Vol.* 5 *of the same work. C. Nugent, Essay on Hydrophobia; to which is prefixed, the Case of a Person cured,* 8*vo. Lond.* 1753. *Le Roux, sur la Rage,* 8*vo. Dijon*, 1780. *Idem. Traitement local de la Rage,* 8*vo. Paris*, 1783. *Edinb. Med. Comment. Vol.* 5, *p.* 42. *J. Vaughan's Cases and Obs. on Hydrophobia,* 8*vo. 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HYDROPHTHALMIA (from ὕδωρ, water, and οφθαλμος, the eye.) *Dropsy of the Eye.*

Hydrophthalmus ; *Hydrophthalmos.* Also *Bupthalmos,* or Ox-eye. In the eye, as in other organs, dropsy arises from a disproportion taking place between the action of the secerning arteries, by which the fluid is deposited in the part, and the action of the absorbent vessels, by which it is taken up, and returned to the circulation; and according to this principle, the disease may be supposed to depend, either upon secretion being made too rapidly, or absorption being slower, than is proportionate to the natural activity of the vessels by which the secretion of the humors of the eye is effected.

According to Beer, dropsy of the eye is seldom entirely a local disease, but at least is generally combined with an unhealthy constitution, or is a mere symptomatic effect of some other dropsical affection, anasarca, hydrocephalus, &c. Sometimes, it appears as a symptom of chlorosis. Beer adds, that the disease may originate either from a preternatural accumulation of the aqueous humor; from that of the vitreous humor; or from an immoderate accumulation of both these humors together. (*Lehre von den Augenkr. B.* 2, *p.* 616, *Wien.* 1817.) When the vitreous humor collects in this manner, it usually loses its natural consistence, and becomes thinner and more watery. (*Richter Anfungsgr. B.* 3, *p.* 392.)

Professor Beer states, that in the case proceeding from a morbid quantity of the aqueous humor, the first indication of the disease is an increase in the dimensions of the cornea, attended with a manifest enlargement of the anterior chamber. The cornea may become in this manner, two, three, or even four times wider, than natural, without bursting, or losing its transparency; for, though a turbid appearance is discernible, this depends rather upon the state of the aqueous humor itself. The iris, which, in the very commencement of the disease, begins to lose its mobility, soon becomes completely motionless, and acquires a duller colour; the pupil always remaining in the mid-state between contraction and dilatation. In the eyeball an annoying sense of pressure, tension, and heaviness is felt, rather than actual pain. In the beginning of the disease, there is a considerable degree of far-sightedness, or presbyopia, which soon changes into a true amaurotic weakness of sight, but never terminates in perfect amaurosis. The free motions of the eyeball are more and more interrupted, in proportion as the organ grows larger, and it has invariably a hard feel, while the sclerotica, to the distance of two lines from the margin of the cornea, is as bluish, as it is in the newborn infant.

Respecting the precise cause of the accumulation of the aqueous humor, Beer offers no observation, worthy of repetition, excepting perhaps that, in which he reminds us, that a similar collection happens apparently as an effect of the conical staphyloma of the whole cornea. (See also *Wardrop's Essays on the Morbid Anatomy of the Eye, Vol.* 2, *p.* 19.) Indeed, as far as our knowledge yet extends, it is impossible to say, whether the changes of the cornea are, in the present disease, to be regarded as the cause, or the effect of the increased quantity of the aqueous humor, or, whether, as seems to me most probable, both phenomena are only effects of one and the same cause. The examples, somewhat repugnant to this idea, are those referred to by Beer, as symptomatic of other dropsical affections. On the other hand, Mr. Wardrop has never seen a preternatural collection of the aqueous humor, without its being accompanied with disease of the coats of the eye. (*Vol. cit. p.* 20.)

In hydrophthalmia, the prognosis is generally unfavourable, and, when the sight is nearly or quite lost, scarcely any hope can be entertained, either of restoring vision, or preserving the shape of the eye. Yet, according to Beer, things are not always quite so unpromising in the preceding form of the disease, especially when the surgeon is consulted in time, and the patient's constitution is not exceedingly impaired. The same experienced author has never seen any instance in which the eye spontaneously burst: on the contrary, when the habit was decidedly bad, and the treatment ineffectual, the disease became gradually conjoined with the second species of dropsy of the eye, and terminated in a frightful disfigurement of the whole organ, and death. On dissection, the innermost textures of the part were found spoiled and disorganized, and sometimes even the orbit itself carious. (*Vol. cit. p.* 619.) With respect to the treatment, Beer thinks, that this must depend very much upon the nature of the primary disease, to which the dropsical affection is ascribable as an effect. He has known great benefit sometimes produced by the submuriate of mercury, combined with digitalis, and a drink containing supertartrate of potassa, and borax. When the disease has been preceded by the sudden cure of any cutaneous disease, he has faith in the method of attempting to restore the affection of the skin by inoculation, or, if that be impracticable, by stimulating its surface with antimonial ointment, or making an issue. This plan is to be aided with internal alterative medicines, such as camphor, the sulphur auratum antimonii, and flowers of sulphur. The local applications, which he prefers in the early stage, are warm dry bags filled with aromatic herbs, and rubbing the parts about the eyebrow, sometimes with mercurial ointment, sometimes with a mixture of æther and liquor ammoniæ. But, when the disease has made considerable progress, and vision is either weak, or nearly lost, while the sclerotica near the cornea is not much discoloured, and there are no appearances of a varicose affection of the blood-vessels of the organ, Beer recommends making a puncture with a small lancet, in the lowest part of the cornea, half a line from the sclerotica, so as to discharge the aqueous humor. The anterior chamber is then to be kept empty for several days, or weeks, if possible, by reopening the small wound every day with the point of the lancet. (See also *Richter's Anfangsgr. B.* 3, *p.* 403.) After the operation, the eye is to be dressed in the same way, as after the extraction of a cataract. (See *Cataract.*) Previously to the paracentesis, Beer has often seen every general and local means perfectly useless, but highly beneficial, as soon as that operation had been practised. Even when the paracentesis fails in bringing about a permanent cure, it may still be resorted to as a palliative with great advantage, and be often beneficially repeated, if care be taken not to make the puncture too large. However, when the blood-vessels are generally varicose, and the constitution very bad, such operation is apt to excite violent inflammation, suppuration, and even sloughing of the organ, attended with imminent danger to the patient's life. (*Beer, vol. cit. p.* 620, 622.)

With regard to the second species of hydrophthalmia, or that depending upon a preternatural accumulation of the vitreous humor, Beer states, that, in this case, it is chiefly the posterior part of the eyeball which is enlarged, so that the whole organ acquires a conical shape, in which the cornea very much participates. The latter membrane remains unaltered in regard to its diameter; but, it is more convex than natural, and its transparency is perfect. It is observed by Mr. Wardrop, (*on Morbid Anatomy of the Eye, Vol.* 2, *p.* 126,) that an increase in the quantity of the vitreous humor happens not unfrequently in staphyloma, in which disease, he says, the enlargement of the eyeball will generally be found to arise more from an increase in the quantity of the vitreous, than of the aqueous humor, and he then expresses his belief, that the case, adduced by Scarpa to illustrate the pathology of hydrophthalmia, and cited in the ensuing part of this article, was an example of staphyloma. Be this as it may, one character constant in staphyloma, is often absent in hydrophthalmia; I mean, opacity of the cornea. In the case, which consists in an immoderate collection of the aqueous humour, the anterior chamber is always enlarged: on the contrary, in the present form of the disease, that cavity is manifestly lessened, for the motionless iris is gradually forced so much towards the cornea, that at length the chamber in question almost completely disappears. However, the colour of the iris undergoes no change, and the pupil is always rather diminutive. Around the cornea, the sclerotica is rendered bluish by distention, with a somewhat smutty tinge. In the early stage, the patient is affected with short-sightedness, *myopia;* but his power of vision is always seriously diminished, and, at last, is so totally destroyed, that not a ray of light can be perceived. The motions of the globe of the eye and eyelids are lessened, or impeded at a still earlier period, than in the first species of hydrophthalmia, and to the touch the organ seems like an egg-shaped stone. The very commencement of the disease is attended with pain, which daily becomes more and more severe, and, at length, is not confined to the eye and its vicinity, but affects all the side of the head, the teeth, and neck, being sometimes so violent as almost to bereave the patient of his senses, who urgently begs the surgeon to puncture the eye, or even is driven by desperation to do it himself, as Beer once knew happen. Even while the pain is less afflicting, the patient is deprived of his sleep and appetite. (*Beer, Vol. cit. p.* 623.) Though an increase in the quantity of the vitreous or aqueous humor has generally been treated of as a distinct disease, and denominated hydrophthalmia, Mr. Wardrop has never seen a dropsy of the eye, without an accompanying disease of the sclerotic coat, or cornea. (*On the Morbid Anatomy of the Eye, Vol.* 2, *p.* 126.) Beer offers no valuable remark on the causes of the preceding form of hydrophthalmia, his account of the connexion with scrophula and syphilis being mere conjecture, though delivered as a positive matter of fact. However, another position, offered in the paragraph, concerning the prognosis, seems more correct; viz. that as the disease is almost always conjoined with an unhealthy constitution, there can be scarcely any hope of a radical cure. Beer's opinion also is, that, when the disease has made such progress, that not a ray can be discerned, and the pain in the eye and head is so violent, by day and night, that the sleep, appetite, and even the senses are lost; it is fortunate, if only the most perilous symptoms can be obviated by palliative treatment; for, the preservation of a good-shaped eye is then quite out of the question. And even in the most favourable cases, the utmost, which can be expected, is to stop the further advance of the disease, a perfect cure being extremely rare.

According to Beer, the first indication is to improve the state of the health by medicines, and regimen; for, unless this object be effected, no expectation of curing the dropsical affection of the eye can be entertained. For this purpose, a long time will be requisite, and as for local treatment, in this case, little or nothing can be accomplished by it. Hence, the disease often continues to grow worse and worse, and, when the pain becomes violent, the best thing which the surgeon can do, both with the view to the functions of the organ, and its form is, to let out the aqueous humor. But, Beer reprobates, in the strongest terms, the plan sometimes recommended, of plunging a trocar through the sclerotica into the vitreous humor, and keeping the tube introduced, until a certain quantity of that humor is discharged. According to Beer's experience, the usual result of such practice is a carcinomatous disease of the eye, terminating in death, which the removal of the part will not prevent. The method, preferred by Beer, is that which is mentioned by Richter, (*Anfangsgr. B.* 3, *p.* 400,) and consists in opening the cornea and capsule of the lens, as in the extraction of the cataract, discharging the lens and vitreous humor, and letting the coats of the eye collapse; but, in order to prevent any re-accumulation of fluid, he afterwards cuts away a little bit of the flap of the cornea. The eye is then to be dressed in the same manner as after the extraction of the cataract. (See *Cataract.*) The third species of hydrophthalmia, or that produced by an accumulation both of the aqueous and vitreous humors together, is excellently described by Scarpa. He observes, that, in every case, on which he has performed the operation, and in other examinations of the different stages of the disease, made on the dead subject, he has constantly found the vitreous humor, more or less, altered in its organization, liquified, and converted into water, according as the disease was ancient, or recent. In some instances, he could not distinguish whether the increased quantity of the vitreous, or acqueous humor, had most share in the formation of the disease.

Scarpa also dissected a dropsical eye, taken from the body of a child. The vitreous humor was not only wanting in this eye, and the cavity destined for its reception filled with water, but the vitreous tunic was converted into a substance, partly of a spongy, partly of a fatty nature. This dropsical eye was one-third larger than natural. The sclerotica was not thinner than that of the other eye: but, in consequence of being yielding, flaccid, and separated from the choroides, it had lost its plumpness, and globular shape. The cornea formed a disk one-third larger than that of this membrane in a sound state; it did not retain its natural pulpy structure, and was obviously thinner than the cornea of the healthy eye. There was a considerable quantity of an aqueous, reddish fluid, between the cornea and iris. The crystalline lens, with its opaque capsule, had been pushed forward a little way into the anterior chamber, but could not advance further, on account of a firm adhesion, which the capsule had contracted with the iris, around the edge of the pupil. As soon as the capsule was opened, the lens issued from it, half dissolved, the rest exceedingly soft. It was impossible to detach the whole of the posterior layer of the capsule from a hard substance, which seemed to be the altered membrane of the vitreous humor. Scarpa, therefore, slit open the choroides, from the ciliary ligament to the bottom of the eye, when a considerable quantity of a reddish aqueous fluid gushed out, without, however, one particle of the vitreous humor. In lieu of the latter body, there was found a small cylinder of a substance, partly of a fungous, partly of a fatty nature, surrounded with a good deal of water, which was effused in the longitudinal axis of the eye, from the entrance of the optic nerve, as far as the ciliary ligament, or that hard substance to which the posterior layer of the capsule firmly adhered. This little cylinder was covered, for the extent of two lines and a half forwards from the entrance of the optic nerve, by a stratum of whitish matter, reflected on itself, like the epiploon, when raised towards the fundus of the stomach. Scarpa conceived that this stratum of whitish matter was the relics of the unorganized retina; for, on pouring rectified spirits of wine on the whole inner surface of the choroides, and the little cylindrical body, he found no vestiges of the retina on this membrane, and that the whitish substance, which was reflected on itself, became very firm, just as the retina does when immersed in spirits of wine. Both the cylinder and the indurated substance, occupying the place of the ciliary body, were manifestly only the membrane of the vitreous humor, destitute of water, and converted, as was described, into a substance, partly of a spongy, partly of an adipose nature. It is not easy to determine, whether this altered state of the vitreous tunic had preceded, or was a consequence of the dropsy of the eye. However it may be, this fact, in conjunction with several other similar ones, that Scarpa has met with, in which he found no vitreous humor in the posterior cavity of the eye, but only water or a bloody lymph, tends very much to establish the fact, that this disease principally consists of a morbific secretion of the vitreous humor, and occasionally, also, of a strange degeneration of the alveolary membrane, by which this humor is formed. Scarpa refers to a similar case. (See *Med. Obs. and Inquiries, Vol.* 3, *art.* 14.)

The augmentation in the secretion of the aqueous fluid, both in the cells of the vitreous humor and out of them, after they have been ruptured from excessive distention, together with a debilitated action of the absorbent system of the eye affected, Scarpa regards as the probable cause of the morbific accumulation of humors in the eye. From such a lodgment, and successive increase of the vitreous and aqueous humors, the eyeball at first necessarily assumes an oval shape, ending at the point of the cornea; the organ enlarges in all dimensions: and in the end, it projects from the orbit in such a manner, that it cannot be covered by the eyelids, disfiguring the patient's face as much as if an ox's eye were placed in the orbit.

This disease (says Scarpa) is sometimes preceded by blows on the eye, or adjoining temple; sometimes by an obstinate internal ophthalmy. In other instances, it is preceded by no inconvenience, except an uneasy sensation of tumefaction and distention in the orbit, a difficulty of moving the eyeball, and a considerable impairment of sight. Lastly, it is sometimes preceded by none of these causes, or no other obvious one whatever, especially when the complaint occurs in children of very tender age from whom no information can be obtained. As soon as the eye has assumed an oval form, and the anterior chamber has become preternaturally capacious, the iris seems situated further backward than usual, and tremulates, in a very singular way, on the slightest motion of the eyeball. The pupil remains dilated in every degree of light, while the crystalline is sometimes brownish from the very beginning of the disease; and sometimes it does not become cloudy till the affection has arrived at its highest pitch. The complaint then becomes stationary; and as the crystalline is not deeply opaque, the patient can distinguish light from darkness, and in some degree, the contour of objects, and brilliant colours. But when the eye has acquired a larger volume, and the whole crystalline has become opaque, the retina at last remains in a state of complete paralysis.

In the last stage of the disease, to which the term bupthalmos, or ox-eye, is properly applicable, when the dropsical eye projects from the orbit, so as not to admit of being covered by the eyelids, with the inconveniences already enumerated, says Scarpa, others associate themselves, arising from the friction of the ciliæ, the secretion of gum, the flux of tears, the ulceration of the lower eyelid, on which the eye rests, and the excoriation of the eye itself. Hence, the dropsical eye is gradually attacked with violent ophthalmies, attended with intolerable pains in the part affected, and the whole head. The ulceration, also, does not always confine itself within certain limits; but continues to spread, first depriving the cornea of its transparency, next consuming the sclerotica, and lastly, destroying progressively the other component parts of the eyeball.

At the first appearance of dropsy of the eye, many surgeons recommend mercurials, the extract of cicuta, and of pulsatilla nigricans; and astringent and corroborant collyria, a seton in the nape of the neck, and compression of the projecting eye. However, Scarpa has never yet met with a single well-detailed history of a dropsy of the eye, cured by means of the above-mentioned internal medicines. With regard to externals, he has learnt, from his own experience, that when the disorder is manifest, astringent, and corroborant collyria, as well as compression of the protuberant eye, are highly prejudicial. In such circumstances, making a seton in the nape of the neck, frequently bathing the eye in a lotion of mallows, and applying to it a poultice, composed of the same plant, have enabled him to calm, for a time, that disagreeable sense of distention in the orbit, and over the forehead, and temple of the same side, of which patients in this state make so much complaint, especially when they are affected with a recurrence of ophthalmy. But, as soon as the eyeball begins to protrude from the orbit, and project beyond the eyelids, he thinks there is no means of opposing the very grievous dangers, which the dropsy of the eye threatens, except an operation, which consists in evacuating, by an incision, the superabundant humors, then exciting gentle inflammation of the membranes, and suppuration within this organ, so as to make it contract and shrink into the bottom of the orbit. To defer the operation any longer, would be abandoning the patient to the constant inconvenience of an habitual ophthalmy, the danger of an ulceration of the eyeball and subjacent eyelid, and, what is worse, of carcinoma of the whole eye, with great peril to the patient.

Beer's prognosis in the third species of hydrophthalmia is at least as discouraging as that made by Scarpa; for the rapidity of the disease is said to be such as leaves scarcely a possibility of benefit being effected by any mode of treatment, and the case usually terminates in a carcinomatous exophthalmia, and death. These melancholy events are said, by Beer, to be accelerated by paracentesis of the eye, however executed; and he thinks, that the sole chance of stopping the progress of the disease depends upon an endeavour being made in its very commencement to improve the general health, though he owns, that success is to be regarded as a very rare and fortunate occurrence. The same author has no faith in any local treatment, and, when the disease is advanced, he considers the extirpation of the eye the only rational expedient, though very precarious in its result. (*Lehre von den Augenkr. B.* 2, *p.* 628, 629.)

The main point, on which Scarpa differs from Beer, is that respecting the effects of discharging the humors of the eye; a practice, which the former represents as useful, even in cases where the hydrophthalmia combines an accumulation both of the aqueous and vitreous humors. In former times, says Scarpa, paracentesis of the eyeball was greatly extolled. Nuck, one of the promoters of this operation, punctured the eye with a trocar, exactly in the centre of the cornea. (*De Duct. Ocul. Aquos, p.* 120.) It has since been thought better to puncture the sclerotica about two lines from the junction of this membrane with the cornea, that such a small quantity of the vitreous humor may be more easily discharged at the same time with the aqueous, as may be deemed adequate to effect a diminution in the morbific enlargement of the eyeball.

According to Scarpa, paracentesis of the eye, done so as merely to discharge the humors, can never be a means of curing dropsy of the eye, unless the puncture, made with the trocar, excite inflammation and suppuration, and afterwards a concretion of the membranes composing the eyeball. Indeed Nuck relates, that in a young man at Breda, he was obliged to puncture the eye five several times; that, on the fifth time of doing this, it was necessary to suck through the cannula of the trocar, in order to evacuate the greatest possible quantity of the vitreous humor; and, lastly, that it seemed proper to introduce a plate of lead between the eyelids and eyeball, for the purpose of making continual pressure on the eye, in its empty shrivelled state. In a woman at the Hague, he twice punctured the eye in vain; and she submitted, two or three times afterwards, to the same operation, but with what degree of success is not specified. Scarpa has no difficulty in believing, that a radical cure of the dropsy has sometimes been accomplished by means of the puncture, after the trocar, and other similar hard substances, have been repeatedly introduced into the eye, through the cannula of that instrument; but this success can never be attributed to the mere evacuation of the superabundance of the vitreous and aqueous humor; though it may be referred to that circumstance, conjoined with the irritation produced by the cannula, or the tents with which Mauchart kept open the wound.

Scarpa condemns the plan of making a circular incision through the sclerotica, as disadvantageous, and even dangerous. In fact, this circular recision, is constantly followed by the most aggravated symptoms, particularly frequent hemorrhages, an accumulation of grumous blood at the bottom of the eyeball, vehement inflammation of the eye, eyelids, and head, obstinate vomitings, convulsions, delirium, and the most imminent danger to the patient's life. Such modern surgeons, as have faithfully published the results of their practice on this point, namely, M. Louis, (*Mém. de l'Acad. de Chir. T.* 13, *p.* 289, 290); Marchan, (*Journal de Méd. de Paris, Janvier,* 1770; *Sur deux Exophthalmies, ou grosseurs contre nature du Globe de l'Œil*); and Terras, (*Ibidem, Mars,* 1776; *Sur l'Hydrophthalmie*); have ingenuously declared that, after performing the circular recision of dropsical eyes in the sclerotica, they had the greatest motives for repenting of what they had done. Scarpa prefers making a circular section, about three lines in breadth, at the summit or centre of the cornea of the dropsical eye, as directed by Celsus, in cases of staphyloma.

Whether the cornea be transparent or not, as sight is irrevocably lost, the surgeon must introduce a small bistoury across the apex, or middle of the cornea, at one line and a half from its central point; and then, by pushing the instrument from one towards the other canthus of the eye, he will cut the lower part of the cornea in a semicircular manner. The segment of the cornea being next elevated with the forceps, the operator is to turn the edge of the knife upward, and complete the work by a circular removal of as much of the centre of the cornea as is equal to three lines in diameter. Through this circular opening, made in the centre of the cornea, the surgeon may, by means of gentle pressure, discharge as much of the superabundant humors in the eye, as is requisite to make the eyeball diminish, and return into the orbit, so as to be covered by the eyelids. As for the rest of the humor lodged in the eye, it will gradually escape of itself, through the circular opening in the cornea, without any more pressure being made.

Until the appearance of the inflammation, that is, until the third or fifth day after the operation, the dressings are to consist of the application of a compress of dry lint, supported by a bandage. As soon as inflammation and tumefaction invade the eye operated on, and the eyelids, the surgeon is to employ such internal remedies as are calculated to moderate the progress of inflammation; and he is to cover the eyelids with a bread and milk poultice, which must be renewed at least once every two hours. It is a very frequent result, both in the staphyloma and dropsy of the eye, that, on the first appearance of inflammation, the eyeball on which the operation has been done, augments and protrudes again from the eyelids, in the same way as before the operation. In this circumstance, Scarpa directs the projecting part of the eyeball to be covered with a piece of fine linen, smeared with a liniment of oil and wax, or the yolk of an egg and oleum hyperici; the application of the bread and milk poultice being continued over this other dressing. Scarpa next states, that when the interior of the eye begins to suppurate, the swelling of the eyelids decreases, and the eyeball diminishes in size, and returns gradually into the orbit. This state of suppuration may be known by observing, that the dressings are smeared with a viscid lymph, blended with a portion of the humors of the eye, which incessantly issue from the centre of the cornea; and by noticing the appearance of the margin of the recision, which is changed into a circle of a whitish substance, resembling the rind of bacon, which is afterwards detached, like a slough, so as to leave a small ulcer, of a very healthy colour. This ulcer, as well as the whole eyeball, contracts, and becomes entirely cicatrized, leaving every opportunity for the placing of an artificial eye between the eyelids and the stump of the eyeball.

If a mild inflammation and suppuration in the interior of the eye should not take place on the fifth day, Scarpa exposes the eye to the air, or removes a circular portion of the cornea, half a line in breadth, or little more, by means of the forceps and curved scissors. The foregoing practice is certainly preferable to that advised by Richter, who, when the eyesight is lost, and the object is merely to discharge the humors, and let the eye collapse, sometimes makes a crucial division of the cornea, and removes the four flaps or angles, or even cuts away the whole of the anterior part of the eyeball through the sclerotica. (*Anfangsgr. B.* 3, *p.* 404.) In order to lessen the bulk of the eye, the late Mr. Ford, in one instance, passed a seton through the front of the organ, with apparent success. (See *Med. Communications, Vol.* 1.) Consult *Mauchart, De Paracentesi Oculi, Tub.* 1744. *Conradi, Handbuch der Pathol. Anat. p.* 523. *Fieliz, in Hufeland's Journ.* 4 *B. p.* 208. *Flajani, Collezione d'Osservazioni, T.* 1. *Obs.* 43. *Gendron, Mal. des Yeux, T.* 2. *Louis, in Mém. de l'Acad. de Chir. T.* 5, 4*to*. *Marchan, in Journ. de Méd. T.* 32, *p.* 65. *Terras, op. cit. Vol.* 45, *p.* 239. *Scarpa, Sulle principali Malattie degli Occhi, Cap.* 13. *C. P. Beger, De Hydropthalmia, Haller Disp. Chir.* 1, 575. *A. Sarwey, De Paracentesi Oculi in Hydropthalmia et Amblyopia Senum; Haller, Disp. Chir.* 1, 587, *Tub.* 1744. *Benedict, de Morbis Humoris Vitrei. Luke, Diss. de Hythrophthalmia, Jen.* 1803. *Richter, Anfangsgr. B.* 3, *p.* 392, *&c. Göt.* 1795. *Beer, Lehre von den Augenkr. B.* 2, *Wien.* 1817. *J. Wardrop, Essays on the Morbid Anatomy of the Human Eye, Chap.* 18 *and* 40, *Vol.* 2, 8*vo. Lond.* 1818. *A. Smith, in Edinb. Med. Journ. No.* 73. *B. Travers, Synopsis of the Diseases of the Eye, p.* 195, *p.* 200, *&c.* 8*vo. Lond.* 1820.

HY'DROPS. (from ὕδωρ, water.) A dropsy, or morbid accumulation of water. For *hydrops articuli*, refer to *Joints, Diseases of;* for *hydrops oculi*, see the foregoing article. With regard to *hydrops pectoris*, *hydrothorax*, or *dropsy of the chest*, as it is altogether a medical case, an account of its symptoms and treatment will hardly be required in this Dictionary. The only concern, which a surgeon has with the disease, is being occasionally required to make an opening for the discharge of the water. (See *Paracentesis Thoracis.*)

HYDROSARCOCELE. (from ὕδωρ, water; σαρξ, flesh; and κηλη, a tumor.) A sarcocele, attended with a collection of fluid in the tunica vaginalis.

HYMEN IMPERFORATE. The inconveniences brought on by such a cause and the mode of relief, are explained in the article *Vagina.*

A continuation of the hymen over a part of the orifice of the meatus urinarius may produce great pain and difficulty in making water, and symptoms, which may give rise to suspicion of there being a stone in the bladder. For a case illustrating the truth of this observation, see *Warner's Cases in Surgery, p.* 276, *Edit.* 4.

HYPOPIUM, or HYPOPYON. (from ὑπο, under; and ϖυον, pus.) An accumulation of a glutinous, yellowish fluid, like pus, in the anterior chamber of the aqueous humour, and, frequently, also in the posterior one, in consequence of severe, acute ophthalmy, particularly the internal species, or what is now so well known under the name of iritis.

The viscid matter of hypopium, though commonly called pus, Scarpa regards as coagulating lymph. The symptoms, portending an extravasation of coagulating lymph in the eye, or an hypopium, are the same as those which occur in the highest stage of violent acute ophthalmy: viz. prodigious tumefaction of the eyelids; the same redness and swelling of the conjunctiva, as in chemosis; burning heat and pain in the eye; pains in the eyebrow and nape of the neck; fever, restlessness, aversion to the faintest light, and a contracted state of the pupil.

As soon as the hypopium begins to form, (says Scarpa) a yellowish semilunar streak makes its appearance at the bottom of the anterior chamber, and, regularly, as the glutinous fluid is secreted from the inflamed internal membranes of the eye, so as to pass through the pupil, and fall into the aqueous humour, it increases in all dimensions, and gradually obscures the iris, first at its inferior part, next where it forms the pupil, and lastly, the whole circumference of this membrane. As long as the inflammatory stage of violent ophthalmy lasts, the hypopium never fails to enlarge; but, immediately this stage ceases, and the ophthalmy enters its second period, or that dependent on local weakness, the quantity of coagulating lymph, forming the hypopium, leaves off increasing, and, from that moment, is disposed to diminish.

This fact sufficiently evinces (continues this eminent Professor) how important it is, in order to check the progress of the hypopium, to employ, with the utmost care, the most effectual means for checking the attack of violent ophthalmy in its first stage. Copious evacuations of blood, both generally and topically, ought to be speedily put in practice; and when chemosis exists, the conjunctiva should be divided; mild aperients given, blisters applied to the nape of the neck, little bags of emollient herbs to the eye, and other measures employed. It will be known, that they have fulfilled the indication, by noticing that, some days after the adoption of such treatment, though there may still be redness of the conjunctiva and eyelids, the lancinating pains in the eye abate, the heat considerably diminishes, the fever subsides, quietude and sleep are restored, the motion of the eye becomes free, and, lastly, the collection of viscid matter forming the hypopium, becomes stationary. It is not unfrequent to see, especially among the lower orders of the people, persons affected with the second stage of severe acute ophthalmy, bearing this collection of coagulating lymph, in the chambers of the aqueous humour, with the greatest indifference, and without complaining of any of those symptoms which characterize the acute stage of opthalmy. It is only at this crisis, or at the termination of the acute stage of violent inflammation of the eye, that the enlargement of the hypopium ceases, and the coagulating lymph begins to be absorbed, provided this salutary operation of nature be not impeded, nor retarded, by any injudicious regimen. However, if Scarpa had also been aware of the great efficacy of mercury, in arresting the effusion of lymph, I can hardly doubt, that he would have modified some of the preceding observations, as well as his practice; a subject to which I shall presently return.

Scarpa states, that persons, little versed in the treatment of diseases of the eyes, would fancy, that the most expeditious and efficacious mode of curing an hypopium, after it has become stationary in the second stage of severe acute ophthalmy, would be that of opening the cornea at its most depending part, in order to procure a speedy exit for the matter collected in the chambers of the aqueous humour; especially, as this was once the common doctrine. But experience shows, that dividing the cornea, in such circumstances, is seldom successful, and most frequently gives rise to evils, worse than the hypopium itself, notwithstanding the modification suggested by Richter, (*Obs. Chir. Fasc.* 1, *Chap.* 12,) not to evacuate the whole of the matter at once, nor to promote its discharge by repeated pressure and injections, but to allow it to flow slowly out of itself. The wound made at the lower part of the cornea, for evacuating the matter of the hypopium, small as the incision may be, most commonly reproduces severe acute ophthalmy, and a greater effusion of coagulating lymph into the chambers of the aqueous humour. Besides, after opening the cornea, if the matter of the hypopium were allowed to escape gradually of itself, it would be several days in being completely discharged, on account of its viscidity. During this time, the glutinous lymph would keep the edges of the wound of the cornea dilated, and make them suppurate. Thus, the incision would be converted into an ulcer, through which the aqueous humour would escape, and even a fold of the iris. Opening the cornea, therefore, only converts the hypopium into an ulcer of that membrane, attended with a prolapsus of the iris, and occasionally of the crystalline itself. Nor can any inference be drawn, in favour of making an artificial opening, during the stationary state of an hypopium in the second stage of severe acute ophthalmy, from the matter of the hypopium having sometimes made its way spontaneously through a narrow aperture in the cornea, with a successful result. For, there is a wide difference, between the effects of a spontaneous opening in a natural, or preternatural, cavity of the animal body, or of one made with caustic, and the consequences of an opening, made with a cutting instrument. In the two first methods, the subsequent symptoms are constantly milder, than in the last. Besides, even in the instance, in which a spontaneous discharge of the hypopium takes place through the cornea, an escape of the aqueous humour, and a prolapsus of the iris, not unfrequently ensue; consequently, the spontaneous evacuation of the hypopium cannot justly form a rule for the treatment of the disease. There is only one case, in which dividing the cornea, in order to discharge an hypopium, is not only useful, but indispensable; this is, when there is such an immense quantity of coagulating lymph, extravasated in the eye, that the excessive distention which it produces of all the coats of this organ, occasions symptoms so vehement, as not only threaten the entire destruction of the eye, but even endanger the life of the patient. But this particular case cannot serve (says Scarpa) as a model for the treatment of ordinary cases.

The dispersion of the hypopium, by means of absorption, forms the primary indication, at which the surgeon should aim. In order to stop its progress, the most efficacious method is to subdue the first violence of the inflammation, and to shorten its acute stage, by the free employment of antiphlogistic treatment, and the use of mild emollient, topical remedies. And, in conjunction with these means, there can now be no doubt, that the practice of Brüel, published in 1809, as will be mentioned at the close of this article, ought to be followed: I mean, the quick exhibition of the submuriate of mercury, which has also been found at the London Ophthalmic Infirmary the most powerful means of checking the effusion of lymph in the eye. (See *Saunders's Work on the Eye, Ed. 2, and a Synopsis of the Diseases of the Eye, by B. Travers, p.* 135.)

If this treatment answer, the incipient collection of coagulating lymph, at the bottom of the anterior chamber of the aqueous humour, not only ceases to augment, but, also, in proportion as the severe ophthalmy disappears, the absorbent system takes up the heterogeneous fluid extravasated in the eye, and the white, or yellow speck, shaped like a crescent, situated at the bottom of the anterior chamber, gradually diminishes, and is at last entirely dispersed. Such, in short, is the successful termination of an hypopium, whenever the disease is properly treated at its commencement, and the acute stage of severe ophthalmy is promptly checked by internal antiphlogistic means, and emollient applications. But, in consequence of the inflammatory period of the severe ophthalmy having resisted, in an uncommon manner, the best means, or because such means have been employed too late, it sometimes happens, that the coagulating lymph, collected in the anterior chamber, is so abundant, even after the acute stage of ophthalmy, that it continues for a long time to cloud the eye, and intercept vision. Scarpa has often seen patients, especially paupers. who, from indolence, negligence, or ill treatment, remained a long time after the cessation of the inflammatory stage of ophthalmy, with the anterior chamber almost entirely filled with the glutinous matter of hypopium. When the inflammation had ceased, these unhappy persons wandered about the streets almost quite indifferent, and without complaining of pain, or any other inconvenience, than the difficulty of seeing with the eye affected. In this second stage of the ophthalmy, the resolution of hypopium obviously cannot be accomplished by the same means, nor with equal celerity, as in the first. At this crisis, the great quantity, and density of the glutinous matter extravasated, and the atony of the vascular system of the eye, make it necessary to give nature sufficient time to dissipate the thick, tenacious matter, and, at length, to dispose it to be insensibly absorbed with the aqueous humour, which is continually undergoing a renovation. Hence it is right, (says Scarpa) to adopt those means, which are best calculated to invigorate the vascular system of the eye, more especially the lymphatics. This requires more or less time, according as the patient is advanced in years, of a relaxed fibre and weak; or a young man of good constitution.

However, according to Scarpa, in the second stage of violent acute ophthalmy, complicated with hypopium, the surgeon should limit his efforts to the removal of every thing, which may irritate the eye, or be likely to renew the inflammation; and he should only employ such means as are conducive to the resolution of the second inflammatory stage, depending on relaxation of the conjunctiva and its vessels, and such remedies as tend, at the same time, to invigorate the action of the absorbents. Therefore, in this state, he ought first to examine carefully the degree of irritability in the eye affected with the hypopium, by introducing, between the eye and eyelids, a few drops of vitriolic collyrium, containing the mucilage of quince seeds. Should the eye seem too strongly stimulated by this application, it must not be used, and little bags of warm mallows with a few grains of camphor are to be substituted for it. In the intervals, the vapours of the liquor ammon. comp. may be applied, and recourse had again to a blister on the nape of the neck. When the extreme sensibility of the eye is overcome, the zinc collyrium must be used again, afterwards strengthened with a few drops of camphorated spirit. In this country, the exhibition of mercury would be generally deemed better practice, than that here recommended by Scarpa. In proportion as the chronic ophthalmy disappears, and the action of the absorbents is re-excited, the tenacious matter of the hypopium divides first into several small masses; then dissolves still further; and, afterwards, decreases in quantity: descending towards the inferior segment of the cornea; and, finally, vanishing altogether. But Scarpa accurately observes, that the surgeon cannot always expect to be equally successful, whether the disease occur during the first, or second stage of violent acute ophthalmy, if the tenacious lymph, suddenly extravasated in the interior of the eye, prevail in such quantity, as not only to fill, but strongly distend, the two chambers of the aqueous humour, and the cornea in particular. In this state, notwithstanding the most skilful treatment, the unpleasant complication is often followed by another inconvenience, still worse than the hypopium itself; viz. ulceration, opacity, and bursting of the cornea.

The ulceration of the cornea ordinarily takes place with such celerity, that the surgeon seldom has time to prevent it. As soon as an aperture has formed, the excessive abundance of coagulating lymph, contained in the eye, (sometimes named empyema oculi) begins to escape through it, and a degree of relief is experienced. But, this melioration is not of long continuance; for, scarcely is the glutinous fluid evacuated, that distended the whole eye, and especially the cornea, when it is followed by a portion of the iris, which glides through the ulcerated aperture, protrudes externally, and constitutes the disease termed prolapsus of the iris. (See *Iris, Prolapsus of.*) But, if in such an emergency the cornea, already ulcerated, opaque, and greatly deranged in its organization, should not immediately burst, the surgeon is then constrained by the violence of the symptoms, depending on the prodigious distention of the eyeball, to make an opening in this membrane, in order to relieve the immense constriction, and even the danger in which life is placed.

Were there the least chance of restoring, in any degree, the transparency of the cornea, and the functions of the organs of vision, after opening the cornea, Scarpa acknowledges, that it would certainly be more prudent to make the opening at the lower part of this membrane. But, in the case of empyema of the eye, now considered, in which the cornea is universally menaced with ulceration and opacity, and seems ready to slough, there can be no hope of its resuming its transparency at any point, and he therefore deems it the best, and most expeditious method of relief to divide its centre with a small bistoury to the extent of a line and a half; and then to raise with a pair of forceps the little flap, and cut it away all round with one stroke of the scissars, so as to let the humours escape, without any pressure.

The eye is to be covered with a bread and milk poultice, which is to be renewed every two hours, the use of such general remedies, as are calculated to check the progress of acute inflammation, and to quiet the nervous system, not being omitted. In proportion as the interior of the eye suppurates, the eyeball gradually diminishes, shrinks into the orbit, and at length cicatrizes, leaving things in a favourable state for the application of an artificial eye.

When Scarpa delivers his opinion, that in the above aggravated form of hypopium, there can be no chance of the cornea resuming its transparency at any point, I think his assertion rather imprudent. Nor, admitting its general truth, does it follow, as a matter of course, that it is necessary and right to cut away a piece of the centre of the cornea, and absolutely destroy whatever little chance may yet be left of saving the eye. In support of this remark, let me contrast what Mr. Travers has said with the advice of Scarpa. "When the hypopium is so large as to rise towards the pupil, and the ulceration of the cornea is extending, I think its discharge *by section near the margin* advisable. If not too long delayed, the ulcerative process is checked by it, which would otherwise run into sloughing, and *the cornea recover with only partial opacity and disfigurement.*" (*Synopsis of the Diseases of the Eye, p.* 280.)

Mauchart de Hypopyo. Tubingæ, 1742. *C. P. Leporin, de Hypopyo.* 4to. *Goët.* 1778. *Goeldlin, Diss. de Hypopyo. Erlang.* 1810. *Walther Merkwürdige Heilung eines Eiterauges, &c.* 8vo. *Landshut,* 1819. *I observe, that in Hufeland and Himley's Journal for Octob.* 1809, *p.* 93, *there is an account of the treatment of an hypopium, or case of effused lymph in the chambers of the eye, by exhibiting from* 12 *to* 18 *grains of the submuriate of mercury, in the space of* 12 *hours, and then giving bark, while as an external application the tinct. opii crocat. was employed. Thus we see, that the efficacy of mercury in checking the effusion of lymph in the eye, and promoting an absorption, has been known many years in Germany. A. Scarpa, Saggio di Osservazioni e d'Esperienze, sulle Principali Malattie degli Occhi; Venezia,* 1802. *Richter Anfangsgründe der Wundarzneykunst, B.* 3. 1795. *J. Wardrop, Essays on the Morbid Anatomy of the Human Eye, Chap.* 6. *Edinb.* 1808.

HYSTEROTOMIA. (from ὑστερα, the womb, and τεμνω, to cut.) See *Cæsarean Operation.*

I.

IMPERFORATE HYMEN. (See *Vagina.*)

INCARCERATION. This term is usually applied to cases of hernia, in the same sense as strangulation. When the viscera are pressed upon either by the opening through which they protrude, or by the parts themselves within the hernial sac, in such a degree, that the course of the intestinal matter to the anus is obstructed, and nausea, sickness, pain, and tension of the swelling and abdomen, &c. are occasioned, the rupture is said to be in a state of incarceration, or strangulation.

According to Professor Scarpa, however, an *incarcerated,* and a *strangulated* hernia, do not imply exactly the same thing. In the first case, says he, the course of the intestinal matter is interrupted, without any considerable impairment of the texture, or vitality of the bowel. On the contrary, in the strangulated hernia, besides the obstruction to the course of the fecal matter, there is organic injury of the coats of the intestine, with loss of its vitality. The bowel, that is merely incarcerated, resumes its functions immediately it is replaced in the abdomen; while that, which is truly strangulated, never returns to its natural state. (*Traité des Hernies, p.* 251.) This distinction, however, is by no means generally adopted.

INCONTINENCE OF URINE. (See *Urine, Incontinence of.*)

INFLAMMATION. (from *inflammo,* to burn.) By the term, *inflammation,* is generally understood, the state of a part, in which it is painful, hotter, redder, and somewhat more turgid, than it naturally is; which topical symptoms, when present in any considerable degree, or when they affect very sensible parts, are attended with fever, or a general disturbance of the system. (*Burns.*)

The susceptibility of the body for inflammation is of two kinds; the one *original,* constituting a part of the animal economy, and beyond the reach of human investigation; the other *acquired* from the influence of climate, habits of life, and state of the mind over the constitution. (*Hunter.*) The first kind of susceptibility, being innate, cannot be diminished by art; the second may be lessened by the mere avoidance of the particular causes, upon which it depends.

Inflammation may, with great propriety, be divided into *healthy* and *unhealthy.* Of the first, there can only be one kind, though divisible into different stages; of the second, there must be an infinite number of species, according to the peculiarities of different constitutions, and the nature of diseases, which are numberless. (*Hunter.*) Another general division is into *common* and *specific* inflammation, the latter term implying, that the affection has some strongly marked particularity about it, rendering it, in some degree independent of such circumstances, as would control and regulate the progress of common inflammation. Such are *venereal*, *variolous*, *vaccine*, *erysipelatous*, *gouty*, and *rheumatic* inflammations, &c. Inflammation may also be divided into the *acute* and *chronic*. This division of the subject is one of the most ancient, and seems to have obtained the sanction of all the best surgical writers. Healthy inflammation is invariably quick in its progress, for which reason, it must always rank as an *acute* species of the affection. However, there are numerous inflammations, controlled by a diseased principle, which are quick in their progress, and are, therefore, to be considered as acute. Chronic inflammation, which will be treated of, when I come to the subject of *tumors*, is always accompanied with diseased action.

My friend, Mr. James, of Exeter, justly impressed with the utility, which would result from a good nosological arrangement of inflammation, has lately attempted to supply what must generally be allowed to be a great desideratum. To the division of inflammation into the *acute*, *subacute*, or *chronic*, he objects, that, in many instances, these are merely different stages of the same disease. The arrangement into the *adhesive*, *suppurative*, *ulcerative*, or *gangrenous* inflammation, he does not altogether approve, because it is merely founded on the modes, in which either different, or, in some instances, the same kinds of inflammation, terminate. Under the heads of *phlegmonous*, *erysipelatous*, and *gangrenous* inflammation, he argues, that diseases of the most opposite nature have been indiscriminately brought together. The disposition to terminate in gangrene, he admits, will afford a basis for subdivision, but not for primary separation. Mr. James makes some judicious observations on the arrangement of the kinds of inflammation, according to the elementary tissue, in which they occur, as proposed by Dr. Carmichael Smith, Pinel, and Bichat. The tissues in question are five, and the doctrine supposes, that the inflammation of each is essentially different. The first is phlegmonous inflammation, which affects the cellular membrane, including the parenchyma of the several viscera. The second is inflammation of serous membranes. The third, of mucous membranes. The fourth, which is named erysipelatous, is of the skin: and the fifth, termed rheumatic, belongs to fibrous structure. That inflammations differ materially from the circumstance of their affecting one of these elementary tissues, rather than another, Mr. James freely admits; but, the following objections appear to him fatal to this system, if they are true. 1. Different kinds of inflammation are liable to occur in the same tissue. 2. The same kind of inflammation is often met with in different tissues. 3. The same inflammation may be transferred from one to another; an argument, however, on which he lays less stress, as being difficult of direct proof. (See *Obs. on the different Species of Inflammation*, p. 3—7, 8vo. *Lond.* 1821.) Although difference of structure unquestionably accounts for some of the varieties in the appearance and character of inflammation, it will not sufficiently explain the principal diversities of this affection to be taken as the foundation of a nosological arrangement, not only for the reasons pointed out by Mr. James, but because the common distinctions of inflammation at present in vogue, and some of which at least are obvious and striking, cannot be at all solved by any reference merely to texture. Nor did this theory satisfy Mr. Hunter, who observed, that, if it were true, "we should soon be made acquainted with all the different inflammations in the same person, at the same time, and even in the same wound. For instance, in an amputation of a leg, where we cut through the skin, cellular membrane, muscle, tendon, periosteum, bone, and marrow, the skin should give us inflammation of its kind, the cellular membrane of its kind; the muscles of theirs, &c. &c. but, we find, it is the same inflammation in them all." However, though Mr. Hunter did not admit the possibility of referring the different kinds of inflammation to peculiarities of texture, his doctrines assign to this cause considerable influence over every form of the disorder, as will be presently explained.

The mode of reasoning, adopted by Mr. James, leads him to propose; 1st. The division of inflammations into two great classes, according to their disposition either to be *limited* by the effusion of organizable coagulable lymph, or to *spread*. 2dly. The orders are established on the principle of the *degree of connexion of the organ with the vital functions of the animal;* another cause, which exerts a predominant influence over the character of the inflammation; acts invariably, and, *cæteris paribus*, in the same degree; the constitutional sympathy being in proportion to the danger, the difficulty of resisting that danger, and of repairing the mischief done. 3dly. The genera are founded on the original disposition of inflammations to have particular modes of termination: thus, says Mr. James, in boil and whitlow, it is to suppurate; in carbuncle, to slough; and in mumps to resolve; and this disposition is so strong, that it is very difficult to procure any other termination. It may happen, however, that there shall be more, than one mode, in which it (the inflammation) is disposed to terminate, as in either resolution, or suppuration, in sphacelus, or ulceration, &c. (*Op. cit. p.* 13—16.) Mr. James conceives, "that these general principles will perhaps afford a sufficient basis for such an arrangement, as shall be both natural and useful in its application to all kinds of common inflammation; gout, rheumatism, and scrofula having peculiarities, which require them to be separated. Also with respect to inflammations, arising from external injuries, as they are more simple in their nature, may take place in sound constitutions, and are accompanied with disorganizations, which do not exist in other cases, Mr. James considers them as materially different. This author purposely excludes from his classification inflammations of the organs of sense, and of the bones, the peculiarities in their structure and functions rendering them fit subjects for separate description. With respect to Mr. James's nosological table of inflammation, I consider it very ingenious, and well deserving of the attention of the profession: I may say this, without at all involving myself in the hypothesis, that the limitation, or spreading of the generality of inflammations, is a circumstance entirely dependent upon their disposition, or indisposition to effuse organizable lymph. Mr. Hunter was well acquainted with the frequent usefulness of the adhesive inflammation in setting limits to disease, yet he did not venture to refer the circumscription of every inflammation to this cause, or the spreading of the disorder entirely to its absence. Nor, indeed, does it seem essential to Mr. James's classification, that any cause should be assigned for the disposition of one class of inflammations to be limited, and of another to spread; the two facts themselves being sufficient for the basis of the division.

There is much foundation for believing, that healthy inflammation is invariably an homogeneous process, obedient to ordained principles, and, in similar structures, similar situations, and in constitutions of equal strength, uniformly assuming the same features. If experience reveals to us, that *here* it is commonly productive of certain effects, and *there* it ordinarily produces different ones, the same unbounded source of wisdom communicates to the mind a knowledge, that there is some difference in the tone of the constitution, or in the structure or situation of the parts affected, assignable as the cause of this variety. A modern author (*Dr. Smith, in Med. Communications, Vol.* 2), makes the nature of the exciting cause one principal ground of the specific distinctions in inflammation, and with good reason, when he takes into the account the action of morbid poisons, and the qualities of disease in general.

The doctrine also receives confirmation from what is observed in cases of burns, and chilblains, where the inflammation is unquestionably attended with great peculiarity, requiring different treatment from that of common inflammation in general. But, when the exciting cause is strictly mechanical, its violence and extent may cause differences in the degree and quantity of inflammation; but, with respect to its quality, this must be accounted for by constitution, or other circumstances.

The attentive observation of experience, the only solid basis of all medical, as well as other, knowledge, has informed the practitioner, that parts, which from their vicinity to the source of the circulation, enjoy a vigorous circulation of blood through them, undergo inflammation more favourably, and resist disease better, than other parts, of similar structure, more remote from the heart. The lower extremities are more prone to inflammation, and disease in general, than parts about the chest; when inflamed, they are longer in getting well; and the circumstance of their being depending parts, which retards the return of blood through the veins, must also increase the backwardness of such parts in any salutary process. (*Hunter.*) Healthy inflammation is of a pale red; when less healthy, it is of a darker colour; but, in every constitution, the inflamed parts will partake more of the healthy red, the nearer they are to the source of the circulation. (*Hunter.*)

Inflammation, when situated in highly organized and very vascular parts, is generally more disposed to take a prosperous course, and is more governable by art, than in parts of an opposite texture. The nearer also such vascular parts are to the heart, the greater will be their tendency to do well in inflammation. (*Hunter.*) Hence, inflammation of the skin, cellular substance, muscles, &c. more frequently ends favourably, than the same affection of bones, tendons, fasciæ, ligaments, &c. It is also more manageable by surgery; for those parts of the body, which are not what anatomists term *vascular*, seem to enjoy only inferior powers of life, and, consequently, when excited in a preternatural degree, frequently mortify.

But, inflammation of vital parts, though they may be exceedingly vascular, cannot go on so favourably, as in other parts of resembling structure, but, of different functions; because, the natural operations of universal health depend so much upon the sound condition of such organs. (*Hunter.*) The truth of this observation is illustrated in cases of gastritis, peripneumony, &c.

All new-formed parts, not originally entering into the fabric of the body, such as tumors, both of the encysted and sarcomatous kinds, excrescences, &c. cannot endure the disturbance of inflammation long, nor in a great degree. The vital powers of such parts are weak, and when irritated by the presence of inflammation, these adventitious substances are sometimes removed by the lymphatics, but more commonly slough. This remark applies also to substances generated as substitutes for the original matter of the body; for instance, granulations and callus. The knowledge of this fact, leads us to a rational principle of cure in the treatment of several surgical diseases. Do we not here perceive the cause, why very large wens are occasionally dispersed by the application of urine, brine, and similar things; which are now in great repute, on this account, with almost every one out of the profession? How many verrucæ, wrongly suspected to originate from a syphilitic cause, are diminished and cured by a course of mercury! It is the stimulus of this mineral upon the whole system, that accomplishes the destruction of these adventitious substances—not its antivenereal quality. Topical stimulants would fulfil the same object, not only with greater expedition, but with no injury to the general health.

Inflammation, *cæteris paribus*, always proceeds more favourably in strong, than in weak constitutions; for, when there is much strength, there is little irritability. In weak constitutions, the operations of inflammation are backward, notwithstanding the part, in which it is seated, may, comparatively speaking, possess considerable organization, and powers of life. (*Hunter.*)

Healthy inflammation, wherever situated, is always most violent on that side of the point of inflammation, which is next to the external surface of the body. When inflammation attacks the socket of a tooth, it does not take place on the inside of the alveolary process, but towards the cheek. When inflammation attacks the cellular substance, surrounding the rectum, near the anus, the affection usually extends itself to the skin of the buttock, leaving the intestine perfectly sound, though in contact with the inflamed part. (*Hunter.*)

We may observe the influence of this law in the diseases of the lachrymal sac and duct, in those of the frontal sinus, and antrum, and, particularly, in gun-shot wounds. Suppose a ball were to pass into the thigh, to within an inch of the opposite side of the limb, we should not find, that inflammation would be excited along the track of the ball, but, on the side next the skin which had not been hurt. If a ball were to pass quite through a limb, and carry into the wound a piece of cloth, which lodged in the middle, equidistant from the two orifices, the skin, immediately over the extraneous body, would inflame, if the passage of the ball were superficial.—(*Hunter.*) Mr. Hunter compared this law with the principle, by which vegetables approach the surface of the earth; but the solution of it was too arduous even for his strong genius and penetration.

We see three very remarkable effects follow the prevalence of inflammation; viz. adhesions of parts of the body to each other; the formation of pus, or suppuration; and ulceration, a process, in which the lymphatics are more concerned, than the blood-vessels. Hence, Mr. Hunter termed the different stages of inflammation, the *adhesive*, the *suppurative*, and the *ulcerative*.

All parts of the body are not equally liable to each of the preceding consequences.

In the cellular membrane, and in the circumscribed cavities, the adhesive stage takes place more readily, than the others; suppuration may be said to follow next in order of frequency; and lastly ulceration.

In internal canals, on the inner surfaces of the eyelids, nose, mouth, and trachea, in the air-cells of the lungs, in the œsophagus, stomach, intestines, pelvis of the kidney, ureters, bladder, urethra, and in all the ducts and outlets of the organs of secretion, being what are termed *mucous membranes*, the suppurative inflammation comes on more readily, than either the adhesive, or the ulcerative stage. Adhesions, which originate from the slightest degree of inflammation in other situations and structures, can only be produced by a violent kind in the above-mentioned parts. Ulceration is more frequently met with upon mucous surfaces, than adhesions. The cellular membrane appears to be much more susceptible of the adhesive inflammation, than the adipose, and much more readily passes into the suppurative. Thus we see the cellular substance, connecting the muscles together, and the adipose membrane to the muscles, inflaming, suppurating, and the matter separating the muscles from their lateral connexions, and even the fat from the muscles, while the latter substance and the skin are only highly inflamed. (*Hunter.*) But, it must be allowed, that in situations where it abounds we very frequently meet with abscesses. This is so much the case, that fat has been accounted a more frequent nidus for collections of matter, than the cellular substance. (*Bromfield.*) Abscesses are particularly liable to form in the neighbourhood of the anus, mammæ, &c. With respect to the fat being highly inflamed, however, the expression is not strictly true. Fat has no vessels, principle of life, nor action of its own; consequently, we cannot suppose that it can itself either inflame, or suppurate. We know, that it is itself a secretion, and when an abscess forms in it, we understand, that the mode of action in the vessels, naturally destined to deposit fat, has been altered to that adapted to the formation of pus. When therefore the fat is said to be inflamed, it is only meant, that the membranous cells, in which it is contained, and by which it is secreted, are thus affected.

The deeply-situated parts of the body, more especially the vital ones, very readily admit of the adhesive stage of inflammation. The circumstance of deeply-seated parts not so readily taking on the suppurative stage of inflammation, as the superficial ones do, is strikingly illustrated in cases of extraneous bodies, which, if deeply lodged, only produce the adhesive inflammation. By this process a cyst is formed, in which they lie without much inconvenience, and they may even gradually change their situation, without disturbing the parts, through which they pass. But no sooner do these same bodies approach the skin, than abscesses immediately arise.

All inflammations, attended with disease, partake of some specific quality, from which simple inflammation is entirely free. When the constitution allows the true adhesive and suppurative stages to occur, it is to be regarded as the most healthy. Were it in an opposite state, we should see the very same irritation excite some other kind of inflammation, such as the erysipelatous, scrophulous, &c. (*Hunter.*)

In specific inflammations, the position, structure, and distance of the part affected from the source of the circulation, as well as from the surface of the body, seem also to have as much influence as in cases of common inflammation. Upon this point, I feel conscious of being a little at variance with what Mr. Hunter has stated; but, the undecided manner in which he expresses himself, not less than the following reflections, encourages me not to desert my own ideas. We see, that venereal eruptions sooner make their appearance upon the chest and face, than upon the extremities. No organized part can be deemed exempt from the attack of common inflammation; many appear to be totally insusceptible of the venereal. We know, that scrophulous diseases of the superior extremities take a more favourable course, require amputation less frequently, and get well oftener than when situated in the inferior limbs. (*Ford.*) The venereal disease makes more rapid advances in the skin and throat, than in the bones and tendons; we often see it producing a specific inflammation, and an enlargement of the superficial parts of the tibia, ulna, clavicle, cranium, &c. while other bones, covered by a considerable quantity of flesh, are very rarely affected. Gouty inflammation is prone to invade the small joints; rheumatic, the large.

SYMPTOMS, NATURE, AND CAUSES OF INFLAMMATION.

Redness, swelling, heat, and pain, the four principal symptoms of phlegmonous inflammation, have been accurately noticed by Celsus: *Notæ vero inflammationis sunt quatuor, rubor, et tumor, cum calore et dolore, lib.* 3, *cap.* 10. If we refer to any writer on this interesting part of surgery, we shall find the above symptoms enumerated as characterizing phlegmon. In short, this term is usually applied to a circumscribed tumor, attended with heat, redness, tension, and a throbbing pain. These are the first appearances observed in every case of phlegmon; and when they are slight, and the part affected is of no great extent, they have commonly very little, and sometimes no apparent, influence on the general system. But, when they are more considerable, and the inflammation becomes extensive, a full, quick, and generally a hard pulse, takes place, and the patient, at the same time, complains of universal heat, thirst, and other symptoms of fever. While the inflamed part becomes red, painful, and swelled, its functions are also impaired. The same degree of inflammation is said to produce more swelling in soft parts, and less in those of a harder structure. (*Burns.*)

Though the redness, swelling, throbbing, tension, and other symptoms of phlegmonous inflammation, are less manifest, when the affection is deeply situated, yet their existence is undoubted.

When persons die of peripneumony, or inflammation of the lungs, the air-cells of these organs are found crowded with a larger number of turgid blood-vessels, than in the healthy state, and, of course, the parts must appear preternaturally red. Coagulating lymph, and even blood, are extravasated in the substance of these viscera, which become heavier, and feel more solid. (*Baillie.*)

The extravasation of coagulating lymph, which is one of the chief causes of the swelling, is also one of the most characteristic signs of phlegmonous inflammation.

Some writers (*Smith in Med. Commun. Vol.* 2,) have confined the seat of phlegmon to the cellular membrane; but, this idea is erroneous. Had such authors duly discriminated the nature of common inflammation, they would have allowed, that this affection existed, wherever the capillaries appeared to be more numerous, and enlarged, than in the natural state, accompanied with an effusion of coagulating lymph, whether upon the surface of a membrane, or a bone, or in the interstices of the cellular substance, and attended with acute pain, and a throbbing pulsation in the part.

As Dr. Thomson has observed, the epithet *remote*, as applied to the *causes of inflammation*, does not appear to be happily chosen; for under this term, are comprehended all those agents, events, and states, which contribute immediately, as well as remotely, directly as well as indirectly, to the production of the affection. (*Lectures on Inflammation, p.* 50.)

The remote causes of inflammation are infinite in number; but, very easy of comprehension, because, only divisible into two general classes. The first includes all such agents as operate by their stimulant or chemical qualities; for instance, cantharides, heat, the action of concentrated acids, alkalies, metallic oxides, and metallic salts, acrid vapours, such as ammoniacal gas, the nitrous, sulphureous, muriatic, oxygenated muriatic gases, &c. alcohol, æther, and all acrid, vegetable essential oils, animal poisons, and the whole of that class of substances known by the name of rubefacients. (*Thomson on Inflammation, p.* 55.) The second class of causes are those, which act mechanically, such as bruises, wounds, pressure, friction, &c.

Fevers often seem to become the remote causes of local inflammation. In other instances, inflammation appears to arise spontaneously, or, as I should rather say, without any perceptible exciting cause.

The principle, on which the application of cold to a part becomes the remote cause of inflammation, is not decidedly known. "No subject, (says a distinguished professor) is more deserving of your study, than the effects, which are produced in the human body by the operation of cold applied to its surface; but, the subject is at the same time, exceedingly extensive, complicated, and difficult. These effects differ according to the degree, in which the cold is applied, the state of the system, the part of the body to which it is applied, and the mode of its application. So diversified, indeed, are these effects, that it requires no mean confidence in theoretical reasoning to believe, that the operation of cold in producing them is explicable upon any single general principle." (See *Thomson on Inflammation, p.* 58.) And in the preceding page, he observes: "The operation of cold upon the human body affords the best example, which I can suggest to you, of the production of inflammation from the operation of a power acting upon a part at a distance from that, in which the inflammation takes place. The instances formerly mentioned of inflammation of the throat, chest, or belly, from the application of cold to the feet, are daily occurrences in these climates, of which it is impossible for us, in the present state of our knowledge of the animal economy, to give any thing like a satisfactory explanation.

"In some instances, cold, or a diminution of temperature, seems to act more directly upon the parts, with which it comes into contact. We have examples of this in the inflammation of the mucous membranes of the nose, fauces, trachea, and bronchiæ, from the inhalation of cold air; and in the production of rheumatic inflammation from the accidental exposure of some part or other of the body to cold. The application of cold, in the instances I have mentioned, seems to have somewhat of a directly exciting effect; and perhaps the same remark is still more applicable to the local effects of cold in the production of the inflammation accompanying the state, which is usually denominated frost-bite. Touching a solid body, as a piece of metal, the temperature of which has been greatly reduced, produces a sensation like that of burning, and may be followed, like the application of fire, by a blister." (*Op. cit.*)

Numerous opinions have been entertained, respecting the *proximate cause of inflammation*; but almost every theory has been built upon the supposition of there being some kind of obstruction in the inflamed part.

While the circulation of the blood was unknown, and the hypothetical notions of the power of the liver, in preparing and sending forth this fluid, continued to prevail, physicians were so fully persuaded of the existence and influence of different humors and spirits, and so little did they know of the regular and constant motion of the blood, that they believed in the possibility of depositions and congestions of the blood, the bile, or lymph; and acknowledged these as the cause of inflammation. Their anatomists taught them, and their professors of physic supported the opinion, that the liver was the centre of the vascular system, from which the blood went forth by day to the extremities, and returned again by night. If then any peccant matter irritated the liver, the blood was sent out more forcibly; and if at the same time any part of the body were weakened, or otherwise disposed to receive a greater quantity of fluid than the rest, then a swelling was produced by the flow of humours to this place. Fluxions, or flows of humour to a place, might happen either from weakness of the part which allowed the humours to enter more abundantly, or from the place attracting the humours, in consequence of the application of heat or other agents. The peculiar nature of the swelling was supposed to depend upon the kind of humour. Blood produced the true phlegmon; bile, erysipelas, &c. An idea was also entertained, that the blood and humours might slowly stagnate in a part, from a want of expulsive power, and this affection was termed a *congestion*, while the expression *fluxion* or *defluxion* was used to denote any swelling arising from the sudden flow of humours from a distant part. (*J. Burns, Dissertations on Inflammation.*)

From the theories of *fluxion* and *congestion*, which were quite incompatible with the laws of the circulation of the blood, we turn our attention to the doctrine of *obstruction*.

Boerhaave inculcated, (*Aph.* 375, *et seq.*) that inflammation was caused by an obstruction to the free circulation of the blood in the minute vessels, and this obstruction, he supposed, might be caused by heat, diarrhœa, too copious flow of urine, and sweat, or whatever could dissipate the thinner parts of the blood, and produce a thickness or viscidity of that fluid. When the lentor did not exist before the production of inflammation, he imagined, that the larger globules of the blood, passed into the small vessels, and thus plugged them up. This circumstance was termed an *error loci*. The obstruction, whether caused by *viscidity* or an *error loci*, was imagined to occasion a resistance to the circulation in the part affected; and hence, an increase of the flow of the blood in the other vessels, an irritation of the heart, and augmentation of the force, or attraction of the blood in that part of the vessel which was behind the obstruction. This caused heat and pain, while the accumulation of the blood produced redness. Boerhaave also brought into the account an *acrimonious state of the fluids*, which rendered resolution out of the question, and gangrene likely to follow. (*Aph.* 388.)

The viscidity of the blood cannot be admitted as the proximate cause of inflammation; because we have no proof, that this state ever exists; or, granting that it did, it would not explain the phenomena. Were a viscidity to occur, it would exist in the whole mass of blood, would affect every part of the body alike, and could not be supposed to produce only a local disorder. How also could such a lentor be produced by causes which bring on inflammation suddenly, without there being time for changes of the fluids to take place?

With regard to the doctrine of *error loci*, or of red globules going into vessels, which did not formerly transmit them, the fact must be admitted, at the same time, that the conclusion is denied. When the eye becomes inflamed, the tunica conjunctiva is seen with its vessels full of red blood, which in health is not the case; but this redness never appears until the inflammation has commenced, and must therefore be considered as an effect, not a cause. Nor can this *error loci* occasion any obstruction in these vessels; for, if they be divided, the blood flows freely, which shows, that they are large enough to allow an easy circulation. (*J. Burns.*)

Boerhaave's theory of obstruction was too circumscribed, and too mechanical; it reduced all inflammations to one species: the only distinctions which could have arisen, must have proceeded from the nature of the obstruction itself; and it was a doctrine that never could account for the action of many specific diseases and morbid poisons. (*Hunter.*)

As for the supposition of the co-operation of an *acrimony of the fluids*, the proportion of the saline matter of the blood has never been proved to be greater in this, than in any other state of the body. (*Burns.*) Even were a general disorder of this kind to be admitted, no rational explanation of the proximate cause of local inflammation could be deduced from it.

The decided impossibility of giving a rational explanation of the immediate cause of inflammation by any supposed state of the blood alone, led pathologists to investigate how far a change in the blood-vessels themselves might account for the process. It belongs more properly to a physiological, than a surgical work, to explain the various facts and experiments in support of the opinion, that the arterial tubes, and especially the capillaries, possess a high degree of vital contractility, whereby the motion of the fluids in them, the process of secretion, and other local phenomena, may be importantly affected, in a manner not at all explicable, by reference only to the action and power of the heart. For such information, I would particularly advise the reader to consult the publications of Dr. Wilson Philip and Dr. Hastings. According to the latter gentleman, the actual agency of the capillary vessels, "is not only supported by such experiments as those related, it is also countenanced by an extensive series of phenomena presented during disease in the human subject. Of these may be mentioned, irregular determinations of blood, the growth of tumors, increased pulsation of arteries leading to inflamed parts, of which the following is a well-marked example, the accuracy of which may be entirely relied upon. The carotids, when the person alluded to is in health, beat equally as to strength and frequency; but, when he is attacked with inflammation in the right tonsil, to which he is particularly subject, and which proceeds sometimes so far as nearly to prevent deglutition, each pulsation of the artery gives a throbbing sensation on the right side of the head. On the application of the hand at this time to each carotid, the right is found to beat much stronger and fuller, than the left. This diversity of action in these two arteries cannot arise from any impulse given by the blood to the heart: it must be derived from some modification of the contractile power of the artery." And Dr. Hastings expresses his belief in this explanation, notwithstanding Dr. C. H. Parry wishes to attribute to the remote influence of the heart some of the phenomena of local congestion and motion, and to show, that the different states of vascular dilatation are still more conspicuously connected with the different degrees of action of the heart, and the consequent momentum of the blood than with local circumstances; and that the proneness to local dilatation, or, as it is called, action, is a consequence of slowly succeeding, but continued impulse.

The blood-vessels, through every part of the system, possess a considerable share of irritability, by which they contract, and propel forward their contents Hence, the blood, by the action of the vessels, receives a new impulse in the most minute tubes, and a well-regulated momentum is preserved in every part of its course. But, of all parts of the sanguiferous system, the capillaries seem most eminently endowed with this faculty, and are least indebted to the presiding influence of the heart. Yet even, in these vessels, the action of the heart is of high importance in sustaining the healthy circulation, inasmuch as it gives the first impulse to the blood, and preserves the harmony of the sanguiferous system.

The vessels are endowed with this vital property, in order that each organ in the body may receive such a supply of blood, as will enable it duly to exercise its functions. Hence, a healthy state of this property is absolutely necessary for the preservation of the animal functions; for, if the vital contraction of the blood-vessels be either increased, or diminished irregular distribution of the blood inevitably follows, and from this source numerous diseases arise, and none more frequently, than inflammation. However, though these sentiments, delivered by Dr. Hastings, may be generally correct, I am not prepared to join in the opinion, that inflammation is ever produced simply by an inequality in the distribution of the blood; a statement, which this gentleman probably does not mean to make himself, as he confesses, that some of the phenomena of this disease depend upon sympathy between the sanguiferous and nervous systems. (See *Hastings on Inflammation of the Mucous Membrane of the Lungs, &c. p.* 32, 64, 65, 8*vo. Lond.* 1820; *and C. H. Parry, Additional Experiments on the Arteries, &c. p.* 112, 114; *Also Whytt on the Motion of the Fluids in the small Vessels; Verschuir de Arteriarum et Venarum vi irritabili; Zimmermann de irritabilitate, p.* 24; *Hunter on the Blood, &c.*)

Dr. Cullen attributed the proximate cause of inflammation to a "spasm of the extreme arteries supporting an increased action in the course of them." This theory only differs from that of Boerhaave in the cause which is assigned for the obstruction. Dr. Cullen conceived, however, that some causes of inequality in the distribution of the blood, might throw an unusual quantity of it into particular vessels, to which it must necessarily prove a stimulus; and, that in order to relieve the congestion, the vis medicatrix naturæ increases still more the action of the vessels; which, as in all other febrile diseases, it effects, by the formation of a spasm on their extremities. "A spasm of the extreme arteries, supporting an increased action in the course of them, may, therefore, be considered as the proximate cause of inflammation; at least, in all cases not arising from direct stimuli applied; and, even in this case, the stimuli may be supposed to produce a spasm of the extreme vessels." *(Cullen.)*

The inconsistencies in Cullen's theory are very glaring. The congestion, or accumulation of blood, which is only an effect or consequence of inflammation, is set down as the cause of the spasm of the vessels, to which spasmodic constriction Cullen, strangely enough, assigns the name of proximate cause. The spasmodic contraction of the extremities of the vessels, instead of propelling the accumulated quantity of blood, would render the passage of the blood from the arterial into the venous system still more difficult. *(Burns.)*

We shall now notice the celebrated, and very original opinions, promulgated on this subject by John Hunter. According to him inflammation is to be considered only as a disturbed state of parts, which requires a new, but salutary mode of action, to restore them to that state, wherein a natural mode of action alone is necessary. From such a view of the subject, therefore, inflammation in itself is not to be considered as a disease, but as a salutary operation, consequent either to some violence or some disease. Elsewhere, the author remarks, the act of inflammation is to be considered as *an increased action of the vessels, which, at first, consists simply in an increase or distention beyond their natural size. This increase seems to depend upon a diminution of the muscular power of the vessels*, at the same time that the elastic power of the artery must be dilated in the same proportion. *This is, therefore, something more than simply a common relaxation:* we must suppose it an action in the parts to produce an increase of size for particular purposes, and this Mr. Hunter would call *an act of dilatation.* The whole is to be considered as a necessary operation of nature. Owing to this dilatation, *there is a greater quantity of blood circulating in the part*, which is according to the common rules of the animal economy; for, whenever a part has more to do than simply to support itself, the blood is there collected in larger quantity. The swelling is produced by an extravasation of coagulable lymph, with some serum: but, this lymph differs from the common lymph, in consequence of passing through inflamed vessels. It is this lymph which becomes the uniting medium of inflamed parts; vessels shoot into it; and it has even the power of becoming vascular itself. The pain proceeds from spasm. The redness is produced either by the arteries being more dilated than the veins, or because the blood is not changed in the veins. "As the vessels become larger, and the part becomes more of the colour of blood, it is to be supposed, there is more blood in the part; and as the true inflammatory colour is scarlet, or that colour which the blood has when in the arteries, one would from hence conclude, either that the arteries were principally dilated, or, at least, if the veins are equally distended, that the blood undergoes no change in such inflammation in its passage from the arteries into the veins, which I think, (says Mr. Hunter) most probably the case; and *this may arise from the quickness of its passage through those vessels.*" When a part cannot be restored to health, after injury, by inflammation alone, or by adhesion, then suppuration, as a preparatory step to the formation of granulations, and the consequent restoration of the part, takes place. The vessels are nearly in the same state as in inflammation; but they are more quiescent, and have acquired a new mode of action. *(Hunter.)*

With respect to Mr. Hunter's theory, which has deservedly had vast influence in regulating the judgment of professional men in this country on the nature of the process, called inflammation, it cannot be received in the present state of knowledge, without some limitation. The hypothesis, that the blood vessels possess an active power of dilatation, independently of their elasticity, as Dr. Hastings observes, must as yet be regarded, as devoid of proof, and therefore should not be assumed, as a basis, on which any theory of inflammation is founded. (*On Inflammation of the Mucous Membrane of the Lungs, &c. p.* 70.) And, as another intelligent writer remarks, how different would have been Mr. Hunter's inferences, if, instead of trusting to the unassisted eye, he had viewed the inflamed vessels through the microscope! He would then have seen the blood moving, and found, that, "*instead of its passage being quickened in the inflamed vessels, it is uniformly rendered slower in proportion to the degree of inflammation, and, in the most inflamed parts, stands still altogether.*" (*On the Vital Functions, p.* 238, *Ed.* 2.) And, in another part of his writings, Dr. Philip has endeavoured to prove, from several facts respecting the colour of the blood, that *within certain limits, the accumulation of this fluid in the debilitated vessels of the inflamed part necessarily causes the blood to retain the florid colour.* (*On Fevers, Part* 2, *Introd.*)

In modern times, the vague, but convenient expression, *increased action of the vessels*, has been very generally used as an adequate explanation of the proximate cause of inflammation. The doctrine, it is said, derives support from a review of the several exciting causes of the affection, which, being in general of an irritating nature, must, when applied to any living, or sensible parts, occasion such increased action of the vessels; while the method of cure also tends to confirm the opinion. But, before one can judge, whether this doctrine is correct, and supported by facts and observation, it is necessary to understand precisely what is implied by increased action of vessels; for it is not every affection of the vessels, capable of being thus denominated, which will of itself constitute inflammation. In gestation, the arteries of the womb are enlarged, and a greater quantity of blood is sent into them; yet this organ is not inflamed. The carotids are in a similar state during the growth of the stag's horn; but no inflammation exists. If, then, the proximate cause of inflammation is to be called an increased action of the vessels, we must first be informed not only what is meant by the term, but, what particular vessels are spoken of, whether the arterial trunks, branches, or capillaries? Because, if the phrase is intended to signify increased alternate expansions and contractions of all the arteries of the inflamed part, it is an hypothesis entirely destitute of foundation. If it be meant to denote an increased velocity of the motion of the blood in the part affected, the doctrine is rather contradicted, than confirmed, by the latest, and most carefully instituted microscopical experiments. But, if the expression only refers to the dilated state of the capillaries, the throbbing of the arteries leading to the seat of inflammation, the effusion of lymph, &c. less fault can be found with the language, though yet requiring much further explanation ere it can communicate any very precise information.

"There are (says a learned professor) two hypotheses which at present divide the opinions of pathologists, respecting the state of the capillary vessels affected with inflammation. According to the first of these hypotheses, the inflamed vessels are in a state of increased action; according to the second, they act with less force, than the trunks, from which they are derived." (See *Thomson on Inflammation, p.* 64.)

The first of these opinions, according to Dr. Thomson, was suggested by the views which Stahl took of the animal economy, and his ideas respecting the tonic, or vital action of the capillary vessels. The doctrine, however, was more particularly insisted upon by his disciples and followers, especially De Gorter, who, in one place, expressly states; "that the proximate cause of inflammation consists in an increased vital action of some particular artery, or arteries, by which the blood is propelled with greater force than usual, into the communicating, lymphatic and colourless vessels." (See *his Compendium Medicinæ* and *Chirurgia Repurgata.*)

The doctrine, which supposes the action of the inflamed vessels to be diminished, or to be proportionably less, than that of the trunk, or trunks, from which they are derived, was, as far as Dr. Thomson can learn, first stated by Vacca, an Italian physician, in a small treatise on inflammation, published at Florence in 1765, entitled, "*Liber de Inflammationis Morbosæ, quæ in humano corpore fit naturâ, causis, effectibus, et curatione.*"

For an account of the arguments, with which Vacca supports his hypothesis, my limits oblige me to refer to the work of Dr. Thomson. *(P. 68, &c.)*

As this gentleman has observed, there are certain points, in which the two doctrines agree, as well as in which they differ.

"The advocates for each hypothesis agree in admitting, 1st, that inflammation has its seat in the capillary vessels; and 2ndly, that the redness in inflammation is owing to an unusual quantity of blood in the vessels of the inflamed part, and consequently that the capillary arteries are much dilated during the state of inflammation. The contractions of these vessels, indeed, it has been said, are increased also in a ratio proportional to the dilatations; but this is an assertion, which has not yet been proved, either in the way of experiment, or of observation.

"The sense of throbbing, which the advocates for the hypothesis of increased capillary action regard as the strongest proof of that action, Mr. Allen is disposed to attribute to the difficulty, which the blood meets with in passing from the trunk into the capillary branches. This sensation of throbbing, and appearance of increased action, may be produced in an instant, by applying a ligature to an uninflamed finger, so as to obstruct the motion of the blood through its point. Besides, this throbbing, or pulsatory motion, can afford us no criterion, by which to judge of the force, with which the artery contracts, for it is produced in the dilatation of the artery, and by a power foreign to the artery itself." (*Thomson on Inflammation, p.* 73.)

Dr. Wilson Philip, many years ago, endeavoured to ascertain, by means of the microscope, the state of the vessels in the various stages of inflammation, both in the *warm* and *cold* blooded animal. I have put the epithet warm in Italics, because it has been very recently observed by my friend Mr. James, that "analogies between the higher and lower orders of animals, the chief subjects of these experiments, cannot be deemed conclusive," (*On some of the General Principles of Inflammation, p.* 29, *8vo. Lond.* 1821) as if it had escaped attention, that many of the experiments were really made on the more perfect animals. From the valuable observations, to which I here allude, (see *Philip on Febrile Diseases, Part* 2, *Introd.*) it appears, that the state of the smaller vessels in an inflamed part is that of preternatural distention and debility. As for the larger vessels, whose state may be ascertained, without the aid of the microscope, "they do not undergo a similar distention, and the increased pulsation of the arteries, sufficiently evinces their increased action. In inflammatory affections of the jaw and the head, for example, a greatly increased action of the maxillary and temporal arteries is readily perceived by the finger. It is to be observed, however, that, although inflammation, as was evident from the foregoing experiments, begins in the capillaries, if it continues, the circulation in the smallest vessels becoming very languid, those immediately preceding them in the course of the circulation begin to be distended, and consequently debilitated." Dr. Philip adds, that such distention and debility of the vessels, which immediately precede the capillaries, cannot go far, because when the former lose their power, the circulation in the latter is not supported, and gangrene soon ensues. "*In short*, (says Dr. Philip) *inflammation seems to consist in the debility of the capillaries, followed by an increased action of the larger arteries*," and is terminated by resolution, when the capillaries are so far excited, and the larger arteries so far weakened, by the preternatural action of the latter, that the power of the capillaries is again in due proportion to the *vis à tergo*.

"Thus far, (says Dr. Philip) I cannot help thinking the nature of inflammation appears sufficiently evident. The motion of the blood is retarded in the capillaries, in consequence of the debility induced in them; an unusual obstacle is thus opposed to its motion in the arteries preceding them in the course of the circulation; which are thus excited to increased action. Several difficulties, however, remain, on which the experiments just related throw no light. Why does a failure of power, of small extent in the capillaries of a vital part, strongly excite, not only the larger arteries of the part affected, but those of the whole system; while a more extensive debility of the capillaries of an external part excites less increased action in the larger arteries of that part, and often none at all in those of the system in general? Why does inflammation often move suddenly from one part to another, when we see no cause, either increasing the action of the capillaries of the inflamed part, or weakening those of the part now affected? Why does inflammation often arise in parts only sympathetically affected, and consequently far removed from the offending cause? Why is inflammation often as apt to spread to neighbouring parts, between which and the part first affected, there is no direct communication of vessels, as to parts in continuation with that part?

"These phenomena, it is evident, (says Dr. Philip) are referrible to the agency of the nervous system, and seem readily explained by the experiments, which prove, that the effects of both stimuli and sedatives, acting through this system, are felt by the vessels, and that independently of the intervention of any effect produced on the heart. (*Exp.* 27, 28.) Thus, the irritation of the nerves of the inflamed part may excite the larger arteries of this part, or of distant parts, or of the whole sanguiferous system. It will of course be most apt to do so, where the irritation excited by the inflammation is greatest, and, consequently in the more important vital parts. It cannot appear surprising, that inflammation should suddenly cease in one part and attack another, when we know, that the nerves are capable of exciting to due action the capillaries of the one part, and in the other of impairing the vigour of those, which have not suffered. In the same way, we account for parts only sympathetically affected becoming inflamed, and for inflammation readily spreading to neighbouring parts, which always sympathize, although there is no direct communication between them, either of vessels, or nerves." (*On the Vital Functions, p.* 279, *&c. Ed.* 2.)

Respecting the inference, made by Dr. Philip from his experiments, that the circulation is slower in inflamed, than uninflamed arteries; Dr. J. Thomson conceives, that its truth "is not necessary to the establishment of Mr. Allen's hypothesis; and from a number of experiments which I have at different times made upon frogs, I am inclined to believe, *that a diminished velocity of the blood, in the capillary branches, is by no means a necessary, constant, nor even the most common effect of incipient and moderate degrees of inflammation.*" (*P.* 75.)

In order to reconcile this difference in the statements made by the only two writers, who have examined this subject by experiment, Dr. Hastings repeated their mode of investigation with the aid of the microscope. His conclusions are, "that certain stimuli, applied to living parts, produce an increased velocity of the blood's motion, and a contraction of the blood-vessels. During this state of excitement, the part affected is so far from giving any thing, like the appearances of inflammation, that the size of the vessels is diminished, and the part paler. But, if the stimulus be long continued, or increased in power, the small vessels, which in the natural state, admit only of one series of globules, become so dilated, as to allow an accumulation of a much less fluid and redder blood in them, which loses its globular appearance, and *moves much more slowly*, than that which previously passed through the vessels. The part now appears inflamed. If the stimulus be removed, the vessels do not soon regain their original state; time is necessary to allow them to recover their contractile power, so as to prevent the impetus, with which the blood is propelled by the heart and larger arteries, from keeping up the dilated state of the capillaries. Here then we are obliged to admit, with Boerhaave, that there is an error loci; for, a denser and redder blood passes into small vessels, which before carried much more fluid contents: but the error loci does not cause the inflammation, but results from the previously weakened state of the capillaries. In this manner, the blood may occasionally be extravasated in inflammation, without any actual rupture of a vessel, for the exhalents may be so weakened, and dilated, as to allow globules to pass through them.

"If the stimulus, which produces the inflammation, be of a very acrid nature, debility of the vessels is frequently induced without any previous excitement. The blood in all the smaller vessels becomes very red, circulates very slowly, and in some vessels stagnates.

"The application of a stimulus, different from that, which produced inflammation, will sometimes bring on resolution. When this occurs, the dilated vessels contract; they no longer contain a red, dense homogeneous fluid, but again receive blood, consisting of small, nearly colourless globules, which float in a colourless fluid; and the motion of these globules at length becomes as quick as before the inflammation took place. If, however, the inflammation proceed, the blood becomes nearly stagnant; it continues very red, and the vessels are much dilated.

"When this high degree of inflammation is not relieved, sphacelus ensues. The part then feels softer to the finger, and gives way with less force. The vessels are much dilated, the blood does not move, it loses its red colour, and becomes of a yellowish brown hue. The separation of the dead from the living part takes place soon after this change in the colour of the blood.

"Whilst the ulceration, produced by this separation of the dead from the living part of the web is healing, the capillary vessels, distributed on the ulcerated surface, and the contiguous parts, are much distended with arterial red blood, which is moved very slowly. When the ulceration is healed, the vessels become contracted, and circulate the fluid, with the same degree of velocity as before the inflammation was excited.

"With respect to the seat of inflammation, it may be observed, that *the capillaries are first affected;* but even the small arteries of the web are also occasionally distended." (*Hastings on Inflammation of the Mucous Membrane of the Lungs, &c. p.* 90—92.)

With respect to the doctrine, espoused by some pathologists, that the smaller branches of veins are the exclusive seat of inflammation, the same author observes, that the microscope shows us that the most minute arterial branches, though far less numerous, are equally affected with weakness and distention.

In the course of Dr. Hastings's inquiry, it is proved, that the healthy circulation of the blood essentially depends upon a due degree of action in the vessels throughout the system; that the application of stimuli, whilst it increases the action of the vessels, produces none of the symptoms of inflammation. When, however, the excessive action of these stimuli has impaired the excitability of the small vessels, the phenomena of inflammation are fully manifested; and when their excitability is restored, the inflammation subsides. It may be logically inferred, therefore, says this writer, that *inflammation consists in a weakened action of the capillaries, by which the equilibrium between the larger and smaller vessels is destroyed, and the latter become distended.* And, with respect to the conclusion, drawn by Dr. Thomson from his experiments, that inflammation, in moderate degrees, consists in an increased action of the vessels, Dr. Hastings argues, that the writer's belief in the excitement of the capillaries, in some cases of inflammation, arises from his having denominated that a state of inflammation, which ought not to be so called. "The application of the salt, (says Dr. Thomson) produced an increased velocity in the dilated larger and smaller arteries and capillary vessels, to which it was more immediately applied. In nine experiments, the phenomena of which I have minutely recorded, the application of the salt was not only followed by a bright red colour, visible to the naked eye, and a sensible enlargement of the arterial and venous branches, but with an increased rapidity of circulation in the capillary vessels; the globules becoming less distinct, than before the application of the salt, and obviously less distinct, from the rapidity of their motion, than the globules in the capillary vessels in the uninflamed part of the web in the same animal. *The repeated application, however, of the salt to the same vessels, was always sooner or later followed by retarded capillary circulation, or even by complete stagnation.*" (See *Thomson's Lectures, p.* 68.) The results of other experiments, made by this gentleman, and which coincide with the sentiments of Dr. W. Philips and Dr. Hastings, need not here be cited.

Now, with regard to those experiments, which seemed to Dr. Thomson to justify the inference, that moderate degrees of inflammation may be attended with an increased velocity of the blood in the inflamed vessels, Dr. Hastings, as I have already said, objects, that the appearances seen, while such velocity of the circulation presented itself in the vessels affected, ought not to have been denominated inflammation; because "it constantly happened in his own experiments, that when inflammation commenced, no globules could be seen even in the blood of the affected vessels. It was universally converted into a bright red homogeneous fluid. So that *globules could never be seen in the capillaries of a really inflamed part, much less moving with great velocity.* He argues, that the state, alluded to by Dr. Thomson, is only that temporary excitement of the capillaries, generally preceding their debility, which is inseparable from inflammation. (See *Hastings on Inflammation, &c. p.* 98, 101.)

Of course, such writers as believe, that the blood in the capillaries is not propelled by these vessels themselves, but by the impulse received from the heart, cannot assent to the foregoing view, in which the proximate cause of the inflammation is ascribed to debility of those vessels. Dr. Parry argues, that the theory which represents this process as consisting in an increased momentum of the blood in the part affected, is not invalidated, were it even proved, according to the opinion of Dr. Philip, that the velocity of the blood in the vessels of an inflamed part is diminished, unless it be also proved, that the velocity is diminished in a greater proportion, than the quantity is increased. (*Elements of Pathology, Vol. 1, p. 84.*) As far, however, as I can judge, the arguments are in favour of Dr. Philip's view of the subject; for, with respect to quantity making up for loss of velocity, if the supposition were to be adopted, surely it could not be retained after the inflammation has arrived at that state, in which the fluid in the capillaries is seen with the microscope to be nearly or quite stagnant. It must be confessed, at the same time, that the question about the proximate cause of inflammation is still a topic of endless controversy, into which I consider it perfectly absurd to enter any further than can be avoided, without having leisure at present to prosecute the inquiry by experiments. In one sense, both Dr. Philip and Dr. Hastings admit, that an increased action of the vessels may exist in inflammation; but then this excitement or increased action is not in the capillaries, but the larger arteries; and Dr. Philip even suggests, that the presence, or absence of such excitement may make the difference between acute and chronic inflammation. The considerations in support of the side of the question, to which I do not myself incline, may be found in the writings of Dr. Parry, Dr. C. H. Parry, and Mr. James of Exeter. From this remark, I would not have it inferred, that I am quite convinced of the propriety of referring the proximate cause of inflammation to *debility* of the capillaries, though the retarded circulation in them, like their dilatation, is now a fact placed out of all doubt. The points, however, on which I should not assent to Dr. Philip's doctrine, will be best understood, when the treatment is considered. In the work of Mr. James may be perused a very good summary of Bichat's doctrine, which I would willingly annex, if the subject were intelligible, without an explanation of some physiological opinions, for which I have not room in this edition. (See *J. H. James, Obs. on some of the general Principles, &c. of Inflammation, p. 38, 8vo. Lond.* 1821.)

Redness.—This is manifestly owing to the increased quantity of blood in the inflamed part. More blood must necessarily be contained there, because the vessels, which previously conveyed this fluid, are preternaturally distended, and the small vessels, which naturally contained only lymph, are now so enlarged as to be capable of receiving red blood. "I froze (says Mr. Hunter) the ear of a rabbit, and thawed it again; this occasioned a considerable inflammation, an increased heat, and thickening of the part. This rabbit was killed when the ear was in the height of inflammation, and the head being injected, the two ears were removed and dried. The uninflamed ear dried clear, and transparent, the vessels were distinctly seen ramifying through its substance; but, the inflamed ear dried thicker and more opaque, and its arteries were considerably larger."

Many have supposed, that the redness of common inflammation is partly occasioned by the generation of new vessels. This doctrine, however, seems very questionable. When coagulated lymph is extravasated upon the surface of a wound, or an inflamed membrane, unquestionably it often becomes vascular, in other words, furnished with new vessels. But, in the extravasated lymph of a phlegmonous tumor, we have no evidence, that there is any formation of new vessels. Were the lymph to be rendered organized and vascular, the swelling and redness would probably be more permanent, and at least not admit so easily of resolution. When adhesions are formed between two inflamed surfaces, the organized substance forming the connexion, lives after the subsidence of the inflammation, and is a permanent effect. In the experiments detailed by Dr. Hastings, when the inflammation began and terminated, without any lesion of the part affected, new vessels were never formed. (*On Inflammation, &c. p. 93.*) At the same time, it must be confessed, that great obscurity prevails in this very difficult part of the subject; for when suppuration happens in a phlegmonous tumor, the cavity is lined by a kind of cyst, or membranous layer of lymph, which is unquestionably furnished both with secreting vessels and absorbents; for, otherwise, how could the continued secretion of pus, or its occasional sudden disappearance, be at all explicable. It was probably, the enlargement of the small vessels, and the circumstance of their being filled with red blood, that led to the theory of new vessels being usually formed in inflammation. It has, however, been justly observed, that the supposition easily admits of refutation; for heat, and many other causes of inflammation, operate so quickly, that there can be no time for the formation of any new vessels; and, yet the redness is as great, and the inflammation as perfect in a minute as in an hour or a day after the application of the exciting cause. (*Burns.*) Mr. Hunter, it is well known, believed, that a coagulum or layer of lymph might produce vessels within itself.—(*On the Blood, p. 92, &c.*) Others, however, distrust this hypothesis, and incline to the opinion, which refers the derivation of vessels for the organization of deposits to parent branches. (*Travers, Synopsis of Diseases of the Eye, p. 113.*) The latter sentiment is corroborated by the appearances noticed by Dr. Hastings, in his experiments, who describes the small vessels first seen in the lymph, upon the surface of a wound, as even then communicating with the inflamed capillaries. (*On Inflammation, p. 94.*) Another reason, assigned for the redness of inflammation, is, that the blood after it has become venous, retains, more or less, its bright scarlet colour. (*Hunter.*) And, in some late very carefully conducted experiments, it was remarked, that the weakened action of the smaller vessels was always accompanied with an alteration in the appearance of the blood. In the natural state of this fluid, globules can be distinctly seen; but, after inflammation has commenced, the globular structure disappears, the blood becomes redder, and the most minute capillaries are distended with it. (*Hastings on Inflammation, &c. p. 95.*)

Swelling.—This effect arises from several causes: 1. The increased quantity of blood in the vessels. 2. The effusion of coagulating lymph, and serum, and deposition of new matter. 3. The interruption of absorption, particularly noticed by Soemmering (*De Morb. Vas. Absorb.*)

Pain.—This is observed to be the greatest during the diastole of the arteries. The affection is probably owing to the unnatural state of the nerves, and not to mere distention, as many have asserted Were the latter cause a real one, the pain would always be proportioned to it.

"Parts, which in the sound state have little, or no sensibility (as Dr. Thomson remarks) become exquisitely sensible in the inflamed. That this is the case with tendon, ligament, cartilage, bone, and membrane, seems to be fully established by Dr. Whytt in the very instructive controversy carried on between him and Haller, respecting the sensibility and irritability of the different parts of man and other animals."—(*Lectures on Inflammation, p.* 45.)

Heat.—The heat or real increase of temperature in an inflamed part, when judged of by the thermometer, is generally much less, than might be supposed from the patient's sensations. It is said never to exceed the heat of the blood at the heart. This in health is usually about 100° Fahrenheit's thermometer; but sometimes in diseases it arises to 106° or even 107°. Mr. Hunter artificially excited inflammation in the chest of a dog, and in the abdomen, rectum, and vagina of an ass, without being able to discover any obvious rise of temperature in these parts. In a patient, however, on whom he operated for hydrocele, the thermometer, introduced into the tunica vaginalis, and kept for some time close to the side of the testicle, was only 92°; but, rose the following day, when inflammation had come on to 98¾°. As Dr. Hastings observes, the advocates for excited action of the vessels in an inflamed part have thought, that the increase of temperature favours their hypothesis, and have called to their aid the ingenious calculations of Dr. Crawford. They have even gone so far as to say, what state of the arteries enables the blood to give out most caloric. They tell us, that, in consequence of excitement of the vessels, more blood is transmitted into the minute arteries; the capacity of a greater quantity of this fluid for heat is of course diminished, and more caloric is evolved in the inflamed part. (*Hastings on Inflammation, p.* 110.) Yet, this theory, besides involving the contradicted hypothesis of an increased and accelerated flow of blood through the vessels of the inflamed part, cannot be reconciled to various other considerations. "Daily experience convinces us, (says the above writer,) that the temperature is not always proportional to the velocity of the circulation. In fevers, the author has several times ascertained, with the thermometer, that the heat was 101°, when the pulse beat only 45 times in a minute. In hydrocephalus, with a pulse from 60 to 70, the heat is often above the degree it reaches in health. In these cases, according to the theory of Dr. Crawford, the heat should rather be under, than above, the natural standard." (*Op. cit. p.* 112.) And, as another judicious writer has noticed, although the former mode of explaining the production of animal heat has been held adequate to account for the phenomena by such philosophers as Black, Crawford, Lavoisier, and Place, the evidence on which it rests, is not so clear, as to have commanded universal assent, or entirely set aside objections. It has indeed been generally allowed, that respiration and the changes it produces in the air and animal fluids, are essential conditions of the evolution of caloric in animals; but, it has been thought, that there are other circumstances, hitherto, perhaps, not well understood, which influence the phenomena. In external appearance, the blood is the same in all the vessels of the fœtus: is this any proof, that its temperature is owing to the conversion of oxygen gas into carbonic acid? Is the uniformity of temperature in the higher animals, under varying states of respiration and circulation, and the consumption of various quantities of oxygen, whether in the same, or different individuals, consistent with the theory? And can local variations of temperature be explained by it? (*Rees's Cyclopædia, art. Respiration.*) Doubts must also spring from the recollection of the discordance of the experiments, related by Dr. Crawford, Dr. John Davy, De la Roche, and Berard. In fact, the determinations of the specific heats of oxygen gas and carbonic acid by the two latter experimenters are conceived to be very much against the probability of Dr. Crawford's theory. Other stronger grounds for scepticism in this subject are the results of Mr. Brodie's investigations. Having pithed, or decapitated animals, he kept up artificial respiration, and thus maintained their circulation. The blood continued to be changed in the lungs from venous to arterial, and from arterial to venous, in the general circulation. The respective colours of the two kinds of blood could not be distinguished from those, which they exhibit in living and healthy animals. Yet, the temperature of an animal, thus heated, sunk faster, than that of another animal simply killed and left to itself; and the former was supposed to be more quickly cooled by the air conveyed into its chest. Other experiments detailed by Mr. Brodie, tend to prove, that the oxygen of the air, employed in artificial respiration, underwent its usual conversion into carbonic acid. A living rabbit formed 50, or 56 cubic inches of carbonic acid in an hour. A decapitated animal, in whom artificial respiration was kept up, emitted 40—48 inches in the same time. The thermometer in the rectum of the latter had fallen from 97 to 90, while, in another rabbit left to itself, but similarly treated in all other respects, it had fallen only to 91. In a rabbit, poisoned with woorara, or the essential oil of bitter almonds, not decapitated, and, in which artificial breathing was kept up, 51 cubic inches of carbonic acid were emitted in an hour. The thermometer in the rectum had sunk to 91 in 30 minutes; while it stood at 92 in another animal, treated exactly in the same way, with the omission of the artificial breathing. From these experiments, Mr. Brodie infers, "that, in an animal in which the brain has ceased to exercise its functions, although respiration continues to be performed, and the circulation of the blood is kept up to the natural standard, although the usual changes in the sensible qualities of the blood take place in the two capillary systems, and the same quantity of carbonic acid is formed as under ordinary circumstances; no heat is generated, and (in consequence of the cold air thrown into the lungs,) the animal cools more rapidly, than one which is actually dead." (See *Phil. Trans. for* 1811, *p.* 36; *and for* 1812, *p.* 378.) It appears certain, therefore, that the generation of animal heat, either in an inflamed, or an uninflamed part, can never be satisfactorily explained by any reference merely to chemical principles, and that the process is essentially connected with, and influenced by, the state of the functions of the brain and nervous system, and no doubt also by the principle of life itself. At the same time, I think, that any hypothesis, suggested without due reference to the connexion, which respiration has with this curious and interesting process, will never be established. Neither would I venture so far as Dr. Philip, who believes, that animal heat is evolved by the same means, by which the formation of the secreted fluids is effected, viz. the action of nervous influence on the blood, and that the production of such heat is to be regarded as a secretion. *(On the Vital Functions, p.* 169.) However, the influence of the nervous system over this process must be allowed to be very great, and may afford a more probable explanation of the cause of the local change of temperature in inflammation, than Dr. Crawford's theory, combined with the doctrine of increased action, and an accelerated circulation in the vessels of the part affected.

Buffy coat.—The blood, when taken out of the living vessels, spontaneously separates into two distinct parts, the serum and the crassamentum. The last is a compound substance, consisting chiefly of coagulating lymph, and red globules, the most heavy ingredients in the blood. Blood, taken away from persons affected with inflammation, is longer in coagulating, and coagulates more firmly, than in other instances. Hence, the red globules, not being so soon entangled in the lymph, descend, by their gravity, more deeply from its surface, which being more or less divested of the red coloring matter, is from its appearance termed the *buffy coat*, or *inflammatory crust*. The firmer and more compact coagulation of the lymph compresses out an unusual quantity of serum from it, and the surface of the sizy blood is often formed into a hollow, the edges being drawn inward. *(Hunter.)* In some cases, these changes in the blood are deemed a more infallible proof of the existence of inflammation, than the state of the pulse itself. They are, however, only a criterion of some unusual operation going on in the system; for, the blood taken from pregnant women is always found to present the same phenomena. In peritonæal inflammation, the patient sometimes seems to be in the most feeble state, and the pulse, abstractedly considered, would rather induce the practitioner to employ tonics, and stimulants, than evacuations; but, should the continuance or exasperation of the disorder, or any other reason, lead him to use the lancet, then the *buffy coat*, and the *concave surface*, of the blood, materially obviate any doubt of the existence of inflammation. Surgeons should never forget, however, that in a few anomalous constitutions, the blood, when drawn, always exhibits the above peculiarities.

Terminations.—Inflammation is said to have three different terminations; or, in more correct language, we may say, that, after this process has continued a certain time, it either subsides entirely, induces a disposition in the vessels to form pus, or completely destroys the vitality of the part.

When the inflammation is to end in the first manner, which is the most favourable, the pain becomes less, the swelling subsides, the fever, and every other symptom gradually abate, till at last the part is wholly restored to its natural size and colour. There is no formation of pus, nor any permanent injury of structure; and, if Dr. Philip's theory of inflammation be correct, the debilitated capillaries are excited to due action by the increased action of the larger arteries. *(On the Vital Functions, p.* 298.) This termination of inflammation is termed by surgeons *resolution*. It is fortunately the most common, as well as the most desirable manner, in which the affection ends.

If, however, notwithstanding the application of the usual remedies, the several symptoms of heat, pain, and redness, instead of diminishing, rather increase; if the febrile symptoms are likewise augmented, and the tumor gradually acquires a larger size, turns soft, somewhat prominent in the middle, or towards its most depending part; if it should next acquire a clear shining appearance, and become less painful, the different symptoms of fever being at the same time diminished, and a fluctuation perceptible in the tumor; the inflammation has ended in *suppuration*.

The worst, but happily, the least frequent consequence of common inflammation, is the death, or *mortification*, of the part affected. In the microscopical experiment of Dr. Hastings, it was observed, that, on the approach of gangrene, the blood entirely loses its red colour, and acquires a yellowish brown tinge. *(On Inflammation, p.* 97.) The part, which was of a bright red, becomes of a livid hue; small vesicles, filled with a thin fetid serum, arise on its surface, and air is plainly felt within the cellular membrane. The pain is indeed diminished; but the pulse sinks, while the tumor is gradually changed into a black, fibrous mass.

These are the three common terminations of inflammation. In books, scirrhus is sometimes enumerated as one of the terminations of inflammation. The best modern surgeons, however, do not regard scirrhus as one of the usual effects of ordinary inflammation: "the term scirrhus, as used by the older medical writers, is extremely indefinite, having been sometimes used to express every kind of induration, which remained after an attack of inflammation, as well as the morbid incipient state of parts about to become affected with cancer. Surgeons now usually limit the use of the term to the last of these significations." (*Thomson on Inflammation, p.* 126.)

Common inflammation, particularly when it affects glandular parts, is often followed by induration, which afterwards continues for a greater or lesser time. Thus, when the testis has been inflamed, a hardness of the epididymis frequently remains during life. Such induration, however, is not at all malignant, and, consequently, very different from what is implied by a real scirrhus.

TREATMENT OF INFLAMMATION.

One principal difficulty in believing the fact of the retardation of the circulation in the capillaries of an inflamed part, and against the supposition of their being in a state of debility, is, that the most effectual treatment of common inflammation consists of means, which are generally of a debilitating nature, as bleeding, purging, &c. And surgeons are still further attached to the theory of increased velocity of the blood's motion, in the part affected, by the recollection of the local augmentation of temperature, the throbbing, and the instantaneous return of the red colour, after the discontinuance of any pressure, by which the redness has been momentarily removed at some point of the inflamed surface. These too are all so many facts, which, as far as I can judge, are admitted by the generality of reasoners, whatever may be their particular theory. At the same time, it appears equally well proved by careful microscopical experiments, that in the capillaries of the part, which is directly the seat of inflammation, there is a retardation, and sometimes even a stagnation, of the circulation. But, this is not all: it is further manifested, that the capillaries are considerably dilated, the blood in them materially altered, and that these phenomena are followed by an increased action of the larger arteries leading to the part affected. Now, I think, if we remain contented with these obvious circumstances, and dismiss the hypothesis of debility of the capillaries, not only the necessity for venturesome conjectures may be avoided, but a more rational account delivered of the principles of the efficacy of the usual mode of treatment. Thus, I would not presume to offer any supposition, why the capillaries are dilated, and why the motion of the fluid in them is retarded, but would be satisfied with a knowledge of the facts, so as to elude a source of endless controversy, viz. the question, whether these changes proceed from debility of the said vessels, or other causes? In the view, which I take of the nature of phlegmonous inflammation, I consider the following circumstances proved: 1. The dilated state of the capillaries in the immediate seat of inflammation. 2. The retardation, or even stagnation of the circulation in them. 3. The increased action, or excitement of the larger arteries leading to the inflamed part. All these three main points seem to me to be fully established by the investigations and experiments both of Dr. Wilson Philip, and Dr. Hastings; and I may make the observation, though aware, that the latter gentleman does not regard increased action of the larger arteries, as a constituent and necessary part of inflammation, because cases occur, in which no such excitement can be detected; (*On Inflammation, p.* 104,) for, I here put out of consideration chronic inflammation, which I believe is entirely a different process, bearing no resemblance to the acute forms of the disorder, either in the state of the capillaries, or of the larger arteries. Assuming the above points, as proved, it is to be inquired, whether other facts, such as the heat and throbbing in the inflamed part, the instantaneous return of redness to the spot, which has been touched, and the efficacy of common treatment, are reconcileable with them, or not. I am disposed to think they are: for, it is only asserted, that the passage of the blood is more or less obstructed in the capillaries in the seat of the inflammation; and the larger arteries, leading to them, are, for the most part, obviously in a state of increased action, whereby a greater quantity of blood must be supposed to be determined towards the part. Now, as this augmented quantity of blood cannot pass freely through the smaller vessels, in the immediate place of inflammation, it must be thrown into such arteries in the neighbourhood, as are capable of receiving it, so that, in fact, the theory of obstruction of the capillaries may not be altogether incompatible, both with increased action, and quickened circulation, in the arteries directly around the parts, in which there is a retarded circulation in the capillaries. This view of the subject, I think, is not liable to greater perplexity in the explanation of the heat, throbbing, &c. than former doctrines, involving the contradicted notion of there being an increased action, and an augmented velocity of the blood's motion, in *all* the arteries of the part affected.

Resolution being the most favourable termination of common inflammation, it is of course, the object at which the surgeon generally aims in the treatment. Dr. Philip's very ingenious view of inflammation leads him to suppose, that resolution arises from the debilitated capillaries being excited to due action by the increased action of the larger arteries. (*On the Vital Functions, p.* 298.) But, I am of opinion, that the doctrine of debility of the capillaries, and the hypothesis of their being strengthened by the excitement or increased action of the larger vessels, are by no means satisfactory, and perhaps not very intelligible. On the contrary, if the capillaries are already so weak as to be distended by the ordinary impulse of the blood, how are they to be restored to their natural dimensions and functions by any increased action of the larger arteries? the effect of which, I should conceive, would be to gorge them still more with blood, and produce even a greater dilatation of them. Were the above reasoning correct, it would follow that a principal indication in the treatment would be to promote the increased action of the larger arteries, whereby so much supposed benefit is communicated to the debilitated capillaries. Yet, such practice is contrary to the dictates of experience, and is even inconsistent with the principles, on which Dr. Philip himself thinks the treatment should be founded. Indeed, the following directions are such, as I imagine will be perfectly approved of by practitioners, who, far from looking upon the increased action of the arteries, as a means of relief, are accustomed to do every thing in their power to lessen and resist it. "All the local means (says Dr. Philip) are calculated either to lessen the contents of the morbidly distended vessels, or to excite these vessels to expel them. The general means are regulated by the effects, produced by the disease on the more distant vessels, through the medium of the nervous system; the objects of this part of the treatment being, neither to allow the action of these vessels to fall so low, that it is incapable of supporting any degree of circulation in the debilitated vessels, nor to become so powerful, as farther *to distend by gorging them with blood. Thus, when the symptoms of active inflammation run high, we* *lessen the vis à tergo;* when gangrene is threatened, we increase it." (*W. Philip, on the Vital Functions, p.* 285, *Ed.* 2.) In short, as soon as the fact is established, that a strong flow of blood towards an inflamed part tends to aggravate the disorder, all difficulty ceases in reconciling the usual means of relief to that theory of inflammation, which takes into the account a retarded state of the circulation in the distended capillaries.

The means, employed for the relief of inflammation, have been cursorily noticed in a preceding article. (See *Antiphlogistics.*) We shall now devote a few pages to a more particular consideration of them.

Removal of exciting causes.—In all cases, the first circumstance to be attended to, is the removal of all such exciting causes as may happen to present themselves. If the irritation of a splinter were to excite phlegmonous inflammation, who would not of his own accord directly take away the extraneous body? In wounds, foreign substances frequently excite inflammation, and ought to be taken away as speedily as possible; splintered pieces of bone often give rise to the affection, and require removal; the head of a bone being out of its place, may press and inflame the part on which it lies; and who does not immediately see the propriety of putting it back into its natural situation? These and other similar exciting causes may often be detected and removed at once, and this is doing a great deal towards the cure and even the prevention of inflammation. However, many of the exciting causes of this affection are only of momentary application; yet, though they no longer exist, the process of inflammation must follow, as a kind of salutary operation, without which, the injured organization, and tone of the parts, still remaining, could not be rectified again. Hence, besides taking away the remote cause, whenever this can be done, it is proper to moderate, by other means, the increased action of the larger arteries, and lessen the velocity of the blood's motion towards the inflamed part.

Bleeding.—As there is reason to believe, that, in common inflammation, a greater quantity of blood is impelled towards the inflamed part, than in the natural state, and experience proves, that nothing has a more powerful effect in checking the disorder, than diminishing the determination of blood to the part, bleeding must be a principal means of relieving inflammation: it lessens the action of the whole sanguiferous system, and, of course, of that part of it, which is directly concerned in regulating the quantity of blood transmitted to the part affected. On the principle also of lessening the whole mass of blood in the circulation, it must have a similar effect.

Bleeding, however, is often misemployed, especially when regarded as the only remedy for inflammation, and other steps are neglected. The general obstinacy and vehemence of the process in weak constitutions prove, that bleeding is not invariably proper, and in such individuals it often appears, as if their general irritability and the difficulty of curing the inflammation, were in a ratio to their weakness. When inflammation is complicated with disorder of the chylopoietic organs, blood should be taken away with great circumspection.

A great deal of induration, with little pain and heat in the inflamed part; the probability of a long and copious suppuration, as is the case in many compound fractures; and the connexion of the inflammation, with a want of tone in the part; are particular instances, in which the practitioner should be sparing of this evacuation. Bleeding is sometimes quite unnecessary, when the local inflammation and symptomatic fever are trivial, when the patient is feeble or very old, and when the cause of the affection can be entirely removed. (*Richter.*)

On the other hand, bleeding is highly beneficial where the inflammation is uncomplicated with any previously existing disorder of the gastric system, while it is considerable in extent and degree, and attended with a good deal of febrile disturbance. The same practice is also strongly indicated, when the part affected is very sensible, and highly important, in regard to its office in the system. Thus the lancet must be freely employed in acute ophthalmy, or inflammation of the eye, which is a most sensible part; and, in inflammation of the lungs, brain, or stomach; organs, the sound state of which is essential to the regular continuance of all the various operations in the animal machine; and if a successful effort be not promptly made to stop such inflammation by the most vigorous means, death itself will be the result.

In general, bleeding may be said to be indicated, when the patient is young, robust, and plethoric; when the cause of the disorder can neither be removed nor diminished; and when there is a very strong motive for wishing to avoid the formation of matter. Inflammation of the eye is a case, illustrative of the truth of the last observation; for, if suppuration take place in this organ, the common consequence is so serious a destruction of its internal structure and organization, that the future restoration of sight is totally impossible. In the examples, falling under the conditions specified as requiring blood to be taken away, it is sometimes necessary frequently to repeat the evacuation.

The efficacy of bleeding is greater, the sooner it is practised, and the more suddenly the blood is evacuated. Bleeding near the part affected is usually more effectual, than when done in a remote situation. Hence, in inflammation of the eye, or brain, it is often considered most advantageous to take blood from the temporal artery.

"In many inflammations, particularly those of the parts contained in the three great cavities of the head, chest, and belly, general blood-letting (says a judicious writer) if not the only, is the principal remedy, to which we can trust for a cure. The quantity of blood, which, in these inflammations, it is necessary to take away, varies according to the violence of the inflammation, the temperament, strength, and habits of the patient, and according to the structure, functions, and situation of the organ in which it occurs. From twelve to twenty ounces, or even more, ought generally to be drawn every time we have occasion to use the lancet in the cure of inflammation, and bleeding to this extent may be repeated two or three times in the course of the first twenty-four hours, according to the effects, which it seems to produce, as well as according to the violence and urgency of the symptoms. In inflammation of internal parts, we judge of the effect of bleeding, and of the necessity of a repetition, from the feeling and continuance of pain, from the state of the pulse, and also from the appearance of the blood, which has been last drawn.

" A partial, and in some instances, an almost complete cessation of pain takes place even during the operation of blood-letting. This is always a favourable symptom, and indicates, that the inflammation has made no great, nor very alarming progress. In other instances, the relief from pain, though inconsiderable, at the time of bleeding, becomes afterwards more sensible, and the other symptoms of inflammation abate in nearly the same proportion; while, in other instances again, the pain is either not relieved by the bleeding, or, if relieved, the relief is but of short duration. These last are cases, in which, the other symptoms of inflammation continuing unabated, recourse must be had again to the use of the lancet, and as much blood drawn, as can be done with safety to the patient.

" The changes, which take place in the state of the pulse, either with regard to its frequency, or strength, during, or soon after the abstraction of blood, though they afford criteria, by which we may judge of the state of the inflammation, and of the effects of the bleeding, are by no means marks so sure of the advantage, which has been obtained, as that derived from the cessation of pain.

" In some inflammations of the head, for example, the pulse is slower than natural, though it beats with its accustomed, or even with an increased degree of strength. In inflammations also of the peritonæum, and of the intestinal canal, we find the pulse not much quicker than natural, small, and contracted. We should deceive ourselves, therefore, were we to infer, that an increase of inflammation had taken place, because, in the first instance, the pulse had become quicker, and, in the second, fuller, and stronger, during, or soon after the abstraction of a quantity of blood.

" The pulse, it may be remarked, has often a contracted, cord-like feel in inflammation, and it may always be regarded as a favourable event, when it becomes softer, fuller, and slower, during, or soon after blood-letting." (See *Thomson's Lectures on Inflammation*, *p.* 166, 168.)

With respect to the buffy coat of the blood, Dr. Thomson states, that it is not by the buffy coat alone, but by the buffy coat in conjunction with the quantity and firmness of the coagulum, that we must judge of the propriety of any further detraction. When the buffy coat has a firm and tenacious consistence, and when the pain continues unabated, we may conclude, that the inflammation is not subdued. But, when the coagulum is soft and easily broken, and when the colour of the buffy coat is changed from a yellowish to a greenish hue, Dr. Thomson thinks, that little or no benefit can be derived from bleeding. But, as already mentioned, every practitioner should remember, that, in particular constitutions, and in pregnancy, the blood taken away naturally exhibits a buffy appearance, independently of inflammation.

The preceding remarks chiefly relate to *general* bleeding; for, in phlegmonous inflammation, *topical* bleeding is scarcely ever improper. It is always a point highly worthy of the surgeon's consideration, whether bleeding *in* or *near* the part, will answer better, than taking the blood from the *general habit*; for, certainly less may be removed in this way, so as to have equal effect upon the part inflamed, and probably, upon every other disease that is relieved by bleeding, with less injury to the constitution. Although, in many cases, the general habit is relieved by bleeding, yet it is the part affected which most requires this evacuation. That local bleeding has very considerable effects on the inflamed part, is proved by the sudden relief, which is often produced by the application of leeches in cases of gout. The mere use of leeches, without other measures, will also sometimes remove a tumor in the breast, having all the appearance of a scirrhus, which cannot be considered as inflammatory, so that topical bleeding extends its power further, than the mere checking of inflammation Some part of its effect has been imputed to sympathy. (*Hunter.*) There are three modes of performing topical bleeding; by cupping; by leeches; and by dividing, or scarifying the dilated vessels leading to the inflamed part. (See *Bleeding.*) Upon the head and face, leeches are commonly employed; upon the chest, either leeches or cupping; upon the abdomen, leeches; and upon the joints, either cupping or leeches. When the eye is inflamed, leeches may either be applied to the adjoining temple, or the dilated vessels of the conjunctiva may be scarified; or both methods may be adopted. When the inflammation extends quite to the surface of the body, leeches are always most eligible, as their bites cause less irritation in inflamed parts, than the punctures of the scarificator, or the pressure of cupping-glasses.

Purging.—The exhibition of mild laxative medicines, and saline purgatives, is a principal means of diminishing inflammation. Purging does not produce such lasting weakness as is the consequence of bleeding, and, therefore, it is scarcely ever omitted, even when the abstraction of blood is deemed improper. Saline purges must lessen the quantity of circulating blood, inasmuch as they increase the secretion from the intestinal arteries; and therefore, they probably operate beneficially in the cure of local inflammation, much upon the same principle as bleeding. Mr. Hunter was of opinion, that purging lowers action, without diminishing strength, by which we are probably to understand, without producing a very lasting or permanent loss of strength. With respect to mild laxative medicines, none are superior to manna, rhubarb, oleum ricini, and the like; and of the saline purgatives, the best are, the sulphate of soda, tartrite of potass, phosphate of soda, and sulphate of magnesia. It may here be remarked, that, besides the benefit, which the local inflammation derives from the judicious administration of purgatives, the costiveness and heat, which usually attend the symptomatic fever, are also removed by the same means.

" Purgatives (says Dr. Thomson) are more or less required in almost every species of inflammation; but they are more peculiarly necessary in those which are accompanied with a high degree of fever, or with derangement of the digestive, or biliary organs. In cases of inflammation which have a tendency to spontaneous resolution, they are almost always the best, and often the only remedies that are required." (*Lectures on Inflammation, p.* 171.

Considering the general approbation of the employment of mild saline purgatives in cases of inflammation, I confess, that I was not a little surprised to find merely the following short unfavourable notice taken of them by a celebrated foreign professor, in his account of the treatment of inflammation. "As for purgatives, they must be used with discretion. There are none of them antiphlogistic, as has been pretended. They always produce more or less irritation, and can only be applicable, when the cause of the inflammation is in the intestinal canal. In the beginning of the complaint, we ought, therefore, in general to abstain from them, and confine ourselves to emollient clysters." (*Boyer, Traité des Maladies Chirurgicales, T.* 1, *p.* 39.)

Diaphoretic and nauseating Medicines.—Medicines, which have the power of producing sickness, lessen, for a time, the action, and even the general powers of life. This is in consequence of every part of the body sympathizing with the stomach; and the effect may be very quickly excited. Sickness lowers the pulse, makes the small vessels contract, and rather disposes the skin to perspiration. But, nothing more than nausea should be caused; for vomiting rather rouses than depresses. (*Hunter.*) Nauseating medicines, employed after bleeding, has been practised once or twice, are often productive of considerable benefit; but there are some affections, in which they cannot be used, such as inflammation of the stomach and intestines. In all superficial inflammations, however, they may be safely and advantageously exhibited, as well as in most inflammatory affections internally situated. In inflammation of the dura mater and brain, and, indeed, in every instance, in which there is an urgent reason for putting as sudden a check as possible to the continuance of the affection, the employment of nauseating doses of antimony is most strongly indicated. The tartrite of antimony (emetic tartar) is the medicine, on which practitioners place the greatest reliance, and it is to be prescribed for the purpose of exciting nausea, as follows:—

℞. Antimonii tartarisati grana duo; Aquæ distillatæ uncias quatuor. Misce et cola. Dosis, Uncia dimidia sextâ quâque horâ.

The safest diaphoretics are citrate of potass, acetate of ammonia, and tartrite of antimony, and James's powder. The two latter, from their effects in producing nausea, and weakening the pulse, are sometimes most efficacious, as already stated.

"The warm bath seems to act (as a modern writer says) not only by increasing the tendency to perspiration, but also by occasioning a determination of blood to those parts of the body to which it is more immediately applied. It is in this way that bathing the feet seems to relieve inflammatory affections of the head and throat. I have not seen any experiments, nor am I acquainted with any, which have been made with a view to ascertain its use in the inflammations of the chest; but, in all inflammations of the belly, and of the viscera contained within that cavity, there are no other means of cure, blood-letting excepted, which afford such sudden and permanent relief as that which is obtained from hot fomentations and warm bathing." (See *Thomson on Inflammation, p.* 173.)

Opium.—The majority of surgeons entertain an insuperable objection to the administration of opiates in almost all cases of inflammation, and the aversion to this practice is for the most part deducible from the recollection of opium being a powerful stimulant. The plan, however, has its advocates. (*B. Bell, Richter, &c.*) One of its strongest partisans tells us, that opium particularly lessens the disturbance of inflammation, and allays pain, which is at once a principal symptom of the process, and a cause of its augmentation, as well as that of the fever. Opium also quiets the inordinate action of the solids, the mental agitation and restlessness so powerfully, that it well deserves the name of the grand *antiphlogistic remedy.* It likewise occasions a moisture on the surface of the body, which experience shows is eminently serviceable in all inflammations affecting the skin. When given with this view, it is usually conjoined with antimony, camphor, calomel, or ipecacuanha. The administration of opium is a general practice in all painful inflammations arising from external causes, and, *it is attended with perfect safety when evacuations from the bowels and bleeding have been previously put in practice.* Care must be taken to give it in sufficient doses; for small quantities not only fail in fulfilling the object, but frequently produce quite an opposite effect. During its employment, the bowels should be kept open with glysters. The efficacy of opium chiefly manifests itself in the early stage of the affection; for, as soon as the inflammatory fever has extended itself to the whole system, it loses its beneficial virtues. Hence, in cases of external injuries, it is to be given, the two first days, immediately after bleeding. It is to be given as soon after the accident as possible, in order to tranquillize the mental alarm, and, if convenient, towards the evening, for the sake of procuring a quiet night. (*Richter.*) Evacuations being premised, says the other advocate for this medicine, the next object of importance is to procure ease and quietness to the patient, which, in cases of inflammation, are often of more real service, than any other circumstance whatever. The most effectual remedy for this purpose is opium, which, when the pain and irritation are considerable, as very frequently happens in extensive inflammations, should never be omitted. In large wounds, especially after amputations, and other capital operations, and in punctures of all kinds, large doses of opium are always attended with remarkably good effects. In all such cases, however, opium, in order to have a proper influence, should be administered in very large doses; otherwise, instead of proving serviceable, it seems rather to have the contrary effect. (*B. Bell.*) According to modern observations, morphine is the principle in opium, that tranquillizes without producing the ill effects of common opium, and of course its preparations are peculiarly suited for cases of inflammation.

On the contrary, those who are averse to the use of opium, remark, that in acute inflammation daily experience shows, independently of every theory, that the exhibition of this medicine increases the general fever, and aggravates the local action. Even given as a preventive of inflammation, after operations, anodynes are almost uniformly hurtful, producing restlessness, heat, thirst, and afterwards headach, sickness, and frequently troublesome vomiting. *(Burns.)*

According to Dr. Thomson, "those diaphoretics, into the composition of which opium enters, seem to be better adapted for inflammation attended with fever of a typhoid character, or for cases where the inflammation has existed for a considerable time before diaphoretics are employed. Given at an early period in acute inflammatory diseases, opium never fails to excite vascular action, and to aggravate all the symptoms of fever. Opium, therefore, is not to be used, unless to allay the pain and irritation from a surgical operation, or from the recent infliction of an external injury. Indeed, unless when the patient is very nervous, and complains much of pain, its use, even after chirurgical operations, had, I believe, in general, better be abstained from, as it almost never fails to add to the violence of the symptomatic fever which is the necessary consequence of the operation. Its effects are often very beneficial, when the period of this fever has passed over." (See *Lectures on Inflammation, p.* 172.) Upon the whole, candour obliges me to own, that the majority of surgeons in this country are decidedly against the general use of opium in inflammation; but, after the performance of severe operations, and in all instances attended with excessive pain, truth, I believe, will justify my saying, that they are in favour of the exhibition of this remedy; and, no doubt, the preparations of morphine ought to be preferred.

Diet and Regimen.—In all cases, the surgeon is to forbid the use of wine and spirits; and, when the inflammation is at all considerable, the same prohibition is to be made in regard to animal food. Watery, cooling, mucilaginous drinks are proper; for they keep off thirst and heat, promote perspiration, and tend to soothe the increased action of the whole arterial system. For this purpose, whey, buttermilk, barley-water, decoctions of dried fruits, water-gruel, &c. may be given.

When diluent drinks "are intended to allay thirst, as well as to promote perspiration, the addition of some vegetable acid, such as lemon-juice, or cream of tartar, renders them in general very palatable to patients. In the earlier stages of inflammation, and where the object is to induce a moisture on the skin, the mineral acids, though they might serve to quench thirst, are not to be employed, as they tend rather to check, than promote the flow of sweat." (*Thomson on Inflammation, p.* 172.)

The chamber in which the patient lies, should not be warmer, than his comfort requires; for heat tends powerfully to keep up an increased action of the sanguiferous system. For the same reason, the patient should not be covered with a superfluous quantity of bed-clothes.

The whole body, but more especially the inflamed part, should be preserved in as complete a state of rest as possible. Every one knows, that all motion, exercise, and muscular exertion, accelerate the circulation, and, hence, must have a pernicious effect on inflammation, by determining a larger quantity of blood to the part affected.

Applications.—With the exception of what has been stated, concerning topical bleeding, all the foregoing remarks relate to the *general* treatment of inflammation: the *local* means remain for consideration.

It has been already observed, that phlegmon is attended with an increase of heat in the part affected, and it is an acknowledged and well known fact, that the action of the arteries, as well as every other operation in the animal economy, is promoted and increased by the influence of heat. For this reason, an obvious indication arises, viz. to reduce the temperature of the inflamed part, by the topical application of cold, and, in particular, by continually abstracting the heat evolved in the part, by keeping up a constant evaporation from its surface.

"Of the local remedies, applied directly to inflamed parts (says Dr. Thomson) cold is undoubtedly one of the most powerful. In reducing the temperature, cold diminishes the morbid sensibility and pain of inflamed parts; and, probably, in consequence of this, the action also of the vessels, by which the inflamed parts are supplied with blood. The most common mode of employing cold is by the application to the part inflamed of cloths, which have been dipt in cold water. These are to be repeated as often as they become warm, or any relief is experienced by the patient from their use. When the inflammation is seated on the remote parts of either the upper or lower extremities of the body, the inflamed part itself may be immersed in water. This immersion, as I shall afterwards have occasion to mention, has often been found useful in superficial burns. In order to increase the effect produced by cold, it has been proposed to reduce the temperature of the water below that of the surrounding atmosphere, by a proper mixture of saline bodies, as some of these are known to produce cold during their solution in water, or even in very urgent cases to apply ice or snow. The ice, however, must not be applied too long, nor in too large a quantity; for, it very quickly reduces the temperature of the part to which it is applied, and, in some instances, has been known to occasion gangrene, &c." (*On Inflammation, p.* 180.)

With the cold water applied to phlegmonous inflammation, it is usual to blend some remedies, which are astringent, and supposed to have also a sedative quality. The acetate of lead, sulphate of zinc, and vinegar, seem now, indeed, to have acquired permanent celebrity for their efficacy in resolving inflammation.

Extensive experience, and long established trials, have now fully confirmed the virtue of all those local remedies, in which the acetate of lead is the active ingredient. M. Goulard, and other French surgeons, found, that the objections to the employment of many other sedative applications in the treatment of inflammation, did not exist against the use of this preparation of lead. The universal assent of modern practitioners proves, indeed, that the acetate of lead, as a local application for genuine phlegmonous inflammation, is certainly unsurpassed, if not unrivalled, in point of efficacy.

The preparations of lead are recommended by M. Goulard, as almost equally applicable to every stage of inflammation. When swellings have fully suppurated, the employment, of what he calls, the *extractum saturni*, will almost always render it unnecessary to open them. Even in gangrene, the solution of lead is represented by this zealous writer, as a remedy deserving of the greatest confidence.

But, notwithstanding the above exaggeration, every man of experience and observation will allow, that, while there is a chance of accomplishing resolution, no local applications to phlegmonous inflammation are in general so proper as cold lotions, containing the acetate of lead.

"The manner in which it operates in curing inflammation (as Dr. Thomson observes) is not known to us, nor is it at all times easy to distinguish between the share, which the lead has in allaying inflammation, and that which is to be attributed to the coldness of the water in which it is dissolved. No one, however, will doubt of the efficacy of this remedy, who has ever felt it in his own body, or witnessed in others the soothing and agreeable effects, which it produces in excoriations of the skin, or in inflammation of mucous membranes. Lead is a remedy, which is often highly useful in excoriations from friction, in punctured wounds with inflammation of absorbent vessels, veins, nerves, &c. in slight burns, in cutaneous heat, eruptions of the face, in fractures and dislocations, in the inflammation attending scirrhus and cancer, syphilis and gonorhœa, in wounds accompanied with excoriation from the discharges they emit, and in wounds attended with a burning sensation of pain." (*P.* 182.)

From the poisonous qualities of lead, when taken into the system, and from the possibility of this mineral being absorbed from the surface of the body, objections have arisen against the free use of its preparations, even as outward remedies in cases of inflammation. Certain it is, however, that, though the possibility of such absorption is proved by the occurrence of the disorder called the *colica pictonum*, which originates in painters from the white lead absorbed into the system, yet, any ill effects from the use of lead, as an application to inflamed parts, are so exceedingly rare, that they can hardly form a serious objection to the practice. It is a fact, that, in inflamed parts, there is an impediment to absorption, and this circumstance may tend to render the employment of lead a matter of safety. Mr. B. Bell observes, that in all the experience which he had had of the external application of lead and its preparations, and in many cases, particularly of burns, where he had known the greatest part of the surface of the body covered with applications of this description for days, nay, for weeks together, he did not recollect a single instance of any disagreeable symptom being ever produced by them. Nor has Dr. Thomson ever seen the colica pictonum follow the use of goulard. (See *Lectures on Inflammation*, *p.* 183.)

A lotion composed of acetate of lead, vinegar, and water, is very commonly employed. ℞. Plumbi Acetatis ℥ss. Solve in Acet. pur. ℥iv. Et adde Aq. Fontanæ distill. ℔ij. The vinegar makes the solution more complete. In all common cases, a teaspoonful of the liquor plumbi acetatis, blended with a pint of water, will be found an eligible lotion. Occasionally. bread-crumb is moistened in the fluid and applied in the form of a poultice; but linen dipped in the lotion, and kept constantly wet with it, is mostly preferred. Thus a continual evaporation is maintained, and of course a regular abstraction of heat.

When the surgeon is afraid of employing a solution of lead, he may try one of the sulphate of zinc. One dram of this substance is to be dissolved in a pint of water, and linen, well wet with the lotion, is to be applied to the inflamed part.

Many practitioners impute very little real efficacy either to the acetate of lead, or sulphate of zinc, contained in the above applications: and they attribute all the good, that is produced, entirely to the evaporation kept up from the surface of the inflamed part, and to the coldness of the fluid, in which the metallic salts are dissolved. Surgeons, who entertain these sentiments, often apply simple cold water, or spirit of wine largely diluted.

There are particular cases of inflammation, in which the extravasation of blood and lymph, in the interstices of the inflamed part, is exceedingly copious, and the swelling considerable, but the pain and redness not particularly great. In such instances, it is an indication to rouse the action of the absorbents, in order that those vessels may remove the extravasated fluid, and with this view, a more powerful discutient lotion may be employed than in other cases, and sometimes it is even better to use embrocations and liniments, than any sort of lotion. The following discutient lotions are often employed:— ℞. Ammoniæ Muriatæ ℥ss. Aceti; Spiritûs Vini rectificati; sing. ℔j. M. ℞. Liq. Ammon. Acet. Spir. Vini rectif.; Aq. Distillatæ; sing. ℥iv. M. The Liq. Ammoniæ Acet. answers very well by itself.

When the part affected with inflammation is not very tender, or when it lies deep, applications of the vegetable acid are often had recourse to with considerable advantage; and the most effectual form of using it seems to be a poultice made with vinegar and crumb of bread. In such cases, it has been thought, that an alternate use of this remedy, and the saturnine lotion, has produced more beneficial effects, than are commonly observed from a continued use of one of them. (*B. Bell.*) However, surgeons of the present day seem to think, that vinegar can be as advantageously applied in the form of a lotion, as in that of a poultice, and, certainly, with less trouble.

Alcohol and æther have acquired some celebrity as local remedies for inflammation. No doubt, one great reason why they are not more extensively used for this purpose is, the expense attending such treatment, as these fluids evaporate with great rapidity. Alcohol may possibly prove useful from its astringent qualities; but it seems much more rational to impute both its virtue, and that of æther, to the powerful manner, in which their evaporation deprives the inflamed part of its heat.

Warm Applications.—The absurdity of attempting to reconcile every useful practice with a philosophical theory, is in no instance more strikingly exemplified, than in the opposite sorts of local applications, which are of service in inflammation. The generality of cases undoubtedly receive most relief from the use of cold sedative astringent lotions; but there are constitutions and parts, which derive most service from the local employment of warm emollient remedies.

Were I to endeavour to define the particular instances in which the latter applications avail most, I should take upon me a task, which has baffled all the most able surgical writers. The first stage of acute ophthalmy, and the hernia humoralis, or inflamed testicle, may be specified, however, as examples, in which, generally speaking, warm emollient applications are better than cold astringent ones. Yet, even with respect to inflammation of the testis, there is some difference of opinion about the superiority of cold or warm applications. Mr. James's sentiments are as follows: in the treatment it is of importance to consider the differences of the cause: thus, in mumps and rheumatism, the constitution is chiefly to be attended to, and cold applications are certainly improper. When it (the inflammation of the testis) arises from a blow, after leeches have been freely employed, fomentations are the best remedy. But Mr. James thinks, that this is not the case, in many instances of hernia humoralis from gonorrhœa, where cold applications are preferable; but, he owns, that the feelings of the patient will best determine the point. (*James on Inflammation, p.* 164.)

"Fomentations, or embrocations with warm water, (as a judicious writer has remarked) are often a very powerful means of abating internal inflammation. This effect is very apparent in some of the deeper-seated inflammations, as in the inflammation of the urinary bladder, intestines, or other viscera contained within the cavity of the abdomen. The warmth, in this case, may be applied to the surface of the abdomen, by bath or fomentation, or, in the way of injection, by the anus, &c. In some inflammations of the joints, warmth also is found to be very useful. These, however, are inflammations which have a tendency to the chronic state." (See *Thomson on Inflammation, p.* 188.)

If we may judge by the feelings of certain patients, there are undoubtedly particular constitutions, in which the local use of warm remedies produces greater relief, than that of cold ones. This circumstance, however, does not generally happen; and, as warm emollient applications, of all kinds, have the most powerful influence in promoting suppuration, a fact admitted by every experienced practitioner, the use of such remedies, while the resolution of inflammation is practicable, must be highly censurable. But, I am ready to grant, that in all cases of inflammation, which manifestly cannot be cured without suppuration, the emollient plan of treatment ought to be at once adopted; for the sooner the matter is formed, the sooner the inflammation itself is stopped. The inflammation, attending contused and gun-shot wounds, and that accompanying boils and carbuncles, are of this description. The inflammation, originating in fevers, commonly ends in suppuration, and, in such instances, perhaps, it might be advantageous, also, to employ at once the emollient treatment.

Warmth and moisture together, in other words, fomentations, are commonly had recourse to in cases of inflammation; but, when the warmth is as much as the sensitive principle can bear, it excites action. Whether it is the action of inflammation, or the action of the contraction of the vessels, is unknown. We see that many patients cannot bear warmth, and, therefore, it might be supposed to increase the action of dilatation, and do harm. But, if the pain should arise from the contraction of the inflamed vessels, benefit would be the result; though we must doubt, that this change is produced, as making the vessels contract would probably give ease. (*Hunter.*)

From the preceding observations, we must perceive how vain it is to theorize on this subject, which even puzzled the genius and penetration of a Hunter. In addition to what has been already observed, I feel totally incapable of giving any useful practical advice, with respect to those cases, in which warm emollient applications should be used in preference to cold astringent ones. I can, however, with confidence remark, that the surgeon, who consults the feelings and comfort of the patient on this point will seldom commit any serious error. Hence, in all cases, in which the first kind of topical applications seem not to produce the wonted degree of relief, let the second sort be tried. From the opportunity of comparison, a right judgment may then be easily formed.

The poultice, made of the powder of linseed, is so easily prepared, that the old bread and milk poultice is now seldom employed. As much hot water is to be put into a basin, as the size of the poultice requires, and then the linseed powder is to be gradually mixed with the water, till the mass is of a proper consistence. Frequently a little sweet oil is also added, to keep the application longer soft and moist.

Fomentations are only to be considered as temporary applications, while the emollient poultices are the permanent ones. The former are, at most, never used more than three times a day, for the space of about half an hour each time. Two of the best are the following:—℞. Lini contusi ℥j. Chamæmeli ℥ij. Aq. Distill. ℔vi Paulisper coque et cola. Or, ℞. Papaveris albi exsiccati ℥iv. Aq. Puræ ℔vj. Coque usque remaneant ℔ij. et cola.

Some practitioners, however, are inclined to think warm water alone quite as efficacious as the decoctions of particular herbs. Thus Dr. Thomson observes, "herbs are now seldom used in the way of fomentation, unless in compliance with ancient custom, or with the prejudices of particular individuals. The discutient power of the warm water may be increased by the addition of various substances, such as vinegar, spirits of wine, saline substances, such as common salt, acetate and muriate of ammonia. But, these warm and stimulating embrocations are used chiefly in the passive, chronic, or more indolent species of inflammation." (See *Lectures on Inflammation, p.* 189.)

By pursuing the treatment, recommended above, the resolution of the inflammation will in general begin to take place, either in the course of three or four days, or in a shorter space of time. At all events, it may usually be known before the expiration of this period, how the disorder will terminate. If the heat, pain, and other attending symptoms abate; and, especially, if the tumor begin to decrease, without the occurrence of any gangrenous appearances; we may then be almost certain, that, by a continuance of the same plan, a total resolution will in time be effected.

On the other hand, when all the different symptoms increase, and, particularly when the tumor becomes larger, and softish, attended with a more violent throbbing pain, we may conclude, that the case will proceed to suppuration. Hence, an immediate change of treatment is indicated, and such applications, as were proper, while resolution seemed practicable, are to be left off, and others substituted. This remark relates to the employment of cold astringent remedies, which, when suppuration is inevitable, only do harm, by retarding what cannot be avoided, and affording no relief of the pain and other symptoms. If the inflammation, however, should already be treated with emollients, no alteration of the topical applications is requisite, in consequence of the inevitability of the formation of matter. Indeed, emollient poultices and fomentations are the chief local means both of promoting suppuration, and diminishing the pain, violent throbbing, &c. which always precede this termination of phlegmonous inflammation.

But, besides the substitution of warm emollient applications for cold astringent lotions, practitioners have decided, that it is also prudent, as soon as the certainty is manifest, to relinquish the free employment of evacuations, particularly blood-letting, and to allow the patient a more generous diet. When the system is too much reduced by the injudicious continuance of rigorous antiphlogistic treatment, the progress of the ensuing suppuration is always retarded in a disadvantageous manner, and the patient is rendered too weak to support either a long continued, or a profuse discharge, which it may not be possible to avoid.

I shall conclude this article with briefly noticing blisters, rubefacients, issues and synapisms, as means often employed for the relief of particular cases of inflammation. "Blisters (says Dr. Thomson) are never applied to a part which is actually inflamed. They seem to be chiefly useful by exciting inflammation in a contiguous part. It is from this tendency, which blisters have to produce inflammation, and of course a certain degree of fever, that they are seldom to be employed in acute inflammatory cases, till the constitutional symptoms are by other means in some measure subdued."—(*P.* 187.)

"Of the same nature, though milder in their operation, than blisters, are the whole class of rubefacients. They produce a determination of blood to the parts to which they are applied, and in a manner not yet well understood, occasion a diminution in the action of the vessels, and consequently in the quantity of blood with which the inflamed parts are supplied. This influence is exerted more or less directly in different instances. The extremities of the intercostal arteries may open both on the pleura lining the chest, and on the surface of the skin covering it, and whatever excites an increased flow of blood into one of these textures, may be conceived to be attended with a proportionally diminished flow into the other texture. But, blisters are found by experience to be efficacious in removing inflammation, where no communication whatever can be traced between the blood-vessels of the inflamed part, and that to which the blister is applied. We have examples of this mode of action in the beneficial effects obtained from the application of blisters in inflammation of the brain and the membranes immediately covering it, of the lungs and intestines, or of any of the viscera contained in the cavity of the abdomen. The nearer in such instances the blister or rubefacient can be applied to the part inflamed, the greater is the relief obtained; and in general, I believe, it may be laid down as a rule, that the relief, which they afford, will be proportional to the degree of inflammation, which they excite." (See *Thomson on Inflammation*, *p.* 187, 189.)

Synapisms, blisters, and issues are in many instances applied in situations, which are so remote from and unconnected by vessels with the inflamed parts, that it is impossible to explain their mode of operation, except through the medium of the nervous system. "The irritation of a synapism applied to the foot (says Dr. Thomson) may relieve an attack of gout in the head, or stomach. Bathing the feet and legs gives relief in inflammation of the bowels; and the application of a blister, or caustic to the neck, may cure an inflammation of the eyes, &c. (*P.* 189.) Here counter-irritation is the principle, by which an explanation is usually attempted. (See *Blisters.*)

Van Swieten's Commentaries on Boerhaave; Gorter's Compendium Medicinæ, 4to. *Lugd.* 1731; *and Chirurgia Repurgata*, 4to. *Lugd.* 1742. *Vacca, Liber de Inflammationis morbosæ, quæ in humano corpore fit, naturâ, causis, effectibus, et curatione*, 1765. *D. Magenisie, the Doctrine of Inflammations, founded upon reason and experience; and entirely cleared from the contradictory systems of Boerhaave, Van Swieten, and others*, 8vo. *Lond.* 1768. *Cullen's First Lines of the Practice of Physic, Vol.* 1. *John Hunter, on the Blood, Inflammation, &c.* 4to. *London*, 1794. *Burns's Dissertations*, 8vo. *Glasgow*, 1800. *Thomson's Lectures on Inflammation, Edinb.* 1813. *Boyer, Traité des Maladies Chir. T.* 1, *Delpech, Précis Elém. des Mal. Chir.* T. 1, *chap.* 1, *Paris*, 1816. *John Herdman, Diss. on White Swelling, and the Doctrine of Inflammation*, 8vo. *Edinb.* 1802. *F. J. V. Broussais, Hist. des Phlegmasies, ou Inflammations Chroniques, &c.* 2 *Tom.* 8vo. *Paris*, 1808. *C. Wenzel, über die Induration und das Geschwür in indurioten Theilen*, 8vo. *Mainz.* 1815. *Wilson Philip, on Febrile Diseases, Part* 2, *Introduction, Ed.* 3; *and An Experimental Inquiry into the Laws of the Vital Functions, Ed.* 2, 8vo. *Lond.* 1818. *Caleb H. Parry, Elements of Pathology and Therapeutics*, 8vo. *Lond.* 1815. *Also, An Experimental*

Inquiry into the Nature, &c. of the Arterial Pulse, 8vo. *Lond.* 1816. *Charles H. Parry, Additional Experiments on the Arteries of Warm-blooded Animals, &c.* 8vo. *Lond.* 1819. *James Wilson, Lectures on the Blood, and on the Anatomy, Physiology, and Surgical Pathology of the Vascular System*, 8vo. *Lond.* 1819. *C. H. Ronnefeld, Animadversiones nonnullæ ad Doctrinam de Inflammatione*, 4to. *Lips.* 1817. *C. Hastings, a Treatise on Inflammation of the Mucous Membrane of the Lungs, &c.* 8vo. *Lond.* 1820. *J. H. James, Observations on some of the General Principles, and on the Particular Nature and Treatment of the different Species of Inflammation*, 8vo. *Lond.* 1821. *This Work, and those of Mr. J. Hunter, Mr. Wilson, Mr. J. Burns, Drs. Parry, Philip, and Hastings, deserve attentive perusal by every body desirous of forming a correct judgment of the nature of inflammation.*

INJECTION. A fluid intended to be thrown against, or into a part of, the body by means of a syringe. Thus port wine and water form an injection, which is used by surgeons for radically curing the hydrocele, and, for this purpose, it is introduced into the cavity of the tunica vaginalis, where it excites the degree of inflammation necessary to produce an universal adhesion between this membrane and the surface of the testicle.

Thus many fluid remedies are introduced into the urethra and vagina for the cure of gonorrhœa. In the article *Gonorrhœa*, will be found an account of the best injections employed for its relief. A few additional remedies of this class are here subjoined.

INJECTIO ACIDI MURIATICI. ℞. Aquæ distil. ℥iv. Acid. Mur. gutt. vij. Misce. Has been used for the relief of the ardor urinæ in cases of gonorrhœa.

INJECTIO ALUMINIS.—℞. Alum. ʒj. Aq. pur. ℥vj. Misce.—Successfully employed by Dr. Cheston, as an injection in affections of the rectum, either when the internal coat is simply relaxed and disposed to prolapsus, or when it is studded with loose fungated tumors.

INJECTIO CUPRI AMMONIATI. ℞. Liquoris Cupri ammon. gutt. xx. Aquæ rosæ ℥iv. Misce. Strongly recommended by Mr. Foot.

INJECTIO QUERCUS. ℞. Decocti quercûs ℔j. Aluminis purificat. ℥ss. Misce. Used, when the rectum, or vagina, is disposed to prolapsus from relaxation, or in cases of gleet.

INOSCULATION denotes, in the language of anatomy and surgery, the union of vessels by conjunction of their extremities. It is generally synonymous with *anastomosis*, though sometimes a distinction is made, *anastomoses* signifying the union of vessels by minute ramifications, and *inosculation* a direct communication by trunks. The great use of inosculations is to facilitate and insure the continuance of the circulation, when the large trunks of vessels are obstructed by pressure, disease, &c. Thus, in cases of aneurism, when the main artery of a limb is tied, the inosculations of the branches, given off above the ligature, with other branches arising below it, form at once a channel, through which the lower part of the limb is supplied with blood. Were there no such arrangement, in the human body, as inosculations, aneurisms could never be cured by a surgical operation. So infinitely numerous indeed are these inosculations, that they do the office of the subclavian, carotid, and external and internal iliac arteries, when these vessels are tied, and upon this fact is founded the success of some of the most brilliant operations in modern surgery. (See *Aneurism.*) Even the aorta itself may be perfectly obstructed, the circulation go on, and every part be fully supplied with blood. (See *Aorta.*) In dogs, the abdominal aorta has been tied, without the circulation in the hinder extremities being stopped; (See *the Experiments of Sir A. Cooper in Med. Chir. Trans. Vol. 2, p.* 258;) and the operation, performed a few years ago, in Guy's hospital, tends to prove, that the same thing is possible in the human subject. (See *Aorta.*) From the observations of the same distinguished surgeon, it appears, that the arteries, which form the new circulation in a limb, after the obliteration of the principal artery, are not only enlarged but tortuous. Any great increase, however, in the diameter of the anastomosing vessels is but slowly produced; for Sir A. Cooper has injected a limb several weeks after the operation for popliteal aneurism, without being able to force the injection through communicating vessels into the parts below. The limb must have active exercise before the vessels enlarge much. On account of the arteries not very readily enlarging, the limbs of persons who have undergone the operation for aneurism, are for a considerable time weaker than natural. They feel the influence of cold more, and are more disposed to ulcerate from slight causes. Hence, the utility of covering them with flannel, or fleecy hosiery. Hence, the rashness of applying cold washes, bandages, &c. (See *Vol. cit. p.* 249, *et seq.*)

In another place, the same gentleman has published an interesting description of the anastomoses of the arteries of the groin. "Hypothesis (says he) would lead to a belief, that anastomosing vessels would be numerous in proportion to the time which had elapsed from the operation; but, the reverse of this is the fact; for, at first, many vessels convey the blood, originally conducted by the principal artery. But, gradually, the number of these channels becomes diminished, and, after a length of time, a few vessels, conveniently situated for the new circulation, become so much enlarged, as to be capable of conveying an equal portion of blood to that which passed through the original trunk."

The experience of Sir A. Cooper also tends to confirm the important fact, that "it is desirable in femoral aneurism, if not, indeed, in all others, to perform the operation in an early state of the disease," as the patient then recovers the use of the limb much more quickly, than when the tumor has been suffered to attain a large size. (See *Med. Chir. Trans. Vol.* 4, *p.* 425, *et seq.*)

INTERRUPTED SUTURE. See *Sutures.*

INTESTINES WOUNDED. See *Wounds of the Abdomen.*

INTROSUSCEPTION, or *Intussusception.* Called also *Volvulus.* A disease, produced by the passing of one portion of an intestine into another, commonly the upper into the lower part

(*J. Hunter.*) On this subject, Mr. Langstaff has published an interesting paper, in the *Edinb. Surg. Journal, No. XI.*; which I shall take the liberty of freely quoting. He remarks, that the small intestines of children are so often affected with introsusception, in a slight degree, that most practitioners must have had opportunities of observing the form of the complaint. The greatest part of three hundred children, who died either of worms, or during dentition, at the Hôpital de la Saltpetriere, and came under the examination of M. Louis, had two, three, four, and even more volvuli, without any inflammation of the parts, or any circumstances leading to a suspicion, that these affections had been injurious during life. "These cases (says M. Louis) seem to prove, that introsusception may be formed, and destroyed again by the mere action of the intestines." (*Mém. de l'Acad. de Chirurg. 4to. T.* 4, *p.* 222.) This opinion is confirmed by the authority of Dr. Baillie, (*Morbid Anatomy, 2d Edit. p.* 162.) who observes, that, "in opening bodies, particularly of infants, an intussusception is not unfrequently found, which had been attended with no mischief; the parts appear perfectly free from inflammation, and they would probably have been easily disentangled from each other by their natural peristaltic motion."

The disease, as Mr. Langstaff remarks, assumes a more dangerous, and, indeed, generally a fatal form, when it occurs at the termination of the small intestines in the cœcum. A contracted state of the part to be introsuscepted, and a dilatation of that portion of the canal, into which this part must pass, are essential conditions to the formation of a volvulus; and they exist nowhere so completely as in this situation. The extent to which the affection here proceeds, would appear almost incredible, if it were not proved by well-authenticated facts. A person, who considered the natural situation and connexion of the parts, would of course require the strongest evidence, before he would believe, that the ileum, cœcum, ascending and transverse portions of the colon, may descend into the sigmoid flexure of the latter intestine; nay more, that they may pass through the rectum, and be protruded in the form of a procidentia ani. Such cases, however, are recorded. (*Langstaff, in Edinb. Med. and Surg. Journal, No. XI.*)

This gentleman next relates the case of a child three months old, the body of which he inspected after death, and found to confirm the truth of the preceding account. The example was particular in there being, in addition to an extensive introsusception in the usual way, a smaller invagination in the opposite direction, like what probably occurred in the case related by Mr. Spry. (*Med. and Physical Journal, No. XI.*) Sir E. Home mentions a retrograde introsusception, in which a worm was found coiled up round the introsuscepted part. The disease took place in a boy who had swallowed arsenic. (See *Trans. of a Soc. for Med. and Chir. Knowledge, Vol.* 1.)

If the following mode of accounting for introsusception be just, it will most frequently happen downwards, although there is no reason why it may not take place in a contrary direction; in which case, the chance of a cure will be increased by the natural actions of the intestinal canal tending to replace the intestine; and probably from this circumstance it may oftener occur than commonly appears.

When the introsusception is downwards, it may be called *progressive*, and when it happens upwards, *retrograde.* The manner in which it may take place is, by one portion of a loose intestine being contracted, and the part immediately below relaxed and dilated; under which circumstances, it might very readily happen by the contracted portion slipping a little way into that which is dilated, not from any action in either portion of intestine, but from some additional weight in the gut above. How far the peristaltic motion, by pushing the contents on to the contracted parts, might force these into the relaxed, Hr. Hunter could not determine, but he was inclined to suppose, that it did not have this effect.

By this mode of accounting for an accidental introsusception, it may take place either upwards or downwards; but if a continuance or an increase of it arises from the action of the intestines, it must be when it is downwards, as we actually find to be the case; yet this does not explain those in which a considerable portion of intestine appears to have been carried into the gut below: to understand these, we must consider the different parts which form the introsusception. It is made up of three folds of intestine; the inner, which passes down, and being reflected upwards, forms the second or inverted portion, which being reflected down again, makes the third or containing part, that is the outermost, which is always in the natural position. (*J. Hunter.*)

The outward fold is the only one which is active, the inverted portion being perfectly passive, and squeezed down by the outer, which inverts more of itself, so that the angle of inversion in this case is always at the angle of reflection of the outer into the middle portion or inverted one, while the innermost is drawn in. From this we can readily see how an introsusception, once begun, may have any length of gut drawn into it.

The external portion, acting upon the other folds in the same way as upon any extraneous matter, will by its peristaltic motion urge them further; and, if any extraneous substance is detained in the cavity of the inner portion, that part will become a fixed point for the outer or containing intestine to act upon. Thus it will be squeezed on, till at last the mesentery preventing more of the innermost part from being drawn in, will act as a kind of stay, yet without entirely hindering the inverted outer fold from going still further. For it being the middle fold that is acted upon by the outer, and this action continuing after the inner portion becomes fixed, the gut is thrown into folds upon itself; so that a foot in length of intestine shall form an introsusception not more, than three inches long.

The outer portion of intestine is alone active in augmenting the disease when once begun; but if the inner one were capable of equal action in its natural direction, the effect would be the same, that of endeavouring to invert itself, as in a prolapsus ani; the outer and inner portions, by their action, would tend to draw in more of the gut, while the intermediate part only would, by its action, have a contrary tendency.

The action of the abdominal muscles cannot assist in either forming, or continuing this disease, as it must compress equally both above and below, although it is capable of producing the prolapsus ani.

When an introsusception begins at the valve of the colon, and inverts that intestine, we find the ileum is not at all affected; which proves that the mesentery, by acting as a stay, prevents its inversion. (*J. Hunter.*)

From the natural attachment of the mesentery to the intestines, one would, at the first view of the subject, conceive it impossible for any one portion of gut to get far within another; as the greater extent of mesentery, that is carried in along with it, would render its further entrance more and more difficult, and we should expect this difficulty to be greater in the large intestines than in the small, as being more closely confined to their situation; yet one of the largest introsusceptions of any known was in the colon, as related by Mr. Whately. (*Vid. Phil. Trans. Vol.* 76, *p.* 305.)

The introsusception appeared to have begun at the insertion of the ileum into the colon, and to have carried in the cœcum with its appendix. The ileum passed on into the colon, till the whole of the ascending colon, the transverse arch, and descending colon, were carried into the sigmoid flexure and rectum. The valve of the colon being the leading part, it at last got as low as the anus; and when the person went to stool he only emptied the ileum, for one half of the large intestines being filled up by the other, the ileum alone, which passed through the centre, discharged its contents. (*J. Hunter.*)

Two questions of considerable importance present themselves to the mind in considering this subject; whether there are any symptoms, by which the existence of the affection can be ascertained during life? And whether we possess any means of relieving it, supposing, that its existence could be discovered? The symptoms, attending an introsusception, are common to inflammation of the intestines, hernia, and obstruction of the canal, from whatever cause, and a volvulus is the least frequent cause of such symptoms. (*Langstaff.*) In the case, published by this gentleman, and in those related by Mr. Hunter and Mr. Spry, the seat of the disease was clearly denoted by a hard tumor on the left side of the abdomen. This circumstance, together with the impossibility of throwing up more, than a very small quantity of fluid in clysters, (*Hevin, Spry, Langstaff,*) and the presence of the other symptoms, would lead us to suspect the nature of the disorder. If the invaginated portion descended so low as to protrude through the anus, and we could ascertain, that it was not an inversion of the gut, the case might be considered as clear, and we should have no hesitation in delivering a prognosis, which, by preparing the friends for the fatal termination, would exonerate us from all blame on its occurrence. (*Langstaff.*)

In the treatment of this disease, bleeding, to lessen the inflammation that might be brought on, and quicksilver, to remove the cause, have been recommended.

Quicksilver would have little effect either in one way or the other, if the introsusception were downward; for it is to be supposed that it would easily make its way through the innermost contained gut, and if it should be stopped in its passage, it would, by increasing its size, become a cause (as before observed) of assisting the disease. In cases of the retrograde kind, quicksilver, assisted by the peristaltic motion, might be expected to press the introsusception back; but even under such circumstances it might get between the containing and inverted gut into the angle of reflection, and, by pushing it farther on, increase the disease it is intended to cure. (*J. Hunter.*)

Every thing, that can increase the action of the intestine downwards, is to be particularly avoided, as tending to increase the peristaltic motion of the outer containing gut, and thus to continue the disease. Medicines can never come into contact with the outer fold, and, having passed the inner, can only act on the outer further down, and therefore cannot immediately affect that portion of the outer which contains the introsusception; but we must suppose that whatever affects or comes into contact with the larger portion of the canal, so as to throw it into action, will also affect by sympathy any part that may escape such application. Mr. Hunter therefore recommends emetics, with the view of inverting the peristaltic motion of the containing gut, which will have a tendency to bring the intestines into their natural situation.

If this practice should not succeed, it might be proper to consider it as a retrograde introsusception, and by administering purges, endeavour to increase the peristaltic motion downwards. (*J. Hunter.*)

I cannot agree with Mr. Langstaff, that it is to be regretted, Hunter's name should be affixed to the foregoing proposal, or that it is an absurd one; for purgatives and emetics were only recommended to increase the peristaltic action, the former downward, the latter upward, according as the supposed nature of the case might require, and this effect they certainly would have, notwithstanding vomiting is an early and constant symptom of the disease, and an insuperable constipation an equally invariable attendant. The method, I allow, however, is not very hopeful, and may sometimes be frustrated by the formation of adhesions. According to Mr. Langstaff, the *Recherches Historiques sur la Gastrotomie dans le cas de Volvulus, par M. Hevin*, contain many interesting facts, and a great deal of sound reasoning. There we find a very ample discussion of the question, concerning the propriety of opening the abdomen, in order to disentangle the introsuscepted intestine; a proposal, which M. Hevin very properly condemns.

If the equivocal and uncertain nature of the symptoms of volvulus were not sufficient to deter us from undertaking an operation, which, under the most favourable circumstances, could not fail to be extremely difficult, and imminently hazardous to the patient, the state of the invaginated parts would entirely banish all thoughts of such an imprudent attempt; for the different folds of the intestine often become agglutinated to each other, so that they can hardly be withdrawn after death; (*Simpson, Edinb. Med. Essays, Vol.* 6; *Hevin's 4th Obs.; Malcolm, Physical and Lit. Essays, Vol.* 2, *p.* 360; *Hunter, Med. and Chir. Trans. and Soemmering in Transl. of Baillie's Morb. Anat.*) nay, the stricture on the introsuscepted part may cause it to inflame, and even mortify. *(Soemmering.)* It is very clear, that, in this state of parts, the operation of gastrotomy would be totally inadmissible, even if the symptoms could clearly indicate the nature of the case, and the affected part could be easily reached and examined. *(Langstaff.)*

The forcible injection of clysters was found useless by Dr. Monro, and the agglutination of the parts must produce an insuperable obstacle to the bowels being pushed back by this means. Some have proposed the employment of a long bougie, or a piece of whalebone, to push back the intestine; and this proposal may be adopted, when we are furnished with an instrument, adapted to follow the windings of the large intestine to its origin in the right ileum, without any risk of perforating the gut in its course. *(Langstaff.)*

It must be confessed, that both surgery and medicine are almost totally unavailing in the present disease. Yet, here, as in many other instances, the resources of nature are exhibited in a most wonderful and astonishing manner, while those of art completely fail. The invaginated portion of intestine sometimes sloughs, and is discharged *per anum*, while the agglutination of the parts preserves the continuity of the intestinal canal. The annals of medicine furnish numerous instances, in which long pieces of gut have been discharged in this manner, and the patient has recovered. Hence, some hope may be allowed under the most unpromising circumstances. In a case, related in Duncan's Commentaries, eighteen inches of small intestine were voided *per anum ;* Vol. 9, p. 278. Three similar instances occur in M. Hevin's Memoir; twenty-three inches of colon came away in one of these, and twenty-eight of small intestines in another. Other cases occur in the Physical and Literary Essays, Vol. 2, p. 361 ; in Duncan's Annals, Vol. 6, p. 298 ; in the Med. Chir. Trans. Vol. 2 ; where Dr. Baillie states, that a yard of intestine was voided. The patients did not, however, ultimately survive in every one of these instances. *(Langstaff, in Edinb. Med. and Surgical Journal.)* A very interesting case, in which a recovery was effected on this principle, and in which from 15 to 18 inches of the ileum were discharged from the anus, was recorded by Mr. Bush last year, (1823), in the *Med. and Phys. Journ.*

Langenbeck has recorded an instance, in which a prolapsus of the large intestines protruded half an ell out of the anus. The disease had lasted thirty weeks. Langenbeck made an incision into, or rather through, the protruded inverted bowel, immediately below the sphincter ani. He first divided the inner vascular coat, then the muscular, and lastly the outer coat with great caution. He now discovered, within the protruded inverted bowel, which he had opened, another part of the intestinal canal, which was not yet inverted. He remarked upon it the appendices epiploicæ, and the white shining peritonæal coat. This last portion would also have become inverted, had the disease continued. He next reduced the latter uninverted part, and afterwards succeeded in replacing the rest of the protrusion ; which did not fall down again when the boy had stools. No bad symptoms immediately followed ; but, the lad being very weak, survived only eight days. (See *Bibl. für die Chir. B.* 3, *p.* 756, *Gott.* 1811.)

Hévin in Mem. de l'Acad. de Chir. Vol. 4, *4to. Hunter's Observations in the Trans. of a Society for the Improvement of Medical and Chirurgical Knowledge, Vol.* 1, *p.* 103, *et seq. L'Encyclopédie Methodique, Partie Chir. Art. Gastrotomie. A. Vater, De Invaginatione Intestinorum. (Haller, Disp. Anat.* 1, 431.*) C. H. Velse, De Mutuo Intestinorum Ingressu, &c. Lugd.* 1742. *(Haller, Disp. Anat.* 7, 97.) *J. C. Lettsom, The History of an Extraordinary Intus-susception, with an account of the dissection by Mr. T. Whately,* 4to *Lond.* 1786. And *Langstaff's Remarks in the Edinb. Med. and Surgical Journal, No. XI.*

INVERSION OF THE UTERUS. (See *Uterus, Inversion of.*)

IODINE. The following are the formulæ recommended by Brera :—1. *Tincture of iodine* made by dissolving 48 grains of pure iodine in an ounce of alcohol. The dose for adults is from 5 to 20 drops, three times a day. The *tincture* is subject to decomposition, and should therefore be used fresh. 2. *Pills of iodine*, made by forming one grain of iodine into two pills, with elder-rob and liquorice root; one to be taken every morning and evening. 3. *Iodine ointment*, made by mixing a drachm of pure iodine with an ounce of lard, or half a drachm of hydriodate of potass with an ounce and a half of lard; of the former, about a scruple, of the latter, a bit, about as large as a filbert, may be rubbed on the part, to which it is intended to be applied. 4. *Solution of Hydriodate of potass*, formed by dissolving 36 grs. of the hydriodate in an ounce of distilled water: it is given in the same dose as the tincture. 5. *Solution of the Iodurretted Hydriodate of Potass*, made by dissolving 36 grs. of the hydriodate and 10 grs. of pure iodine in 10 drachms of water. The dose, in the beginning of its use, should not be more than 5 or 6 drops, three times a day.

From Dr. Keller's statement, in the Revue Med. for June, 1823, it appears, that the ointment is made stronger in France, than that mentioned by Brera, two drachms of the hydriodate being mixed with an ounce of fat.

In administering iodine, care must be taken not to combine it with substances calculated to decompose it, and only to let the patient take it when the stomach is empty. The liquid preparations are generally given by Dr. Coindet in syrup and water. When ill effects arise from its too violent operation, such as pains in the stomach, chest, bowels, defective vision, loss of sleep, palpitations, tremors, convulsions, &c. or even inconveniences of a less dangerous kind, the medicine should be immediately discontinued. A strict regimen, copious mucilaginous drinks, the tepid bath, and sometimes bleeding, are necessary. When the bronchocele, or other tumor, is also in too great a state of irritation, from the medicine, fomentations, poultices, and leeches, are indicated.

Iodine has obtained considerable reputation for its efficacy in bronchocele, scrophula, various chronic tumors, enlargements of the breast, testicle, &c. (See *Brera's Saggio Clinico sull' Iodio, e sulle differenti sue combinazioni, Padua,* 1822. *J. R. Coindet, on the Effects of Iodine, in Broncho-*

cele and Scrophula; a translation of his three Memoirs, by Dr. J. R. Johnson, Lond. 1821. Also *Magendie's Formulary, Ed.* 2, *Lond.* 1824.)

IRIS, PROLAPSUS OF. A small tumor, formed by the protrusion of a portion of the iris through an opening in the cornea. It is sometimes named *staphyloma of the iris.*

The causes of this complaint are such wounds and ulcers of the cornea, as make an opening of a certain extent into the anterior chamber of the aqueous humor, and such violent contusions of the eyeball, as occasion a rupture of the cornea. If the edges of a wound in this situation, whether accidental, made for the purpose of extracting the cataract, or evacuating the matter of hypopium, be not brought immediately afterwards into reciprocal contact, or continue not sufficiently agglutinated together to prevent the escape of the aqueous humor from the anterior chamber, regularly as this fluid is reproduced; the iris, drawn by its continual flux towards the cornea, glides between the lips of the wound, becomes elongated, and a portion of it gradually protrudes, beyond the cornea, in the form of a small tumor. The same thing takes place, whenever the eyeball unfortunately receives a blow, or is too much compressed by bandages, during the existence of a recent wound of the cornea. Also, if the patient should be affected, in this circumstance, with a spasm of the muscles of the eye, with violent and repeated vomiting, or with strong and frequent coughing, a prolapsus of the iris may be caused. When an ulcer of the cornea penetrates the anterior chamber of the aqueous humor, the same inconvenience happens more frequently, than when there is a recent wound of that membrane; for, the solution of continuity in the cornea, arising from an ulcer, is attended with loss of substance, and, in a membrane, so tense, and compact as this is, the edges of an ulcer do not admit of being brought into mutual contact.

The little tumor is likewise necessarily of the same colour as the iris, viz. brown, or greyish, being surrounded at its base by an opaque circle of the cornea, on which membrane there is an ulcer, or a wound of not a very recent description.

As it usually happens, that the cornea is only penetrated at one part of its circumference by a wound, or ulcer, so in practice, only one prolapsus of the iris is commonly met with in the same eye. But, if the cornea should happen to be wounded, or ulcerated, at several distinct points, the iris may protrude at several different places of the same eye, forming an equal number of small projecting tumors on the surface of the cornea. Scarpa has seen a patient, who had three very distinct protrusions of the iris on the same cornea, in consequence of three separate ulcers, penetrating the anterior chamber of the aqueous humor; one in the upper, and two in the lower, segment of the cornea.

If, says Scarpa, the delicate structure of the iris; the great quantity of blood-vessels, which enter it; and the numerous nervous filaments, which proceed to be distributed to it, as a common centre; be considered, the nature, and severity of those symptoms may be readily accounted for, which are wont to attend this disease, however small the portion of the iris projecting from the cornea may be, even if no larger than a fly's head. The hard and continual frictions, to which this delicate membrane is then exposed, in consequence of the motions of the eyelids; together with the access of air, tears, and gum to it; are causes quite adequate to the production of continual irritation; and the blood, which tends to the point of the greatest irritation, cannot fail to render the projecting portion of the iris much larger, almost directly after its protrusion, than it was at the moment of its first passing through the cornea. Hence, it becomes, soon after the prolapsus, more incarcerated and irritated, than it was at first. In the incipient state of the disease, the patient complains of a pain, similar to what would arise from a pin penetrating the eye; next he begins to experience, at the same time, an oppressive sensation of tightness, or constriction, over the whole eyeball. Inflammation of the conjunctiva, and eyelids, a burning effusion of tears, and an absolute inability to endure the light, successively take place. As the protruded portion of the iris drags after it all the rest of this membrane, the pupil assumes of mechanical necessity an oval shape, and deviates from the centre of the iris, towards the seat of the prolapsus. The intensity of the pain, produced by the inflammation, and other symptoms, attendant on the prolapsus of the iris, does not, however, always continue to increase.

Indeed, in practice, cases of old protrusions of the iris often occur, where, after the disease has been left to itself, the pain and inflammation spontaneously subside, and the tumor of the iris becomes nearly insensible.

In the early stage, some direct the iris to be replaced by means of a whalebone probe; and, in case of difficulty, a dilatation of the wound, or ulcer, of the cornea, to be made proportioned to the exigency of the case, as is done for the return of a strangulated intestinal hernia. Others only recommend stimulating the prolapsed portion of the iris, with the view of making it contract and shrink into the eye; or suddenly exposing the eye affected to a very vivid light, in the belief, that, as the pupil then forcibly contracts, the piece of the iris, engaged between the lips of the wound, or ulcer of the cornea, will rise to its proper place. However, Scarpa represents all such methods as absolutely useless, and even dangerous. Supposing it were possible, by such attempts, to reduce the iris to its proper situation, without tearing, or injuring it, still the aqueous humor would escape again, through the wound, or ulcer of the cornea, so that the iris, when replaced, would fall down, the moment afterwards, and project from the cornea, in the same way as before the operation. Hence, though Scarpa admits, that the prolapsus of the iris is a serious accident, he argues that as surgery has no means of suppressing at once, or, at least, of suspending, the escape of the aqueous humor through a wound, much less through an ulcer of the cornea, when either exceeds certain limits, the prolapsus of the iris, far from being an evil in such unfavourable circumstances, is rather useful, and, perhaps, the only means of preventing the total loss of the organ of sight; for, the flap of the iris insinuates itself, like a plug, between the edges of the wound, or ulcer of the cornea, and thus completely prevents the exit of the aqueous humor.

Here I ought to observe, that Scarpa's unlimited condemnation of the plan of ever attempting to replace the iris is contrary to the advice delivered by Beer, as may be seen by referring to the article *Cataract*, where the treatment of the protrusion of the iris after the operation of extraction is noticed. And even with respect to the prolapsus of the iris from ulceration making its way through the cornea, Beer distinctly states, that, a recent prolapsus of this kind, formed in the second still existing stage of ophthalmy, may not only be lessened by proper treatment, calculated to produce a quick cicatrization of the ulcer, but the iris may be again completely removed from the cornea, without any adhesion to the edge of the ulcer taking place. (*B. 2, p.* 63.) But where the prolapsus of the iris remains, as a consequence of previous inflammation of the eye, Beer confesses, that it cannot be cured, without a partial adhesion of the iris to the cornea being left, and a dense scar on the latter membrane in the situation of the protruded iris. (*Vol. cit. p.* 66.)

In conformity to Scarpa's principles, there are two principal indications in the treatment of the recent prolapsus of the iris. The first is, to diminish, as speedily as possible, the exquisite sensibility in the protruded part of the iris; the other is gradually to destroy the projecting portion of this membrane, to such a depth, as shall be sufficient to prevent the little tumor from keeping the edges of the wound, or ulcer of the cornea asunder, and retarding cicatrization. The adhesion, however, which connects the iris with the inside of the cornea, must not be destroyed.

For fulfilling these indications, touching the portion of the iris projecting from the cornea with the oxygenated muriate of antimony, or with what is more expeditious and convenient, the argentum nitratum, is recommended, so as to form an eschar of sufficient depth. And, in order that this operation may be effected with quickness and precision, it is necessary that an assistant, standing behind the patient's head, should support the upper eyelid with Pellier's elevator; and that the patient should keep his eye steadily fixed on one object.

While the assistant gently raises the upper eyelid, the surgeon must depress the lower one, with the index and middle fingers of his left hand; and, with the right, he is to be ready to touch the little prominence formed by the iris with the argentum nitratum, scraped to a point like a pencil. This is to be applied to the centre of the little tumor, until an eschar of sufficient depth is formed. The pain which the patient experiences at this moment, is very acute; but, it subsides as soon as the eye is bathed with warm milk. The caustic, in destroying the projecting portion of the iris, destroys the principal organ of sensibility, by covering it with an eschar, of sufficient depth to protect the part affected from the effect of the friction of the eyelids, and from coming into contact with the air and tears. This is the reason, not only why the sense of pricking and constriction in the eye abates after the application of the caustic, but also why the inflammation of the conjunctiva undergoes a considerable diminution, as well as the burning and copious effusion of tears.

As in the case of ulcer of the cornea, these advantages only last while the eschar remains adherent to the little tumor formed by the iris; when it falls off, as it usually does two or three days after the use of the caustic, all the abovementioned symptoms are rekindled, with this difference, that they are less intense and acute, than they were previously, and the tumor of the iris is not so prominent as it was before the caustic was applied. When these symptoms make their appearance, the surgeon must once more have recourse to the argentum nitratum, with the precautions explained above; and he is to employ it a third, and even a fourth time, as occasion may require, until the prominent portion of the iris is sufficiently reduced to a level with the edges of the wound, or ulcer of the cornea, and no obstacle is left to the granulating process, and complete cicatrization.

There is a certain period, beyond which, the application of caustic to the protruded iris becomes exceedingly dangerous, though at first it may have been highly beneficial; beyond which, the eschar, which previously soothed the pain, exasperates it, and re-produces the inflammation of the conjunctiva, in almost as vehement a degree as in the beginning of the disease. This appears to Scarpa to be the case, whenever the surgeon continues to employ the caustic, after the little tumor of the iris has been destroyed to a level with the external edges of the wound, or ulcer of the cornea, and the application begins to destroy the granulations just as they are originating. Hence, as soon as the surgeon perceives, that the part of the iris, projecting from the cornea, is sufficiently lowered, and that the application of the argentum nitratum, far from allaying, only irritates the disease, he must desist entirely from using the caustic, and be content with introducing between the eye and eyelids, every two hours, the collyrium zinci sulphatis with the mucilage of quince-seeds. Every morning and evening, Janin's ophthalmic ointment, weakened with a double, or triple proportion of lard, is to be applied. If the stimulus of such local remedies should not disturb the work of nature, the ulcer gradually diminishes, and heals in the course of a fortnight.

The adhesion, which the projecting part of the iris contracts to the internal margin of the wound, or ulcer of the cornea, during the treatment, continues the same after the perfection of the external cicatrix, and of course during the rest of the patient's life. Hence, even after the most successful treatment of the prolapsus of the iris, the pupil remains a little inclined towards the place of the scar in the cornea, and of an oval figure. The change in the situation and shape of the pupil, however, causes little or no diminution of the patient's faculty of discerning distinctly the smallest objects; and is much less detrimental to the sight, than one, inexperienced in these matters, might conceive; provided the scar on the cornea be not too extensive, nor situated exactly in the centre of this membrane. In the first case, the sight is the less obstructed, as the pupil, which, on the first occurrence of the prolapsus, was narrow, oblong, and drawn considerably towards the wound, or ulcer, gradually enlarges, and forms a less contracted oval. As soon as the wound is completely healed, the pupil tends, in some degree, to occupy its former situation in the centre of the cornea; a fact, also noticed by Richter.

According to Scarpa, the recision of the protrusion with scissars can only be practised with success, when the iris has contracted a firm adhesion to the internal edge of the wound, or ulcer of the cornea; and, more especially, in that ancient prolapsus of the iris, in which the projecting portion of the iris has become with time almost insensible, hard, and callous, with its base strangulated between the edges of the wound, or ulcer of the cornea, and besides being adherent to them, having also a slender pedicle. Scarpa indeed has seen an incarcerated one fall off of itself.

In such circumstances, the recision of the old prolapsus of the iris is not attended with the least danger; for, after removing with a stroke of the scissars, that prominent portion of the iris, which has already contracted internal adhesions to the ulcerated margin of the cornea, so as to reduce it to a level with the external edges of the ulcer, there is no hazard of renewing the effusion of the aqueous humor, or giving an opportunity for another piece of the iris to be protruded. One or two applications of the argentum nitratum suffice afterwards for the production of granulations on the ulcer of the cornea, and the formation of a cicatrix. But, it is not so, in the treatment of the recent prolapsus of the iris, which has no adhesions to the internal edges of the wound, or ulcer of the cornea.

In four subjects, affected with recent prolapsus of the iris, after Scarpa had removed, with a pair of convex edged scissars, a portion of that membrane projecting beyond the cornea, of about the size of a fly's head, he found, on the ensuing day, that a new portion of the iris, not less than the first, had made its way through the ulcer of the cornea, and that the pupil was very much contracted, and drawn considerably further towards the ulcer of the cornea. These circumstances took place, notwithstanding the wound was touched immediately afterwards with the argentum nitratum. Hence Scarpa apprehends, that if he were ever to divide such a little tumor again, it would reappear, and always with an additional protrusion of the iris, and a further distortion of the pupil. The advantage of caustic in the recent sensible prolapsus of the iris; and the use of scissars only in old callous cases; agree also with the directions given both by Beer, and Mr. Travers. *(Lehre von den Augenkr. B. 2, p. 68; and Synopsis, p. 280.)*

There is a particular species of prolapsus, much less frequent, indeed, than that of the iris; but, which does occur, and, in Scarpa's opinion, is very improperly termed by modern oculists, "*prolapsus of the tunic of the aqueous humor.*" (*Janin, Pellier, Guérin, Gleize, &c.*) Neither do his sentiments upon this subject agree with those of Beer, whose explanation of the nature of the case is given at p. 331 of this Dictionary. We shall there see, that it is a case, which he terms *ceratocele*, and which he thinks arises from a yielding of the inner layers of the cornea, in consequence of the outer ones not having united. And, in his second vol. p. 59, he has given a description of the same kind of disease from the support of the outer layers of the cornea being destroyed by ulceration. This is a point, on which the most experienced men differ so much, that it is difficult to reconcile their statements. Dr. Vetch seems to have full reliance upon the accuracy of the accounts of a protrusion of the membrane of the aqueous humor. (*Treatise on Diseases of the Eye, p. 54, &c.*) Mr. Travers inclines to Beer's view of the subject, and details reasons for doubting, that the vesicle is a distinct texture: "its appearance corresponds accurately to that of the innermost lamella of the cornea." (*Synopsis of the Diseases of the Eye, p.* 116.)

It is, says Scarpa, a transparent vesicle, filled with an aqueous fluid, and composed of a very delicate membrane, projecting from a wound, or ulcer of the cornea, much in the same way as the iris does under similar circumstances. Scarpa has several times seen this transparent vesicle, full of water, elongating itself beyond the cornea, shortly after the operation for the extraction of the cataract, and sometimes, also, in consequence of an ulcer of the cornea, especially after rescinding a prolapsed portion of the iris.

The generality of oculists believe, that this little transparent tumor consists of the delicate, elastic, diaphanous membrane, which invests the inner surface of the cornea, and is described by Descemet and Demours. "As soon as the membrane lining the cornea (they say) is exposed by the wound, or ulcer of the latter, and the delicate pellicle can no longer resist the impulse of the humors pressing behind it, it is necessitated to yield gradually, to become elongated, and to project from the wound, or ulcer of the cornea, exactly in the form of a pellucid vesicle." But, says Scarpa, how remote this theory is from the truth, must be manifest: 1. The delicate and elastic pellicle, described by Descemet and Demours, is not separable by any artifice from the inner surface of the cornea, except near where the cornea and sclerotica unite. Since these protruded vesicles make their appearance in practice at every point of the cornea, and even at its very centre, where the above pellicle is certainly neither separable, nor distinct from the compact texture of the cornea; it may at least be asserted, that the tunic of the aqueous humor does not in every instance constitute the transparent vesicle in question. 2. It is a well known fact, that this vesicular, pellucid prolapsus happens more frequently after the extraction of the cataract, than on any other occasion. In this case, since the tunic of the aqueous humor has certainly been divided to afford an exit to the crystalline, no one can be of opinion, that the transparent vesicle, which protrudes from the cornea, after this operation, ought to be attributed to the distention and protrusion of the tunic of the aqueous humor. 3. If, in cases of ulcers of the cornea, the transparent vesicle should sometimes appear after the recision of the prolapsus of the iris, it is obvious, that if it consisted of the tunic of the aqueous humor, it ought invariably to appear before the prolapsus of the iris. 4. Should the surgeon remove the protruded vesicle to a level with the cornea by a stroke of the scissars, a small quantity of limpid water is seen to ooze out, at the moment when the incision is made, without any part of the aqueous humor escaping from the anterior chamber. This inconvenience would be inevitable, were the protruded vesicle in question formed by the delicate elastic pellicle, which is said to invest the inner surface of the cornea. Besides, the little transparent tumor disappears when the incision is made; but often another one, exactly similar to what was cut off, is found in the very same place the following day. Had the little transparent tumor been composed of the tunic of the aqueous humor, elongated out of the wound, or ulcer of the cornea, it could not at all events have been reproduced at the same part of the cornea.

It is clear to Scarpa, that the pretended prolapsus of the tunic of the aqueous humor is, strictly speaking, only a forcible protrusion of a portion of the vitreous humor, which, from too much pressure being made on the eye, either at the time of the operation, or afterwards, or from a spasm of the muscles of the eye, insinuates itself between the edges of the wound after the extraction of the cataract, and projects in the form of a transparent vesicle. The same thing also happens after ulcers of the cornea, whenever the aqueous humor has escaped, and a portion of the vitreous humor is urged by forcible pressure towards the ulcer facing the pupil; or whenever an elongated piece of the vitreous humor, after the recision of a prolapsed portion of the iris, passes by a shorter route, than through the pupil, between the lips of the ulcer of the cornea. At length, we understand why, in both these instances, a transparent vesicle forms, even after the recision of the tunic of the aqueous humor, or ulceration of the cornea; and why it very often reappears in the same place, though it has been cut away to a level with the cornea. It is because one or more cells of the vitreous humor, constituting the transparent vesicle, are succeeded after their removal by other cells of the same humor, which glide between the lips of the wound, or ulcer of the cornea, into the same situation.

The treatment of this species of prolapsus consists in removing the transparent vesicle, projecting from the wound, or ulcer, by means of a pair of curved scissars with convex edges, and bringing the edges of the wound of the cornea immediately afterwards into perfect apposition, in order that they may unite together as exactly as possible. But, when there is an ulcer of the cornea, as soon as the vesicle is removed, the sore must be touched with the argentum nitratum, so that the eschar may resist any new prolapsus of the vitreous humor, and at the same time dispose the ulcer of the cornea to granulate and heal.

If, in some particular cases, the vesicle should not project sufficiently from the wound, or ulcer of the cornea, to be included in the scissars, the same object may be accomplished by puncturing the tumor with a lancet, or couching-needle; for, when the limpid fluid which it contains is discharged, the membrane forming it shrinks within the edges of the wound, or ulcer of the cornea, and no longer hinders the union of the former or the cicatrization of the latter.

Should the transparent tumor reappear in the same situation, the day after its recision, or puncture, it is right to repeat one of these operations, and to adopt further measures for maintaining the edges of the wound of the cornea in contact; or, if it should be an ulcer, the eschar must be made to adhere more deeply to its bottom and sides, so as to form a greater obstacle to the escape of the vitreous humor. In these circumstances, the surgeon must take all possible care to obviate such causes as have a tendency to propel the vitreous humor towards the wound, or ulcer, of the cornea; particularly too much pressure on the eyelids, spasms of the muscles of the eye, coughing, sneezing, efforts at stool, and other similar ones; and care must also be taken to check the progress of inflammation.

Scarpa has seen a prolapsus of the choroid coat, two lines from the union of the cornea with the sclerotica, in the inferior hemisphere of the eye. It was preceded by a small abscess, the consequence of severe ophthalmy. The treatment consisted in applying the argentum nitratum several times to the projecting portion of the choroides, until it was consumed, and reduced to a level with the bottom of the ulcer of the cornea. The part then healed. The eye remained, however, considerably weakened, and the pupil afterwards became nearly closed. *Scarpa sulle Principali Malattie degli Occhi*, *Vénezia*, 1802. *Richter's Anfangs. der Wundarzneykunst*, *B.* 3, *Von den Vorfalle der Regenbogenhaut.* *Pellier*, *Obs. sur l'Œil*, *p.* 350. *C. J. Beer*, *Lehre von den Augenkrankheiten*, *B.* 1, § 402, 518, *and* 592, *and B.* 2, § 58, 62, *&c.* 8*vo.* *Wien.* 1813—1817. *J. Wardrop*, *Essays on the Morbid Anatomy of the Human Eye*, *Vol* 2, *p.* 51, 8*vo.* *Lond.* 1818. *J. Vetch*, *A Practical Treatise on the Diseases of the Eye*, *p.* 53, *&c.* *Lond.* 8*vo.* 1820. *B. Travers*, *A Synopsis of the Diseases of the Eye*, *p.* 116, 280, *&c.* 8*vo.* *Lond.* 1820. *Weller on Diseases of the Eye*, *Transl. by Dr. Monteath*, 8*vo.* *Glasgow*, 1821.

For a description of the manner of dividing the iris, in order to make an artificial pupil, when the natural one is closed, refer to *Pupil*, *Closure of.*

Iris, *Effects of certain Narcotics upon the*, see Belladonna and Cataract. The following work upon the subject also merits attention. *C. Himly*, *de la Paralysie de l'Iris par une application locale de la Jusquiaume, et de son utilité dans le traitement de plusieurs maladies des Yeux*, 2*de* *Ed.* 12*mo.* *Altona*, 1805.

IRITIS. Inflammation of the iris. See Ophthalmy.

ISCHU'RIA. (from ισχω, to restrain; and ȣϱον, the urine.) A suppression, or stoppage of the urine.

The distinction between a *suppression* and *retention* of urine, is practical and judicious. The former, most properly points out a defect in the secretion of the kidneys; the latter, an inability of expelling the urine when secreted. (*Hey.*)

The first disease is not very common, is named *ischuria renalis*, or *suppression of urine*, and belongs to the province of the physician; the second is an exceedingly frequent disorder, is named *ischuria vesicalis*, or *retention of urine*, and its treatment is altogether surgical. (See *Catheter*, and *Urine*, *Retention of.*)

ISSUE signifies an ulcer, made designedly by the practitioner, and kept open a certain time, or even the patient's whole life, for the cure, or prevention, of a variety of diseases.

The physician, in his practice, has frequent occasion to recommend the making of an issue, and the surgeon finds it a principal means of relief in several important cases, as, for instance, white swellings, disease of the hip-joint, caries of the vertebræ, &c. Many persons are never in health, or, at least, fancy themselves always ill, unless they have an issue formed in some part of their body or another. The making of an issue, indeed, is not unfrequently considered as an imitation of nature, who, of her own accord, often forms ulcers and abscesses in various parts of the body (as is not uncommonly conjectured) for the purpose of discharging pernicious humors, whereby people are supposed to be freed from grievous disorders, and have their health preserved. The humoral pathologists were excessively partial to these notions, which, at the present time, will be found by every experienced practitioner to influence the mass of mankind, and render the formation of issues more common, than perhaps is consistent with the better-established principles of medical science. Few old subjects will allow a sore of long standing to be dried up (as the expression is), without requiring the surgeon immediately afterwards to make an issue for them. When an ulcer has existed a great length of time, the constitution may possibly become so habituated to it, that the health may really suffer from its being healed. "I have often (says the experienced Dr. Parry) seen various thoracic affections, as pulmonary consumption, asthma, carditis, or hydrothorax, arise from the spontaneous, or artificial cure of ulcers, perpetual blisters, or fistulæ." (*Elements of Pathology, &c. p.* 386.) Asthmatic complaints, severe headachs, &c. are frequently observed to follow the cicatrization of an old ulcer; but, whether they would have happened, if an issue had been made in time, is a question difficult of positive determination; for, many persons with old ulcers are not prevented from suffering from asthma and headach. The plan of making an issue, however, is commendable both as rational and exempt from danger. Whatever may be the solidity of the theories, which have been offered by medical writers, in regard to issues, the practitioner, who has his eyes open, cannot fail to see the benefit often derived from such means; and if there be any unquestionable facts in medicine and surgery, we may confidently set down amongst them the frequent possibility of relieving one disease by exciting another of a less grievous and more curable nature.

There are two ways of making an issue; one is with a lancet, or scalpel; the other with caustic.

The place for the issue being fixed upon, the surgeon and his assistant are to pinch up a fold of the integuments, and, with a lancet or knife, make in them an incision of sufficient size to hold a pea, or as many peas as may be thought proper. The pea or peas are then to be placed in the cut, and covered with a piece of adhesive plaster, a compress, and bandage. The peas, first inserted, need not be removed for three or four days, when suppuration will have begun; but, the issue is afterwards to be cleaned and dressed every day, and have fresh peas put into it. The preceding is the ordinary method of making such issues, as are intended to contain only one or two peas.

When the issue is to be larger, which is generally proper, in cases of diseased vertebræ, white swellings, &c., the best plan is to destroy a portion of the integuments with caustic. The caustic potassa, blended with quicklime, is mostly preferred for this purpose. The situation and size of the issue having been determined, the surgeon is to take care, that the caustic does not extend its action to the surrounding parts. With this view, he is to take a piece of adhesive plaster, and having cut a hole in it, of the exact shape and size of the issue intended to be made, he is to apply it to the part. Thus the plaster will defend the adjacent skin from the effects of the caustic, while the uncovered portion of integuments, corresponding to the hole in the plaster, is that which is to be destroyed. The caustic is to be taken hold of with a bit of lint, or tow, and its end, having been a little moistened with water, is to be steadily rubbed upon the part of the skin, where the issue is to be formed. The frictions are to be continued, till the whole surface, intended to be destroyed, assumes a darkish corroded appearance. The caustic matter may now be carefully washed off with some wet tow. The plaster is to be removed, and a linseed poultice applied. As soon as the eschar is detached, or any part of it is loose enough to be cut away, without pain or bleeding, the peas are to be inserted and confined in their proper place with a piece of adhesive plaster. Some use beans for the purpose; others beads, which answer very well, and have the advantage of serving for any length of time, when washed and cleaned every day. If the issue is at all of a longitudinal shape, the peas, beans, or beads, may be more easily kept in their places, when a thread is passed through them.

Issues ought always to be made, if possible, in a situation, where the peas will not be much disturbed by the ordinary motions of the body, nor interfere with the action of muscles. The interspaces, between the margins and insertions of muscles, are deemed the most eligible places. Thus, issues in the arm are usually made just at the inferior angle of the deltoid muscle, by the side of the external edge of the biceps. In the lower extremities, issues are often made at the inner side of the thigh, immediately above the knee, in a cavity, that may be readily felt there with the fingers. Sometimes, issues are made upon the inside of the leg, just below the knee. For the relief of certain affections of the head, or eye, the nape of the neck is commonly selected as a good situation. In caries of the vertebræ, they are made on each side of the spinous processes. In cases of diseased hips, they are formed in a depression just behind and below the trochanter major. When the nature of the disorder does not particularly indicate the situation for the issue, the arm should be preferred to the leg, as issues upon the upper extremities, especially the left arm, are much less annoying, than upon either of the lower limbs.

The great art of keeping an issue open, for a long while, consists in maintaining an equal and effectual pressure upon the peas, by which means, they are confined in their places, little depressions are made for them, and the granulations hindered from rising. Compresses of pasteboard and sheet-lead will often be found highly useful. This plan is the surest one of preventing the issue from healing, and the most likely to save the patient all the severe and repeated suffering, which the fresh application of the caustic, or the use of stimulating powders, in order to renew the sore and repress the fungous flesh, unavoidably occasions.

There is a method of making issues with the caustic made into a sort of paste, which is laid upon the part left uncovered by the adhesive plaster. It seems to me to be a more tedious and painful plan, and I do not recommend it.

It has been suspected, that the pain, arising from the caustic might be lessened, by mixing opium with the application; but, the idea seems not at all probable; the destruction of a part of the skin must inevitably cause considerable pain, with whatever substance it is produced, and opium itself, so far from being likely to diminish the agony, is itself a violent stimulus, whenever it comes into contact with the exposed extremities of the nerves.

J.

JAW-BONE, AMPUTATION OF CONSIDERABLE PORTIONS OF THE LOWER. This operation, which is one of the achievements of modern surgery, was first performed, by Dr. Mott, in America; and it has since been done by Dupuytren, Graefe, Lallemand, Dr. M'Clellan, and others. Want of room compels me to postpone the account of it till the publication of the next edition of the First Lines of the Practice of Surgery.

JOINTS, DISEASES OF. The joints are subject to numerous diseases, which are more or less dangerous, according to their particular nature. Like all other parts, the joints are liable to inflammation and abscesses; their capsules frequently become distended with an aqueous secretion, and the disease termed *hydrops articuli*, is produced; but, the most important of all their morbid affections, are the cases, which a few years ago were indiscriminately called *white swellings*, *scrophulous joints*, and the *disease of the hip-joint*. Here, as Mr. Brodie remarks, the same name has been frequently applied to different diseases, and the same disease has received different appellations. And confusion, with respect to the diagnosis, always gives rise to a corresponding confusion, with respect to the employment of remedies. Although, says he, diseases in their advanced stage extend to all the dissimilar parts, of which the joints are composed, such is not the case in the beginning. Here, as elsewhere, the morbid actions commence, sometimes in one, and sometimes in another texture, differing in their nature, and, of course, requiring to be differently treated, according to the mechanical organization, and vital properties of the part, in which they originate. (See *Pathological and Surgical Obs. on Diseases of the Joints*, *p.* 2, *8vo. Lond.* 1818.) It was this idea which led Mr. Brodie to trace by dissection the exact parts, in which several of the principal diseases of the joints commence, and, how much light and discrimination his successful investigations have produced, it is needless for me here to insist upon, as his merit will long be appreciated by every surgeon, who recollects the perplexity and ignorance, which prevailed only a few years ago in this very interesting branch of surgery.

Wounds.—By the wound of a joint, surgeons mean a case, where the capsular ligament is penetrated, or divided. The injury is often accompanied with a division of the lateral, or other ligaments, and sometimes also with that of the cartilages and bones. That the capsular ligament is wounded may generally be learned by the introduction of a probe, and frequently by a discharge of a transparent viscid fluid, called the synovia. But, as a similar discharge may proceed from mere wounds of the bursæ mucosæ, we might form an erroneous judgment, were we unacquainted with the situation of these little membranous bags. Boyer has seen several cases, in which a fluid, resembling synovia, was discharged from wounds of the sheaths of tendons. (See *Traité des Maladies Chirurg. T.* 4. *p.* 408.) Here, the advice which I have given in another place, (see *Wounds of the Abdomen*,) respecting the temerity of being too officious with the probe, is equally important, inasmuch as the rough introduction of this instrument into a large joint, like the knee, would be very likely to excite inflammation of the synovial membrane, and a train of dangerous and even fatal consequences; while the information, gained by such employment of the probe, is of little use; because, whenever a wound is suspected to reach into the capsular ligament, exactly the same treatment should always be followed, as if the joint were positively known to be penetrated.

Notwithstanding simple wounds, even of large joints, often heal favourably, without any bad symptoms, this is not constantly the case, and the records of surgery furnish many examples, in which the most alarming and fatal consequences ensued. (See *Hunter's Commentaries*, *Part* 1, *p.* 69.) When properly treated, punctured wounds of the joints (says Boyer) are not in general attended with danger; but, as some of these wounds, which were apparently quite simple, have been followed by very bad symptoms, and even death, we should always be extremely circumspect in the prognosis. (See *Traité des Mal. Chir. T.* 4, *p.* 409.) The treatment consists in endeavouring to heal the injury by the first intention; in applying cold lotions; forbidding all motion of the part; and employing bleeding and other antiphlogistic remedies.

Baron Boyer relates two cases of punctured wounds of the elbow-joint, which healed up in a few days, without any unfavourable symptom.

He acknowledges, however, that these accidents do not always go on so well, and that the consequences are sometimes perilous.

Simple incised wounds present only one indication; viz. that of healing the part by the first intention. At the moment of the accident, some of the synovia is discharged, indicating that the capsular ligament is wounded. Should this circumstance not have been noticed at first, the surgeon may see the synovia flow out again, if he move, or press upon, the joint. But, in making this examination, the greatest gentleness should be used, lest the irritation of the capsular ligament be increased. When the wound is large, and there is no considerable thickness of soft parts, the articular surfaces are exposed to view.

The prognosis of an incised wound of a joint is not generally unfavourable, when the edges have been immediately brought together, the cavity of the joint has not been long exposed, and blood is not extravasated in it. This last danger is also exaggerated, as will be noticed, in speaking of collections of blood in joints. With these exceptions, says Boyer, the wound may heal as readily, as if the joint were not opened, and he has cited several facts in proof of this statement. Its truth is also confirmed by the success which attends operations, practised for the purpose of extracting cartilaginous substances from the knee. Nay, very bad cases sometimes recover under judicious management, even though the joint be large, and abscesses follow. Thus I saw, in St. Bartholomew's hospital, in the year 1820, two examples of compound fractures of the patella, where the opening in the capsule was so large, that the finger could readily pass into the cavity of the joint, yet, after large abscesses, a great deal of fever, and separation of bone, the patients recovered with stiff joints. But, I would advise surgeons not to let any facts of this kind prejudice their judgment in the treatment of gun-shot wounds of the large joints, where, in the circumstances elsewhere explained (see *Amputation* and *Gun-shot Wounds*) amputation is the safest practice. In a sabre, or cut wound, the principal object is to heal the wound by the first intention. The rest of the treatment consists in using every possible means for the prevention of inflammation, by perfect quietude of the part, the use of cold applications, &c.

Let it always be remembered, however, that wounds of the joints do not always heal in the above favourable manner. Even amongst those cases, which appear the most slight and simple, there are but too many, which are followed by such aggravated symptoms, as either prove fatal, or occasion a necessity for amputation. And, in other instances of a less grievous description, when the patient is cured, the termination of danger is not without an anchylosis, by which the motion and functions of the joint are permanently destroyed.

The experienced Mr. Hey has noticed wounds of the joints, and made some pertinent remarks on the subject. He states, that, in these cases, the utmost care should be taken to *prevent* inflammation. "Upon this circumstance chiefly depends a successful termination. I have seen (says he) many large wounds of the great joints healed without the supervention of any dangerous symptoms, where due care has been taken to prevent inflammation; whilst injuries, apparently trifling, will often be followed by a train of distressing and dangerous consequences, where such care has been neglected. It is generally easier to prevent inflammation in the joints, after a wound, than to arrest its progress when once begun. I speak now of inflammation affecting the capsular ligament. A slight degree of redness and tenderness in the integuments only, is of little consequence; but, when the capsular ligament becomes inflamed, the formation of abscesses attended with a high degree of fever, and ultimately a stiffness of the joint, are the common consequences, if the life of the patient is preserved." (See *Hey's Practical Obs. in Surgery, p.* 354. *Edit.* 2.)

For facts, in confirmation of the foregoing account, I particularly refer the reader to several cases recorded in this last publication, *p.* 355, *et seq.* and by *Boyer (Traité des Mal. Chir. T.* 4, *p.* 426, *&c.*).

When the large joints, particularly the knee, are wounded, the stomach is frequently very much affected. I remember seeing, under the care of Mr. Best of Newbury, a man, who, in his occupation as a wheelwright, happened to give himself a wound, by which one side of the knee was laid open; a good deal of constitutional disturbance and of inflammation and suppuration ensued: but, what particularly struck me, was the manner, in which the stomach was disordered.

In speaking of cartilaginous substances in the joints, I shall have occasion to advert again to the danger attendant on wounds of these parts; and the same fact is still further considered, in the articles *Amputation*, *Dislocations*, *Fractures*, and *Gun-shot Wounds*, in which last part of the Dictionary, the sentiments of Baron Larrey, and other writers on military surgery, are laid before the reader.

Inflammation of Joints, if we exclude from consideration specific cases, may be said usually to be the consequence of a contusion, sprain, wound, or some other kind of injury: but, with respect to the inflammation of the synovial membrane, as described by Mr. Brodie, no cause is so frequent, as the application of cold, and hence, he explains the frequency of this disease in the knee, and its rarity in the hip and shoulder, which are covered by a thick mass of flesh. As a late writer observes, the inflammation arising from a wound, is infinitely the most severe after it has once commenced. (*James on Inflammation, p.* 157.)

The inflamed joint shows the common symptoms of inflammation; viz. preternatural redness, increased heat, throbbing, pain, and swelling, while the constitution is also disturbed by the common symptoms of inflammatory fever. It deserves notice, however, that, in these cases, the constitutional symptoms are often exceedingly severe, and the pulse is more frequent, and less full and strong, than when parts, more disposed to return to a state of health, are affected. The inflammation first attacks some part of the capsular ligament, and very quickly spreads over its whole extent, as usually happens in all inflammations of smooth serous membranes.

The capsules of the joints are naturally not very sensible; but like many other parts similarly circumstanced, they often become acutely painful, when Inflamed. The complaint is accompanied with an increased secretion of the synovia, which becomes of a more aqueous, and of a less albuminous quality, than it is in the healthy state. Hence, it is not so well calculated for lubricating the articular surfaces, and preventing the effects of friction, as it is in the natural condition of the joint; a circumstance, which may explain, why a grating sensation is often perceived on moving the patella.

The capsular ligaments, like other parts, are frequently thickened by inflammation, and, sometimes coagulating lymph, being effused on their internal surfaces, organized cartilaginous or osseous bodies are formed within the joints.

It has been explained by Mr. Brodie, that the usual consequences of inflammation of the synovial membrane, or capsular ligament, are; 1. a preternatural secretion of synovia, 2. an effusion of coagulating lymph into the cavity of the joint, 3. a thickening of the synovial membrane, a conversion of it into a substance resembling gristle, and an effusion of coagulable lymph, and probably of serum, into the cellular structure by which it is connected with the external parts. The same gentleman has seen several cases, where, from the appearance of the joint, and the symptoms, there was every reason to believe, that the inflammation had produced adhesions of the reflected folds of the membrane to each other: and, in dissection, he has occasionally observed adhesions, which might have arisen from inflammation at some former period. "These effects of inflammation of the synovial, very much resemble those of inflammation of the serous membranes. There are, however, some points of difference. In the former, I have reason to believe, that suppuration rarely takes place independently of ulceration; but, this is a frequent occurrence in the latter. Inflammation of the peritonæum, or pleura, though very slight in degree, and of very short duration, terminates in the effusion of coagulable lymph; but, it is only violent, or long continued inflammation which has this termination in the membranes of joints." (*Brodie in Med. Chir. Trans. Vol.* 4, *p.* 216.)

When the inflammation attains a high pitch, an abscess may occur in the capsular ligament, which at length ulcerates, and the pus makes its way beneath the skin, and is, sooner or later, discharged through ulcerated openings.

An abscess rarely takes place in an important articulation, in consequence of acute inflammation, without the system being, also, so deranged, that life itself is imminently endangered. Severe febrile symptoms always afflict the patient, and, occasionally, delirium and coma taking place, death itself ensues. Two rapidly fatal cases of ulceration of the synovial membrane, where matter had formed within it from a sprain of the hip, and a contusion of the shoulder, are recorded by Mr. Brodie. (See *Pathol. Chir. Obs. p.* 65.)

In these cases, the inflammatory fever is very quickly converted into the hectic; indeed, when an abscess has taken place in a large joint, in consequence of acute inflammation, hectic symptoms almost immediately begin to show themselves, and the strong actions of the common inflammatory fever suddenly subside.

Local consequences, even worse than those above described, may follow inflammation of a joint. As the layer of the capsular ligament, reflected over the cartilages of the articulation, is often inflamed, the cartilages themselves may have the inflammation communicated to them. Parts of a cartilaginous structure, being very incapable of bearing the irritation of disease, often ulcerate, or, in other words, are absorbed, so as to leave a portion, or the whole, of the articular surface of the bones, completely denuded of its natural covering. At length, the heads of the bones themselves inflame, and become carious; or the consequence may be anchylosis. Mr. Brodie has seen some cases, in which there was extensive destruction of the cartilages, apparently in consequence of neglected inflammation of the synovial membrane; but, he believes, that in most cases, where ulceration of the cartilage is combined with such inflammation, the former is the primary affection, and the latter takes place subsequently, in consequence of the formation of an abscess within the joint. (*Pathol. and Surg. Obs. &c. p.* 17.) According to Mr. Brodie, who speaks chiefly of the inflammation which begins in the synovial membrane itself, and is not communicated to it from other textures, the disease very seldom attacks young children, but is frequent in adult persons, the reverse of what happens in some other diseases of the joints.

The inflammation of the capsular ligament, or synovial membrane, frequently assumes the chronic form, and is then very often confounded with other more serious maladies, under the general appellation of white-swelling. The disease often arises from cold, and hence, is more common in the knee and ankle, than in the hip, or shoulder. It may also arise from the immoderate use of mercury, and, in particular constitutions, from rheumatism and general debility of the system. In these instances, it often leaves one joint and attacks another; and it is less severe, and less disposed to produce effusion of coagulating lymph, or a thickened state of the membrane, than when it is apparently a local disease. (*Brodie, in Med. Chir. Trans. Vol.* 4, *p.* 218.) In the latter case, the disorder is more likely to assume a severe character, and may be of long duration, leaving the joint with its functions more or less impaired, and occasionally terminating in its total destruction. The following are the chief symptoms of the complaint, pointed out by Mr. Brodie. At first, although some pain is felt over the whole joint, the patient refers it principally to one spot, and it is not at its height before the end of a week or ten days. Sometimes, even at this period, the pain is trifling, but sometimes it is considerable, and every motion of the joint is distressing. In a day, or two, after the commencement of the pain, the joint is affected with swelling, which at first arises entirely from a collection of fluid in its cavity, and, in the superficial joints, an undulation may be distinguished. However, after the inflammation has prevailed some time, the fluid is rendered less perceptible, either in consequence of the synovial membrane being thickened, or the effusion of lymph; and the more solid the swelling is, the more is the mobility of the joint impaired. The form of the diseased joint does not correspond to that of the heads of the bones; but, as the swelling is chiefly caused by the distention of the synovial membrane, "its figure depends in a great measure on the situation of the ligaments and tendons, which resist it in certain directions, and allow it to take place in others. Thus, when the knee is affected, the swelling is principally observable on the anterior and lower part of the thigh," where there is only a yielding cellular structure between the extensor muscles, and the bone. It is also often considerable in the spaces, between the ligament of the patella and the lateral ligaments, because at these points, the fatty substance is propelled outward by the collection of fluid. In the elbow, the swelling occurs principally above the olecranon, under the extensor muscles of the forearm; and in the ankle, it is between the lateral ligaments, and the tendons in front of the joint. In the hip and shoulder, where the disease is less frequent, the fluid cannot be felt, but the swelling is perceptible through the muscles. In the beginning of this disease in the hip, a fulness both in the groin and nates may be remarked; but, afterwards, the nates become flattened, and the glutæi wasted from want of use. The pain is usually confined to the hip, but Mr. Brodie has seen cases, in which it was also referred to the knee. It may be discriminated from the case, in which the cartilages of the hip are ulcerated, by observing, that *the pain is more severe in the beginning, than in the advanced stage of the disease;* it never amounts to the excruciating sensation, felt in the other disease; and it is aggravated by motion, but not by pressing the cartilaginous surfaces against each other. The wasting of the glutæi is also preceded by a fulness of the nates. After the inflammation has subsided, the fluid is absorbed, and the joint frequently regains its natural figure and mobility; but, in the majority of cases, stiffness and swelling remain, and the patient continues very liable to relapse, the pain returning, and the swelling being augmented, whenever the patient exposes himself to cold, or exercises the limb a great deal. In cases, where the synovial membrane is thickened, a slow kind of inflammation sometimes continues in the part, notwithstanding the fluid has been absorbed, and the principal swelling has subsided, the disease at length extending to the cartilages, suppuration taking place, and the articular surfaces being completely destroyed. According to Mr. Brodie, in this advanced stage, the history of the disease, and not its present appearance, is the only thing, by which one can learn, whether the primary affection was inflammation of the synovial membrane, or ulceration of the cartilages. Though such is the most common character of inflammation of the synovial membrane, it is admitted, that its nature is sometimes more acute, exhibiting the symptoms mentioned at the beginning of this section. (See *Brodie's Pathol. and Surg. Obs. p.* 21, *&c.*) It is remarked by Mr. Wilson, that, when coagulable lymph is effused, the whole of it does not always adhere to the inflamed surface, but some of it forms flakes, which float in the fluid within the joint, in masses large enough to be sometimes felt through the capsular ligament. In other instances, the lymph becomes solid, adheres to the inside of the synovial membrane, and becomes vascular. The surface of this adventitious coating is sometimes smooth; but, occasionally, it forms thick projecting masses, of different degrees of thickness and length, and so numerous as to conceal every part of the original smooth surface of the synovial membrane, as exemplified in a preparation in Windmill-street. (*On the Skeleton and Diseases of Bones and Joints, p.* 319.)

When inflammation of the synovial membrane has arisen from a protracted, or ill-conducted course of mercury, Mr. Brodie recommends a trial of sarsaparilla; and when the disorder is connected with rheumatism, the medicines advised, are opium with diaphoretics, preparations of colchicum autumnale, and other usual remedies for rheumatic complaints. In some instances, however, in which several joints were affected, this gentleman has known benefit derived from moderate doses of mercury. (*p.* 31.) But, whether the disease be local, or dependent on the state of the constitution, Mr. Brodie considers topical remedies of most importance.

It will considerably shorten what we have to say concerning the treatment of inflamed joints, to observe, that, in the acute form of inflammation of the synovial membrane, the antiphlogistic plan, in the full sense of the expression, is to be strictly adopted. But, as there is a variety of means often adapted to the same purpose, it seems necessary to offer a few remarks on those which lay the greatest claim to our commendations.

There are few other surgical cases, in which general, and especially topical bleeding, is more strongly indicated. The violence of the inflammation, and the strength, age, and pulse of the patient, must determine, with regard to the use of the lancet; but, the application of leeches may be said to be invariably proper. When the leeches fall off, the bleeding is to be promoted by fomenting the part. The surgeon should daily persist in this practice, until the acute stage of the inflammation has subsided. As Mr. Brodie observes, attention should also be paid to the state of the bowels, and saline draughts, and diaphoretic medicines be exhibited. (*Pathol. and Surgical Obs. p.* 32.) In conjunction with this treatment, the lotio plumbi acetatis must be employed.

In a few instances, however, the patient seems to derive more ease and benefit from the employment of fomentations and emollient poultices, which, according to Mr. Brodie, is the case, when the swelling has been produced rapidly, and is attended with considerable tension. But, on this point, as I have remarked in speaking of *Inflammation,* the feelings of the afflicted should always be consulted; for, if the pain be materially alleviated by this, or that application, its employment will hardly ever be wrong.

Nothing more need be said, concerning the rest of the treatment, proper during the vehemence of the inflammation, as the duty of the surgeon is not materially different from what it is in other inflammatory cases.

As soon as the acute stage of the affection has subsided, the grand object is to remove the effects which have been left. These are a thickened state of the capsular ligament, and parts surrounding the articulation; a stiffness of the joint, and pain, when it is moved; fluid in the capsule, &c.

At first, as Mr. Brodie has observed, the joints should be kept perfectly quiet, and blood should be several times taken from the part, by means of leeches and cupping. The latter is the method, to which the preceding writer expresses the preference. The use of cold evaporating lotions is also to be continued until the inflammation has further abated, when a blister may be applied, and kept open with the savin cerate, or a repetition of blisters kept up, as preferred by Mr. Brodie. "The blisters (he says) should be of considerable size; and if the joint be deep-seated, they may be applied as near to it as possible; but, otherwise, at a little distance. Thus, when the synovial membrane of the hip is affected, they may be placed on the groin and nates; but, when that of the wrist is inflamed, they should be applied to the lower part of the forearm." Mr. Brodie thinks blisters have more effect, than any other means, in removing the swelling; but, excepting in very slight cases, he very rightly condemns their use, unpreceded by the abstraction of blood. After the subsidence of the inflammation, moderate exercise of the joint, and stimulating liniments are recommended. The camphor liniment is to be strengthened with the addition of liquor ammoniæ, or tinctura lyttæ, or the following formula adopted, as that to which the above gentleman seems to give the preference. ℞. Olei olivæ ℥iss. acid. sulph. ℥ss. M. He speaks also favourably of the effects of the antimonial ointment, in the proportion of ʒj. of the antim. tart. to ℥j. ung. cetacei. Plasters of gum ammoniac he regards as sometimes useful in preventing relapses. Issues and setons are never serviceable, unless ulceration of the cartilages has begun. For the removal of the remains of the swelling and stiffness, Mr. Brodie joins other writers in praising the efficacy of friction and exercise. The friction may be made with camphorated mercurial ointment, or with powdered starch; but the friction is to be employed with caution, as otherwise it may produce a return of the inflammation. When this happens, it is to be discontinued, and blood taken from the part. On the whole, Mr. Brodie appears to consider friction better adapted to cases, where the stiffness depends upon the state of the external parts, than to others, where it arises from disease in the joint itself. With respect to the plan of allowing a column of warm water to fall on the part, as suggested by Le Dran, and practised at the watering-places, he allows, that it is beneficial, but that it requires the same caution, as the employment of friction. (*Pathol. and Surg. Obs. p.* 30, *&c.*)

I have met with several instances, in which lotions, composed of vinegar and muriate of ammonia, sufficed for the removal of the chronic complaints, left after the acute stage of the disorder. The ointment of iodine promises also to be a valuable application.

The severity of the constitutional symptoms is mostly, if not always, greater, when the inflammation of a large joint arises from a wound, than when it is the consequence of a bruise, or sprain.

Loose cartilages in Joints.—Hard, roundish, or flattened bodies, mostly of a cartilaginous nature, are sometimes formed within the capsular ligaments, occasioning more or less pain in the affected joints, and a considerable impediment to the freedom of their movements. The disorder, though not noticed by any of the very ancient writers, is far from being uncommon. Paré is the first who speaks of it: he says, that *a hard polished, white body, of the size of an almond*, was discharged from the knee of a patient, in the year 1558, in which he had made an incision for an *aqueous apostume* (without doubt an hydrops articuli). (*Liv.* 25, *chap.* 15, *p.* 772.) A hundred and thirty-three years afterwards, viz. in 1691, Pechlin published the full details of another case, in which a cartilaginous body was successfully extracted from the knee. (*Observat. Physico-med. Obs.* 38, *p.* 306.) Dr. A. Monro, in 1726, dissected the knee-joint of a woman, who had been hung, and found in the articulation a cartilaginous body, of the shape and size of a small bean. These were the only examples of the disease known before the year 1736, at which period Mr. Simpson cut out of the knee a similar substance, which he supposed at the time of the operation was only beneath the skin. (See *Edinb. Med. Essays, Vol.* 4.) But, of late years, the disease has been frequently noticed and described, particularly by Bromfield, Hewit, Middleton, Gooch, Ford, Home, Bell, Abernethy, and Brodie, in England; by Henckel, Theden, and Lœffler, in Germany; and by Desault and Sabatier, in France. Hence, as Boyer remarks, it is now as well known, as most others, to which the joints are subject. (*Traité des Mal. Chir. T.* 4, *p.* 434.)

Such detached and moveable cartilages are not peculiar to the knee, as they occur in other joints: yet they are most frequently met with in the knee, and it is in this joint that they produce symptoms, which render them the object of a chirurgical operation. Morgagni and B. Bell met with them in the ankle; Haller in the joint of the jaw; and Hey in the elbow.

According to Sir Everard Home, these substances are analogous in their structure to bone; but, in their external appearance, they bear a greater resemblance to cartilage. They are not, however, always exactly of the same structure, being in some instances softer, than in others. Their external surface is smooth and polished, and, being lubricated by the synovia, allows them to be moved readily from one part of the joint to another. They seldom remain long at rest, while the limb is in motion; and when they happen to be in situations where they are pressed upon with force by the different parts of the joint, they occasion considerable pain, and materially interfere with its necessary motions.

The circumstance of their being loose, and having no visible attachment, made it difficult to offer good conjectures respecting their formation; and, according to Sir E. Home, no satisfactory account of their origin had been given, when Mr. Hunter made his observations. In the course of his experiments, instituted with the view of proving a living principle in the blood, Mr. Hunter was naturally induced to attend to the phenomena, which took place, when that fluid was extravasated, whether in consequence of accidental violence, or other circumstances. The first change he found to be coagulation; and the coagulum thus formed, if in contact with living parts, did not produce an irritation similar to extraneous matter, nor was it absorbed and taken back into the constitution, but in many instances preserved its living principle, and became vascular, receiving branches from the neighbouring blood-vessels for its support; it afterwards underwent changes, rendering it similar to the parts, to which it was attached, and which supplied it with nourishment. When a coagulum adhered to a surface, which varied its position, the attachment was rendered in some instances pendulous, and in others it was entirely broken.

Hence, it was easy to explain the mode, in which those pendulous bodies are formed, which are sometimes attached to the inside of circumscribed cavities, and the principle being established, it became equally easy for Mr. Hunter, to apply it under other circumstances, since it is evident from a known law in the animal economy, that extravasated blood, when rendered an organized part of the body, can assume the nature of the parts into which it is effused, and consequently, the same coagulum, which, in another situation, might form a soft tumor, would when situated on a bone, or in the neighbourhood of bone, often form a hard one. The cartilages, found in the knee-joint, therefore, appeared to him to originate from a deposit of coagulated blood upon the end of one of the bones, which had acquired the nature of cartilage, and had afterwards been separated. This opinion was further confirmed by the examination of joints which had been violently strained, or otherwise injured, where the patients had died at different periods after the accident. In some of these cases, there were small projecting parts, preternaturally formed, as hard as cartilage, and so situated, as to be readily knocked off by any sudden, or violent motion of the joint. (*Trans. for the Improvement of Med. and Chir. Knowledge, Vol.* 1.)

Mr. Brodie met with two cases, however, in which the loose bodies were of a different nature, and had a different origin from that referred to by Sir E. Home. Sometimes disease causes a bony ridge to be formed, like a small exostosis, round the margin of the cartilaginous surfaces of the joint. In the two examples, alluded to, this preternatural growth of bone had taken place, and in consequence of the motion of the parts, portions of it had been broken off, and lay loose in the cavity of the joint. (*Brodie in Med. and Chir. Trans. Vol.* 4, *p.* 276.) And, in a more recent publication, he remarks, that, in the majority of cases, which he has met with, no inflammation preceded the formation of these preternatural substances, and, therefore, he thinks it probable, that, in some instances, they are generated, like other tumors, by some different process. He further observes, that they appear to be situated originally either on the external surface, or in the substance of the synovial membrane, since before they become detached, a thin layer of the latter may be traced over them. (*Pathological and Surgical Obs. p.* 298.)

One or more of these preternatural bodies may be formed in the same joint. Sir E. Home mentions one instance, in which there were three; they are commonly about the size of a horse-bean, often much smaller, and sometimes considerably larger; when very large, they do not give so much trouble to the patient as the smaller kind. A soldier of the 56th regiment had one nearly as big as the patella, which occasioned little uneasiness, being too large to insinuate itself into the moving parts of the joint. Morgagni saw twenty-five in the left knee of an old woman, who died of apoplexy; and Haller met with no less than twenty, in the articulation of the lower jaw. When there are several in the same joint, it is observed, that their size is generally small. (*Boyer, Traité des Mal. Chir. T.* 4, *p.* 436.)

The diagnosis of this disease, as Boyer observes, is seldom attended with any difficulty. When the formation of the extraneous substances follows a fall, or blow, upon the joint, the complaint begins with a swelling of the surrounding soft parts, and upon the subsidence of this swelling, which lasts for a time more or less long, the presence of the little cartilaginous tumors is indicated by certain symptoms, which are peculiar to them. In persons who have had no blow, nor fall upon the knee, the disease sometimes commences with a more or less acute pain in the joint, with, or without swelling of the surrounding soft parts, and which affection is usually regarded as rheumatism. To these first symptoms, which are common both to cases of foreign bodies in the joints, and other diseases of these parts, are soon added other particular signs, by which the nature of the case is evinced.

As the extraneous bodies are in general free and moveable in the joint, they can easily be made to slip about from one part of the articulation to another: a circumstance which is facilitated by the smoothness of their surface, as well as by the synovia, which is mostly in larger quantity, than natural. According to the situation, which they happen to occupy, sometimes they produce acute pain; sometimes no pain whatever. When they lodge in a depression, where they are not compressed, they cause no pain; and if they could be always kept in this position, their presence would not be likely to excite any inconveniences. But, when they get between the articular surfaces, which in certain postures of the limb come into contact with each other, the following are the effects of the compression. Sometimes, the extraneous substance suddenly glides between the condyles of the thigh-bone and head of the tibia, and, while it lodges there, excites acute pain in certain directions of the limb, and instantaneous loss of the power of moving the knee. But, when it shifts its place again, either naturally, or accidentally, during an examination of the affected part, the compression is removed, the pain all at once ceases, and the functions of the joint are as suddenly restored. Most frequently, when the extraneous body gets behind the patella, or the ligament of the patella, as the patient is walking, he is compelled to make a sudden stop, and would fall down from the acuteness of the pain, if nothing were at hand to save him. Some patients have been observed, however, who experienced no pain in these circumstances. Reimarus mentions a man, who suffered great pain and could not move his leg, when the extraneous body was at the side of the joint; but was immediately relieved by pushing it under the patella. B. Bell met with cases, in which the pain was so violent at the instant when the patients put their legs in certain postures, that fainting was brought on, and they were so afraid of a return of the suffering, that they preferred remaining perfectly quiet to running any risk of causing the pain again. He even asserts, that he had known some persons, in whom the least motion of the limb would cause such pain as awoke them out of the deepest sleep. The pain, excited by the situation of the extraneous body betwixt the articular surfaces, recurs at intervals more or less long, and always in consequence of some motion or exertion. Sometimes it ceases directly by the effect of a movement, contrary to that which produced it; but, most frequently it continues, and then the surrounding soft parts are affected with swelling, which obliges the patient to keep his bed, and have recourse to emollient anodyne applications. Sometimes, as I have already noticed, the foreign body lies at a part of the joint, where it causes no inconvenience, and makes no pressure on the articular surfaces. In this case, all the symptoms have been known to cease for several months, so that the patient imagined himself cured, when, suddenly, the foreign body was urged by some effort into another situation, where it occasioned a renewal of all the former pain.

The foregoing circumstances afford strong presumptive evidence of the presence of extraneous cartilaginous substances in the joint; but, they do not amount to certainty: this can only be acquired by the touch. In handling the knee of the patient, the surgeon feels a hard, prominent substance, which slips about under his fingers, and glides under the patella, or the ligament of this bone, and sometimes under the tendon of the extensor muscles of the leg, from one side of the joint to the other. The extraneous body may make its appearance either at the inside or the outside of the articulation; but, it most frequently presents itself at the former part, which is the broadest and most sloping, while the capsular ligament there is loosest. Desault met with one instance, in which the capsular ligament and soft parts were so loose, that the patient could turn the extraneous substance round and round.

In general, the complaint is not dangerous; but, as it is painful, and obstructs, or often prevents, walking; and usually can be cured only by an operation, which has sometimes had fatal consequences; we cannot be too much upon our guard in delivering a prognosis.

It is only in the knee, that the disease ever becomes so troublesome as to require an operation, or, indeed, any surgical treatment.

If we except making an incision into the joint, for the purpose of extracting the cartilaginous tumors, we are not acquainted with any certain means of freeing a patient from the inconvenience of the complaint. To this plan, the danger, attendant on all wounds of so large an articulation as the knee, is a very serious objection. Middleton and Gooch endeavoured to conduct the extraneous body into a situation, where it produced no pain, and to retain it in that position a long time by bandages, under the idea, that the cartilaginous substance would adhere to the contiguous parts, and occasion no future trouble. Some will be inclined to think, that no positive conclusion ought to be drawn from the cases brought forward by these gentlemen, because they had no opportunity of seeing their patients again at the end of a reasonable length of time, and we know, that loose cartilages in the joints sometimes disappear for half a year, and then make their appearance again. Yet, perhaps, the very circumstance of the patients not applying again, may justify the inference, that sufficient relief had been obtained.

However, it should not be concealed, that this method was also tried in St. George's Hospital without benefit, and that in one case, the pain was increased by it. (See *Reimarus de Fungo Articulorum*, § 27, 54, *&c.*)

Mr. Hey, aware of the dangerous symptoms, which have occasionally resulted from the most simple wounds penetrating the knee-joint, was induced to try the efficacy of a laced knee-cap, and the cases, which he has adduced, clearly demonstrate, that the benefit thus obtained, is not temporary, at least, as long as the patient continues to wear the bandage. In one case, the method had been tried for ten years, with all the success which the patient could desire. Boyer also made one patient use a knee-cap for a year; after which it was left off, the patient appearing cured. And, in a second instance, the same practitioner tried the plan, which put a stop to the pain, and enabled the patient to walk with ease; but, it was not known whether the method was properly continued, as the patient had not latterly been seen. (*Boyer, Traité des Mal. Chir. T.* 4, *p.* 444.)

Contemplating the evidence upon this point, and the perilous symptoms, sometimes following wounds of the knee-joint, I am decidedly of opinion, that the effect of a knee-cap, or of a roller and compress, applied over the loose cartilage, ought generally to be tried, before having recourse to excision. I say generally, because the conduct of the surgeon ought, in such cases, to be adapted to the condition, and inclination of the patient. If a man be deprived of his livelihood, by not being able to use his knee; if he cannot, or will not take the trouble of wearing a bandage; if he be urgently desirous of running the risk of the operation after things have been impartially explained to him; if a bandage should not be productive of sufficient relief; and, lastly, if excessive pain, severe inflammation of the joint, a great deal of symptomatic fever, and lameness, should frequently be produced by the complaint, (See *Brodie's Pathological and Surg. Obs. p.* 299), I think it is the duty of a surgeon to operate. It is very certain, that success has generally attended the operation; but, small as the chance is of losing the limb, and even life, in the attempt to get rid of the disease, since the inconveniences of the complaint are, in most cases, very bearable, and are even capable of palliation by means of a bandage, endangering the limb and life in any degree, must seem to many persons contrary to the dictates of prudence. At all events, we must agree with Boyer, that, as a laced knee-cap can do no harm, we ought always to make trial of it, and never perform the operation except when pressure does not answer, and the return of frequent and violent pain makes the employment of the knife necessary. (See *Traité des Mal. Chir. T.* 4, *p.* 445.)

I am ready to allow, with M. Brochier, that the danger, attendant on wounds of the large joints, has always been exaggerated in consequence of ancient prejudices. (*Desault's Journ. Vol.* 2.) But, making every allowance for the influence of prejudice, a man must be very sceptical indeed, who does not consider the wound of so large a joint as the knee, attended with real cause for the apprehension of danger. See Case 2, in my *Treatise on the Diseases of the Joints.* At the end of Mr. Ford's case, (*Med. Obs. and Inquiries, Vol.* 5.) we read on the subject of cutting loose cartilages out of the knee: "The society have been informed of several cases, in which the operation has been performed; some, like this, have healed up, without any trouble; others have been followed by violent inflammation, fever, and death itself." A case was lately published, in which the patient very nearly lost his life from suppuration in the knee-joint after this operation. (See *Kirby's Cases*, *p.* 75.) In the same work, reference is also made to two other cases, which actually had a fatal termination; (*p.* 82:) and even in Mr. Kirby's own instance, the recovery was not effected without the entire loss of the motions of the knee.

As the disorder is often attended with a degree of heat and tenderness in the articulation; as the danger of the operation is, in a great measure, proportioned to the subsequent inflammation; and, as much of the danger is at once removed, if the wound unite by the first intention; the advice, to keep the patient in bed, a few days before operating, to apply leeches, and cold saturnine lotions to the knee during the same time, and to exhibit beforehand a saline purgative, is highly prudent.

I shall next introduce an account of the plan of operating, as described by several of the best modern surgeons.

"As these loose bodies cannot always be found, no time can be fixed for the operation; but the patient, who will soon become familiar with his own complaint, must arrest them when in a favourable situation, and retain them there till the surgeon can be sent for.

"Before the operation, the limb should be extended upon a table in an horizontal position, and secured by means of assistants; the loose cartilages are to be pushed into the upper part of the joint above the patella, and then to one side; the inner side is to be preferred, as in that situation only the vastus internus muscle will be divided in the operation. Should there be several of these bodies, they must be all secured, or the operation should be postponed till some more favourable opportunity, since the leaving of one will subject the patient to the repetition of an operation, not only painful, but attended with some degree of danger.

"The loose bodies are to be secured in the situation above-mentioned by an assistant, a task not easily performed while they are cut upon, from their being lubricated by the synovia; and if allowed to escape into the general cavity, they may not readily, if at all, be brought back into the same situation.

"The operation consists in making an incision upon the loose cartilage, which it will be best to do in the direction of the thigh, as the wound will more readily be healed by the first intention. If the skin is drawn to one side, previously to making the incision, the wound through the parts underneath will not correspond with that made in the skin, which circumstance will favour their union. The incision upon the cartilage must be made with caution, as it will with difficulty be retained in its situation if much force is applied. The assistant is to endeavour to push the loose body through the opening, which must be made sufficiently large for that purpose; but as this cannot always be done, the broad end of an eyed probe may be passed under it, so as to lift it out, or a sharp-pointed instrument may be stuck into it, which will fix it to its situation, and bring it more within the management of the surgeon.

"The cartilages being all extracted, the cut edges of the wound are to be brought together, and, by means of a compress of lint, not only pressed close to one another, but also to the parts underneath, in which situation they are to be retained by sticking plaster, and the uniting bandage.

"As union by the first intention is of the utmost consequence after this operation, to prevent an inflammation of the joint, the patient should remain in bed with the leg extended, till the wound is perfectly united, or at least all chance of inflammation at an end." (*Home, in Trans. for the Improvement of Med. and Chir. Knowledge, Vol.* 1, *p.* 239, *&c.*)

In one instance, Desault proceeded in the following manner: the surgeon, after relaxing the capsular ligament by extending the leg, brought the extraneous body on the inside of the articulation against the attachment of the capsular ligament, and secured it in this situation, between the index finger and thumb of the left hand, whilst an assistant drew the integuments forwards towards the patella. The parts, covering this extraneous body, were now divided by an incision one inch in length, and its extraction accomplished by pushing it from above downwards, and raising it inferiorly with the end of the knife. This substance, on examination, was found similar in colour to the cartilages that cover the articular surfaces: it was three quarters of an inch in length, six lines and a half in width, and three lines in thickness; its surfaces were smooth, one concave and the other convex: its circumference irregular, disseminated with red points, forming small depressions; the inside was ossified, the outside of a cartilaginous texture. As soon as the substance was extracted, the assistant let go the integuments which he had drawn forwards; they consequently returned to their natural situation, on the inner side of the knee-joint, in such a manner, that the external wound in the integuments was situated more inward, than the one in the capsular ligament. Two advantages were procured by this means: on the one hand, air was prevented from penetrating into the articulation; and on the other, the floating portion of capsular ligament, retained inwards by the skin, was more likely to attach itself to the condyle, in case it did not unite to the other portion of the capsule divided near its attachment. The edges of the wound were brought into contact by means of the uniting bandage; dry lint and compresses were applied, and retained on the part by a slight bandage; and the limb was kept in a state of extension. (*Desault's Journal, T.* 2.) According to Mr. Abernethy, the inner surface of the internal condyle of the os femoris presents an extensive and nearly a plain surface, which terminates in front and at its upper part by an edge which forms a portion of a circle. If the points of the finger be firmly pressed upon this edge so as to form a kind of line of circumvallation round these (cartilaginous) bodies, they cannot pass into the joint in this direction, nor can they recede in any other, on account of the tense state of the internal lateral ligament. Here these substances are near the surface, and may be distinctly felt: and they may be exposed by simply dividing the integuments, fascia, and the capsule of the joint.

In an interesting case, which Mr. Abernethy relates, the integuments of the knee were gently pressed towards the internal condyle, and the fingers of an assistant applied round the circular edge of the bone. The integuments were gently drawn towards the inner hamstring, and longitudinally divided, immediately over the loose substance, to the extent of an inch and a half. This withdrawing of the integuments from their natural situation was designed to prevent a direct correspondence of the external wound to that in the capsule of the joint: for, when the integuments were suffered to regain their natural position, the wound in them was nearer to the patella, than the wound in the capsule. The fascia, which covers the joint, having been exposed by the division of the integuments, it was divided in a similar direction, and nearly to the same extent. The capsule was now laid bare, and gently divided to the extent of half an inch, where it covered one of the hard substances, which suddenly slipped through the opening, and by pressing gently upon the other, it was also discharged. The bodies, thus removed, were about three quarters of an inch in length, and half an inch in breadth. They had a highly polished surface, and were hard like cartilage. The fluid contained in the joint was pressed toward the wound, and about two ounces of synovia were discharged. The wound of the integuments was then gently drawn towards the patella, and accurately closed with sticking plaster. (*Surgical Observations,* 1804.)

When there are several extraneous cartilaginous bodies in the joint operated upon, the surgeon ought to extract them all through the same wound, if it can be done without producing too much irritation of the capsular ligament, and they will admit of it. But, frequently, only one can be made to present itself at a time, or can be easily extracted. Each little tumor will then require a separate operation, which is a far safer plan, than disturbing the part by long and repeated attempts to extract them all at once. (*Boyer, Traité des Mal. Chir. T.* 4, *p.* 448.) The surgeon is also often obliged to make his incision at a particular point, because at no other can the extraneous substance be fixed. A case confirming all these latter observations was lately published by Dr. Clarke. (See *Med. Chir. Trans. Vol.* 5, *p.* 67.) In this instance, the operation was thrice performed upon the same knee-joint, with perfect success. Mr Brodie also extracted five loose cartilages, by three different operations, without any subsequent unpleasant symptoms, although the patient appears to have been previously subject to repeated attacks of severe inflammation of the joint. (*Pathological and Surg. Obs. p.* 299.)

On the preceding subject, some observations, and two successful operations, have been lately published by Baron Larrey. (See *Mémoires de Chir. Militaire, T.* 2, *p.* 421, *&c.*) With the exception of a few wrong theories, he appears to have given a fair account of the disease.

Hydrops Articuli signifies a collection of serous fluid in the capsular ligament of a joint. The knee is more subject, than other joints, to dropsical disease, which has been known, however, to affect the wrist, ankle, and shoulder joints. (*Boyer, Traité des Mal. Chir. T.* 4, *p.* 456.)

Mr. Russell adopts the opinion, that some cases of this kind are venereal, and others scrophulous; but the doctrine does not appear to rest upon any solid foundation. Hydrops articuli generally arises from contusions, rheumatism, sprains, exposure to severe cold, the presence of extraneous cartilaginous bodies in the joint, and in general from any thing which irritates the capsular ligament; and, as already explained, it is a common attendant on inflammation of the synovial membrane; the complaint also sometimes follows fevers; but, in most instances, it is purely a local affection, quite independent of general debility. (*Boyer, T.* 4, *p.* 467.)

Hydrops articuli presents itself in the form of a soft tumor; circumscribed by the attachments of the capsular ligament; without change of colour in the skin; accompanied with a fluctuation; it is indolent, and very little painful; causing hardly any impediment to the motion of the joint; yielding to the pressure of the finger, but not retaining any impression, as in œdema. The swelling does not occupy equally every side of the joint, being most conspicuous where the capsular ligament is loose and superficial. In the wrist, it occurs at the anterior and posterior parts of the joint, but, especially, in the former situation, while it is scarcely perceptible at the sides. In the ankle, it is more apparent in front of the malleoli, than anywhere else; and, in the shoulder, it does not surround the joint, but is almost always confined to the forepart of it, and can only be seen in the interspace between the deltoid and great pectoral muscles.

In the knee-joint, which is the common situation of hydrops articuli, the tumor does not occur behind the articulation; but at the front and sides. Behind, the capsular ligament is too narrow to admit of being much distended with the synovia; while, in front, and laterally, it is broad, so that it can there yield considerably in proportion as the quantity of fluid increases. The swelling is at first circumscribed by the attachments of the capsular ligament: but, in consequence of the accumulation of fluid, it afterwards exceeds these limits above, and spreads more or less upward between the thigh-bone and the extensor muscles of the leg, which are lifted up by it. Boyer has seen it reach to the upper third of the thigh. The swelling is irregular in shape: it is most prominent, where the capsular ligament is wide and loose and it is in some measure divided longitudinally into two lateral portions, by the patella, the ligament of the patella, and the tendon of the extensor muscles of the leg, all which parts the synovia raises, and pushes forward, though in a much less degree, than the capsular ligament. Of these lateral portions, the internal is broadest and most prominent, because the part of the capsule between the patella and edge of the internal condyle being larger, than that situated between the patella and edge of the external condyle, yields in a greater degree to the distending fluid. The motions of the leg, which are generally little interrupted by this disease, make a difference in the shape and consistence of the swelling. In flexion, the tumor becomes harder, tenser, and broader, and more prominent at the sides of the knee-pan, which is somewhat depressed by its ligament. In extension, the tumor is softer, and the fluctuation plainer.

In order to feel distinctly the fluctuation, which is one of the best symptoms of the disease, the ends of two or three fingers should be placed on one side of the swelling, while the opposite side is to be struck with the end of the middle finger of the other hand.

The patella, being pushed forward, away from the articular pulley, is very moveable, and, as it were, floating. When it is pressed backward, while the leg is extended, it can be felt to move a certain way, before it meets with the resistance of the articular pulley. And on the pressure being discontinued, it immediately separates from this part again.

By such symptoms, hydrops articuli may easily be distinguished from other diseases of the joints, from tumors of the bursa mucosa under the extensor tendons of the leg; from ganglions in front of the knee-pan; from rheumatism; œdema, &c.

The prognosis is most favourable, when the swelling is recent and small, and has been quick in its progress. On the contrary, when the tumor is of long standing and large; the effused fluid thick and viscid; and the synovial membrane thickened; the removal of the fluid by absorption, and the restoration of the parts to their natural state, will be more slow and difficult. The worst case is that, which is complicated with disease of the capsular ligament, cartilages, and bones.

The cure of the above-described dropsical affection of the joints, depends upon the absorption of the effused fluid. And, when the case is combined with acute or chronic inflammation of the synovial membrane, the treatment is the same, as that already recommended for those particular forms of disease. When inflammation subsides, the absorption of the fluid is sometimes altogether spontaneous, and it may always be promoted, by mere friction, by rubbing the joint with camphorated mercurial ointment, or the ointment of iodine, and particularly, by the employment of blisters.

The operation of a blister may be very materially assisted with a moderately tight bandage. Among other effectual means of cure, we may enumerate frictions with flannel impregnated with the fumes of vinegar; electricity; and the exhibition of mercurial purgatives. When hydrops articuli occurs during the debility, consequent to typhoid and other fevers, the complaint can hardly be expected to get well, before the patient regains some degree of strength.

As, however, hydrops articuli is generally quite a local disease, Boyer contends, that it should be chiefly treated with topical remedies; and he sets down diuretics, sudorifics, hydragogues, &c. as improper or inefficient. (*Op. cit. p.* 467.) He is strongly in favour of repeated blisters, both for the prevention and cure of the disease.

Circumstances do not often justify making an opening into the joint; but, excessive distention, in some neglected cases, might certainly be an urgent reason for performing such an operation. Also, if the complaint should resist all other plans of treatment, and the irritation of the tumor greatly impair a weak constitution, the practice would be justifiable. An interesting example of this kind is related by Mr. Latta. (*System of Surgery, Vol.* 2, *p.* 490.)

It is best to make the opening in such a way, that the wound in the capsular ligament after the operation, will not remain directly opposite the wound in the skin. For this purpose, the teguments are to be pushed to one side, before the surgeon divides them. (*Encyclopédie Méthod. Part. Chir. Art. Hydropisie des Jointures.*)

The operation is not always successful, being sometimes followed by alarming symptoms, which either end fatally, or occasion a necessity for amputation. The fluid also generally collects again, and as the synovial membrane is mostly thickened, it often inflames, and suppuration in the joint ensues. Hence, when hydrops articuli originates from rheumatism; when it is recent, indolent, and not large; and when it does not seriously impair the functions of the joint; Boyer recommends the operation not to be done. But, he sanctions its performance, when the disease is combined with extraneous cartilaginous bodies in the joint; or when it is very considerable, attended with severe pain, and impairment of the functions of the joint. (*Op. cit. T* 4, *p.* 473.)

Collections of Blood in Joints.—Most systematic writers speak of this kind of case, though it must be uncommon. Tumors, about the joints, composed of blood, and set down in numerous surgical works, as extravasations within the capsular ligaments, are generally on the outside of them.

Were blood known to be undoubtedly effused in a large articulation, however, no man would be justified in making an opening for its discharge. No bad symptoms are likely to result from its mere presence, and the absorbents will, in the end, take it away. If an incision were made into the joint, the coagulated state of the extravasated blood would not allow such blood to be easily discharged.

The best plan is to apply discutient remedies; a lotion of vinegar, spirits of wine and muriate o ammonia for the first three or four days; and afterwards, friction with camphorated liniments may be safely adopted.

Mr. Hey relates a case, in which the knee-joint was wounded, and blood insinuated itself into the capsular ligament; yet, though the occurrence could not be hindered, no harm resulted from the extravasation, which was absorbed, without having created the smallest inconvenience. (*Practical Obs. in Surgery, p.* 354.)

White-Swelling.—The white swelling, or spina ventosa, as it was at one time not unfrequently called, in imitation of the Arabian writers, Rhazes and Avicenna, has been a name indiscriminately applied to many diseases, which differ widely in their nature, curability, and treatment. Wiseman was the first who used the term White-Swelling; and if the expression did not confound together complaints of very different kinds, not much fault could be found with it, because it unquestionably conveys an idea of one mark of some of these distempers, which is, that notwithstanding the increase of size in the joint, the skin is generally not inflamed, but retains its natural colour. (*Pott.*)

The name, therefore, appears objectionable, only inasmuch as it has tended to prevent the introduction of a sufficient number of well-founded and necessary distinctions. Systematic writers have generally been content with a distinction into two kinds, viz. *rheumatic*, and *scrophulous*.

The last species of the disease they also distinguish into such tumors, as primarily affect the bones, and then the ligaments and soft parts; and into other cases, in which the cartilages, ligaments, and soft parts become diseased, before there is any morbid affection of the bones.

Mr. Brodie has endeavoured to form a more correct classification of the different complaints, to which the term white-swelling is applied; and his descriptions are valuable, because confirmed by extensive observation, and numerous dissections. With respect to the disease beginning in the ligaments, if the capsular ligaments be put out of consideration, it is, as this gentleman observes, a rare occurrence, and he has never met with a case, in which the fact was proved by dissection. (*Pathol. and Surgical Obs. p.* 7.)

1. The first case is inflammation of the synovial membrane, as described in the foregoing pages, especially that form of the disease, which often arises from cold, and constitutes the disease, formerly often termed a rheumatic white-swelling.

2. Another form of disease, ordinarily comprised under the general name of white-swelling, has been particularly described by Mr. Brodie: the disease originates in the synovial membrane, which loses its natural organization, and becomes converted into a thick, pulpy substance, of a light brown, and sometimes of a reddish brown colour, intersected by white membranous lines, and from $\frac{1}{4}$ to $\frac{1}{2}$ of an inch, or even more than an inch, in thickness. As this disease advances, it involves all the parts, of which the joint is composed, producing ulceration of the cartilages, caries of the bones, wasting of the ligaments, and abscesses in different places. The complaint has invariably proved slow in its progress, and sometimes has remained nearly in an indolent state for many months, or even for one or two years; but (says Mr. Brodie,) "I have never met with an instance, in which a real amendment was produced; much less have I known any, in which a cure was effected." (See *Medico-Chir. Trans. Vol.* 4, *p.* 220, *&c.*) The whole, or nearly the whole of the synovial membrane has always been found affected; though if a very early examination were made, Mr. Brodie conceives, that this might not be the case, and in one example, he found only a half of the membrane thus altered, while the rest was of its natural structure. (*Pathol. and Surg. Obs. p.* 94.) This gentleman further acquaints us, that the preceding affection of the synovial membrane is rarely met with, except in the knee; that he has never known an instance of it in the hip, or shoulder; that it is peculiar to the synovial membrane of the joints; that he has never known an instance of it in other serous membranes, nor even in the synovial membranes, which constitute the bursæ mucosæ and sheaths of tendons; and that it generally takes place in young persons, under, or not much above, the age of puberty. In fact, Mr. Brodie has not met with more than one instance, in which it occurred after the middle period of life. Mr. Hodgson, of Birmingham, it seems, has met with one example of it in the ankle; and another in one of the joints of the fingers. "In the origin of this disease, there is a slight degree of stiffness and tumefaction, without pain, and producing only the most trifling inconvenience. These symptoms gradually increase: at last, the joint scarcely admits of the smallest motion, the stiffness being greater, than where it is the consequence of simple inflammation. The form of the swelling bears some resemblance to that in cases of inflammation of the synovial membrane, but it is less regular. The swelling is soft and elastic, and gives to the hand a sensation as if it contained fluid. If only one hand be employed in making the examination, the deception may be complete, and the most experienced surgeon may be led to suppose, there is a fluid in the joint when there is none; but, if both hands be employed, one on each side, the absence of fluid is distinguished by the want of fluctuation.

"The patient experiences little, or no pain, until abscesses begin to form, and the cartilages ulcerate; and even then the pain is not so severe, as where the ulceration of the cartilages occurs, as a primary disease, and the abscesses heal more readily, and discharge a smaller quantity of pus, than in cases of this last description. At this period, the patient becomes affected with hectic fever, loses his flesh, and gradually sinks, unless the limb be removed by an operation." (*Brodie, in Med. Chir. Trans. Vol.* 5, *p.* 251, 252.) In the majority of cases, this gentleman believes, that *the gradual progress of the enlargement, the stiffness of the joint, without pain, and the soft elastic swelling without fluctuation,* will enable the practitioner readily to distinguish this from all other diseases of the joints. However, when the diseased synovial membrane happens to be distended with a quantity of turbid serum and flakes of coagulable lymph, the complaint somewhat resembles in its feel and appearance that stage of common inflammation of the synovial membrane, where this part is left thickened, and more or less distended with coagulable lymph; but the impossibility of relieving the former case by the same means, which cure the latter, and due attention to the history of the disease, will prove the difference between them. (*Brodie, Pathol. and Surg. Obs. p.* 96.)

3. Ulceration of the articular cartilages takes place in the advanced stage of several diseases of the joints, and it also exists in many instances as a primary affection, in the early stage of which the bones, synovial membrane, and ligaments, are in a natural state. If neglected, it ultimately occasions the entire destruction of the articulation. It may be the consequence of inflammation of the cartilage itself, or of the bony surface, with which it is connected; but, as Mr. Brodie further observes, in many instances, there are no evident marks of the disorder being preceded by any inflammatory action in one part, or the other, and the inflammation, which afterwards takes place, appears rather to be the attendant upon, than the cause of, the ulcerative process. One striking peculiarity of ulceration of the articular cartilages is, that the process may take place, without the formation of pus; for the disease often proceeds so far as to cause caries of the bones, and yet no purulent matter is found within the joint. (See *Brodie's Pathol. and Surgical Obs. &c. p.* 117, *Ed.* 2.) The investigations of the same author dispose him to believe, that a conversion of these cartilages into a soft fibrous structure, is a frequent though not constant forerunner of ulceration. (*P.* 121.) When the ulceration of the cartilage occurs in the superficial joints, it constitutes one of the diseases, which have been known by the name of white-swelling. From cases, which Mr. Brodie has met with, he is led to conclude, that when it takes place in the hip, it is this disease, which has been variously designated by writers, the "*morbus coxarius*," the "Disease of the Hip," the "Scrophulous Hip," the "Scrophulous Caries of the Hip Joint." At least, says Mr. Brodie, it is to this disease, that these names have been principally applied, though probably other morbid affections have been occasionally confounded with it. (*Med. Chir. Trans. Vol.* 4, *p.* 236.) The ulceration of the articular cartilages takes place, as a primary disease, chiefly in children, or adults under the middle age. "Of sixty-eight persons affected with this disease, fifty-six (according to Mr. Brodie) were under thirty years of age: the youngest was an infant of about twelve months; the oldest was a woman of sixty. As the knee is more frequently affected by inflammation of the synovial membrane, so is the hip more liable than other joints, to the ulceration of the cartilaginous surfaces. In general the disease is confined to a single joint; but, it is not very unusual to find two or three joints affected in the same individual, either at the same time, or in succession. Sometimes, the patient traces the beginning of his symptoms to a local injury, or to his having been exposed to cold; but, for the most part, no cause can be assigned for the complaint." (See *Med. Chir. Trans. Vol.* 6, *p.* 319.)

The symptoms of the disease of the hip-joint will be described in the ensuing section, and we shall here confine our remarks to the symptoms characterizing ulceration of the cartilages of the knee, as pointed out by Mr. Brodie. They differ from those of inflammation of the synovial membrane, by the pain being slight in the beginning, and gradually becoming very intense, which is the reverse of what happens in the latter affection. The pain in the commencement is also unattended with any evident swelling, which never comes on in less than four or five weeks, and often not till after several months. It is not to be inferred, however, that every slight pain of the joint, unaccompanied with swelling, must of course arise from ulceration of the cartilages. But, says Mr. Brodie, when the pain continues to increase, and at last is very severe; when it is aggravated by the motion of the bones on each other, and when, after a time, a slight tumefaction of the joint takes place, we may conclude, that the disease consists in such ulceration. The swelling arises from a slight inflammation of the cellular membrane on the outside of the joint; it has the form of the articulating ends of the bones; and for the most part it appears greater than it really is, in consequence of the muscles being wasted. No fluctuation is perceptible, as where the synovial membrane is inflamed; nor is there the peculiar elasticity, which exists, where the synovial membrane has undergone a morbid alteration of its structure.

Mr. Brodie has explained, however, that, in some cases, the swelling has a different shape, and communicates the feel of a fluctuation. This happens, when inflammation of the synovial membrane, attended with a collection of the synovia of the joint, or abscesses in the surrounding soft parts, or in the articulation itself, occur as secondary diseases. When there has been considerable destruction of the soft parts from abscesses and ulceration, the head of the tibia may become dislocated and drawn towards the ham. (See *Med. Chir. Trans. Vol.* 6, *p.* 326, *&c.*) In the 9th vol. of this work, Mr. Mayo has described an acute form of ulceration of the cartilages, as displayed in three cases affecting the knee, elbow, and ankle. They were all attended with severe pain in the beginning; two ended in anchylosis after antiphlogistic treatment for two months; and the third patient, a boy, died, during the existence of this disease, of an injury of the head. The bones of the ankle-joint were found almost stripped of cartilage; what remained of this texture was thinned, and that unequally; but, it seemed in other respects unchanged, and adhered firmly to the bone.

4. I shall pass over ulceration of the synovial membrane, which Mr. Brodie considers in a separate section, and now proceed to the scrophulous white-swelling. In the scrophulous disease of the joints, the bones are primarily affected, in consequence of which, ulceration takes place in the cartilages covering their articular extremities. The cartilages being ulcerated, the subsequent progress of the disease (says Mr. Brodie) is the same as where this ulceration takes place in the first instance. (*Medico-Chir. Trans. Vol.* 4, *p.* 266.)

By Mr. Lloyd, scrophulous white-swellings are divided into three stages; the first being that in which the affection is confined to the bone; the second, that in which the external parts become thickened and swelled; and the third being what he names the suppurative stage, attended with ulceration of the cartilages, inflammation of the synovial membrane, and abscesses. (*On Scrophula, p.* 121.) It was formerly a common notion, that, in white-swellings, the heads of the bones were always enlarged. Mr. Russell, I believe, is the first writer who expressed an opposite sentiment, and he distinctly declares, *that he had never heard, nor known of an instance, in which the tibia was enlarged from an attack of white-swelling.* (*P.* 37.) The inaccuracy of the opinion was afterwards pointed out by Mr. Lawrence, to the late Mr. Crowther, and the subject was mentioned in the earliest edition of the "First Lines of the Practice of Surgery."

Deceived by the feel of many diseased joints, and influenced by general opinion, I once supposed, that there was generally a regular expansion of the heads of scrophulous bones. But, excepting an occasional enlargement, which arises from spiculæ of bony matter, deposited on the outside of the tibia, ulna, &c. and which alteration cannot be called an expansion of those bones; for a long time, I never met with the head of a bone enlarged, in consequence of the disease known by the name of white-swelling. I was formerly much in the habit of inspecting the state of the numerous diseased joints, which were every year amputated at St. Bartholomew's Hospital, and though I was long attentive to this point, my searches after a really enlarged scrophulous bone always proved in vain. Nor was there at that period any specimen of an expanded head of a scrophulous bone in Mr. Abernethy's museum. Within the last few years, however, a specimen of an enlargement of the upper head of the ulna has been found, and it was some time ago shown to me by Mr. Stanley. Mr. Langstaff is said to have in his possession a knee-joint, in which the femur and tibia are much expanded, "the external laminæ of the bones not being thicker, than when the bones are of their natural size, and the *cancelli healthy, though of rather greater solidity, than natural. (Lloyd on Scrophula, p.* 148.) However, this last form of disease evidently does not resemble the common scrophulous affection of the heads of the bones. I may add, that Mr. Wilson, whose dissections were very numerous, concurs with the best modern writers, concerning the rarity of an actual expansion of the substance of the heads of the bones. (*On the Skeleton, &c. p.* 336.) I have also heard of a few other instances, in which the heads of the bones were actually enlarged in cases of white-swelling. However, I believe the occurrence is far from being usual, and doubts may yet be entertained, whether such enlargement is combined with the following alteration of structure. The change, which the head of the tibia undergoes in many cases, is first a partial absorption of the phosphate of lime throughout its texture, while at first a transparent fluid, and afterwards a yellow cheesy substance, are deposited in the cancelli. In a more advanced stage, and, indeed, in that stage, which most frequently takes place before a joint is amputated, the head of the bone has deep excavations in consequence of caries, and its structure is now so softened, that when an instrument is pushed against the carious part, it easily penetrates deeply into the bone. Occasionally, as Mr. Lloyd has observed, all the bones of a joint are affected in this way; but, frequently only one of them. (*On Scrophula, p.* 120.)

According to a modern writer, "The morbid affection appears to have its origin in the bones, which become preternaturally vascular, and contain a less than usual quantity of earthy matter, while, at first, a transparent fluid, and afterwards a yellow cheesy substance, is deposited in their cancelli. From the diseased bone, vessels, carrying red blood, shoot into the cartilage, which afterwards ulcerates in spots, the ulceration beginning on that surface, which is connected to the bone. As the caries of the bones advances, pus is collected in the joint. At last, the abscess bursts externally, having formed numerous and circuitous sinuses." (*Brodie, in Med. Chir. Trans. Vol.* 4, *p.* 272, *and Pathol. Obs. p.* 227.) The above-described alteration of the structure of the bones, this author has never seen in the cranium, nor in the middle of the cylindrical bones; but, it is asserted by another late writer, that the cheesy matter sometimes pervades the cancelli of the whole bone, and is deposited in innumerable portions of the most minute size. (*E. A. Lloyd, on Scrophula, p.* 120.) Also, with respect to the increased vascularity of the diseased part of the bone, although Mr. Lloyd assents to the truth of this statement, as applied to the early stage of the disorder, he represents the vascularity as afterwards being diminished, in proportion as the quantity of cheeselike deposit increases. (*Vol. cit. p.* 122, 123.)

A cursory examination of a diseased joint, even when it is cut open, will not suffice to shew that the heads of the bones have not acquired an increase of size. In making a dissection of this kind, in the presence of a medical friend, I found that even after the joint had been opened, the swelling had every appearance of arising from an actual expansion of the bones. The gentleman with me felt the ends of the bones after the integuments had been removed, and he coincided with me, that the feel, which was even now communicated, seemed to be caused by a swelling of the bones themselves. But, on cleaning them, the enlargement was demonstrated to arise entirely from a thickening of the soft parts. So unusual, indeed, is the expansion of the heads of the bones, that the late Mr. Crowther, who paid great attention to these cases, joined Mr. Russell in believing, that such a change never happened: a conclusion not entirely correct. (See *Practical Obs. on White-Swelling, &c. Edit.* 2, *p.* 14, 1808.)

Mr. Russell has particularly noticed how much the soft parts frequently contribute to the swelling. He describes the appearances on dissection thus: "The great mass of the swelling appears to arise from an affection of the parts, exterior to the cavity of the joint, and which, besides an enlargement in size, seem also to have undergone a material change in structure. There is a larger, than natural proportion of a viscid fluid, intermixed with the cellular substance; and the cellular substance itself has become thicker, softer, and of a less firm consistence, than in a state of health." (*On the Morbid Affections of the Knee, p.* 30.) The manner, in which the soft parts are affected, is also described by Mr. Brodie: "Inflammation takes place of the cellular membrane, external to the joint. Serum, and afterwards coagulable lymph, are effused, and hence arises a puffy elastic swelling in the early, and an œdematous swelling in the advanced stage of the disease.

"Scrophula attacks only those bones, or portions of bones, which have a spongy texture, as the extremities of the cylindrical bones, and the bones of the carpus and tarsus; and hence, the joints become affected from their contiguity to the parts, which are the original seat of the disease." (See *Medico-Chir. Trans. Vol.* 4, *p.* 273.)

In the cavity of the joint, we sometimes find a quantity of curd-like matter, and the cartilages absorbed in various places, but more particularly round the edges of the articular surfaces.

As the name of the disease implies, the skin is not at all altered in colour. According to Mr. Lloyd, the first decided symptom of disease in the articulating extremity of a bone, is an occasional deep-seated, dull, heavy pain, unattended by swelling, and not increased by motion; and, if it be the hip, knee, or ankle, which is affected, the patient keeps the knee rather bent, and never fully extends it in progression. (*On Scrophula, p.* 133.) In some instances, the swelling yields in a certain degree to pressure; but it never pits, and is almost always sufficiently firm to make an uninformed examiner believe, that the bones contribute to the tumor. It is remarked by Mr. Brodie, that, while the disease is going on in the cancellous structure of the bones, before its effects have extended to the other textures, and while there is still no evident swelling, the patient experiences some degree of pain, which, however, is never very severe, and often is so slight, that it is scarcely noticed. After a time, varying from a few weeks to several months, the external parts begin to swell, and serum and coagulable lymph to be effused in the cellular membrane, so as to form a puffy, elastic swelling. (*Pathol. Obs. p.* 231.) In the majority of scrophulous white-swellings, let the pain be trivial, or more severe, it is particularly situated in one part of the joint; viz. either the centre of the articulation, or the head of the tibia. Sometimes, the pain continues without interruption; sometimes there are intermissions; and, in other instances, the pain recurs at regular times, so as to have been called by some writers, periodical. Almost all authors describe the patient, as suffering more uneasiness in the diseased part, when he is warm, and particularly, when he is in this condition in bed.

In the early stage of the disease, the swelling is mostly very inconsiderable, or there is even no visible enlargement whatever, excepting perhaps after exercise. In the little depressions, naturally situated on each side of the patella, a fulness generally first shews itself, and gradually spreads all over the affected joint. According to Mr. Lloyd, however, when the soft parts, on the outside of the knee-joint, permanently swell, the swelling often commences on each side, just behind the condyles, so that the joint appears wider, and he says, that he has often seen the enlargement commence by the swelling of a gland, immediately above the inner condyle. He observes, however, that there is no point of the joint, where the swelling may not begin. (*Op. cit. p.* 139.)

The patient, unable to bear the weight of his body on the disordered joint, in consequence of the great increase of pain, thus created, gets into the habit of only touching the ground with his toes, and the knee being generally kept a little bent in this manner, soon loses the capacity of being completely extended again. When white-swellings have lasted a good while, the knee is almost always found in a permanent state of flexion. In scrophulous cases, the pain constantly precedes any appearance of swelling; but the interval between the two symptoms differs very much in different subjects.

The morbid joint, in the course of time, acquires a vast magnitude. Still the integuments retain their natural colour, and remain unaffected. The enlargement, however, always seems greater than it really is, in consequence of the emaciation of the limb both above and below the disease.

An appearance of blue distended veins, and a shining smoothness, are the only alterations to be noticed in the skin, covering the enlarged joint. The shining smoothness seems attributable to the distention, which obliterates the natural furrows and wrinkles of the cutis. When the joint is thus swollen, the integuments cannot be pinched up into a fold, as they could in the state of health, and even in the beginning of the disease.

As the distemper of the articulation advances, the cartilages ulcerate, and collections of matter form around the part, and at length burst. Their progress, as Mr. Brodie has stated, is slow, and when they burst, or are opened, they discharge a thin pus, with portions of a curd-like substance floating in it. The discharge afterwards becomes less copious, and thicker. (*Pathol. Obs. p* 234.) The ulcerated openings sometimes heal up; but, such abscesses are generally followed by other collections, which pursue the same course. In some cases, these abscesses form a few months after the first affection of the joint; on other occasions, several years elapse, and no suppuration of this kind makes its appearance. They sometimes communicate with the cavity of the diseased joint, or lead down to diseased bone, portions of which occasionally exfoliate. In the generality of cases, several abscesses take place in succession, some healing up, and others ending in sinuses.

As the cartilages continue to ulcerate, Mr. Brodie has observed, that the pain becomes aggravated, though not in a very great degree, and he says, that it is not severe, until an abscess has formed, and the parts over it are distended and inflamed. (*Pathol. Obs. p.* 234.)

The local mischief must necessarily produce more or less constitutional disturbance. The patient's health becomes gradually impaired, he loses his appetite and natural rest and sleep; his pulse is small and frequent; an obstinate debilitating diarrhœa, and profuse nocturnal sweats, ensue. These complaints are, sooner or later, followed by dissolution, unless the constitution be relieved in time, either by the amendment, or removal of the diseased part. In different patients, however, the course of the disease, and its effects upon the system, vary considerably, in relation to the rapidity, with which they occur.

Rheumatic white-swellings, or inflammations and thickenings of the synovial membrane from cold, or other causes, are very distinct diseases from the scrophulous distemper of the large joints. In the first, the pain is said never to occur without being attended with swelling. Scrophulous white-swellings, on the other hand, are always preceded by a pain, which is particularly confined to one point of the articulation. In rheumatic cases, the pain is more general, and diffused over the whole joint.

Mr. Lloyd thinks, that the scrophulous white-swelling may be distinguished from all other diseases of the joints, by its being attended with less pain, by the great degree of external swelling often existing for a long time before matter forms in the cavity of the articulation, and by the swelling being but little diminished by any discharge of matter, which may take place. In its first stage, before the interior of the joint is affected, it may be distinguished from primary ulceration of the cartilages, by the pain not being much increased by motion. The grating, produced by moving the joint, is also commonly less in this disease, than in ordinary ulceration of the cartilages. (*Lloyd on Scrophula, p.* 142.) And, according to Mr. Brodie, the principal criterion between scrophulous diseases of joints, and the primary ulceration of cartilages, is the little degree of pain in the former cases, which is never much complained of before an abscess forms, nor particularly severe, "except in a few instances, and in the most advanced stage of the disease, when a portion of ulcerated bone has died, and having exfoliated, so as to lie loose in the cavity of the joint, irritates the parts, with which it is in contact, and thus becomes a source of constant torment." (*Brodie's Pathol. Obs. p.* 236.)

It seems probable, that cases, in which the cancellous structure of the bones is found quite undiseased, and in which the mass of disease is confined to the soft parts, are not scrophulous white-swellings. Few persons, who have attained the age of five and twenty, *without having had the least symptom of scrophula*, ever experience, after this period of life, a first attack of the white-swelling of the strumous kind. The general correctness of this observation, I believe, is universally admitted, and that there are but few exceptions to it is confirmed by the statements of Volpi, of Pavia. However, Mr. Lloyd attended a man, who, at the age of between forty and fifty, died of phthisis, and had at the time a scrophulous ankle, besides several abscesses about his hip and groin. And the same gentleman met with another patient upwards of forty years old, with a similar disease. (*On Scrophula*, *p.* 137.) But, if these patients had had no marks of scrophula in their younger days, a circumstance not specified, they form deviations from what is usual, as indeed Mr. Lloyd seems to admit. My own observations lead me fully to concur with Mr. Brodie, that the scrophulous affections of the joints, so frequent in children, are rare after the age of thirty. (*Pathol. Obs. p.* 229.) All cases in which the internal structure of the heads of the bones become softened, previously to the affection of the cartilages, and soft parts, are probably scrophulous.

Mr. Russell has noticed the frequent enlargement of the lymphatic glands in the groin, in consequence of the irritation of the disease in the knee; but he justly adds, that this secondary affection never proves long troublesome.

When the bones are diseased, the head of the tibia always suffers more, than the condyles of the thigh-bone. (*Russell.*) The articular surface of the femur sometimes has not a single rough or carious point, notwithstanding that of the tibia may have suffered a great deal. The cartilaginous coverings of the heads of the bones are generally eroded first at their edges; and, in the knee, the cartilage of the tibia is always more affected, than that covering the condyles of the thigh-bone. Indeed, when white-swellings have their origin in the bones, and the knee is the seat of the disorder, there is some ground for supposing, that it is in the tibia, that the morbid mischief usually first commences.

The ligaments of the knee are occasionally so weakened, or destroyed, that the tibia and fibula become, more or less, dislocated backward, and drawn towards the tuberosity of the ischium, by the powerful action of the flexor muscles of the leg. It is observed by Mr. Brodie, that just as ulceration of the cartilages is sometimes followed by dislocation of the hip, so we find, that dislocation of the knee occasionally takes place from the same cause. Where there has been considerable distention of the soft parts, in consequence of ulceration extending to them, the head of the tibia is gradually drawn backwards by the action of the flexor muscles; and Mr. Brodie has even known this happen, previously to the formation of any abscesses. (*Pathol. Obs. p.* 172, *ed.* 2.)

I have seen a curious species of white-swelling, in which the leg could be bent to each side to a very considerable distance, both when the knee was extended and bent; a state implying a preternatural looseness, or perhaps a destruction, of the ligaments of the articulation.

Scrophulous white-swellings, no doubt, are under the influence of a particular kind of constitution, termed a *scrophulous* or *strumous habit*, in which every cause, capable of exciting inflammation, or any morbid and irritable state of a large joint, may bring on the present severe disease. On the other hand, in a man of a sound constitution, a similar irritation would only induce common healthy inflammation of the joint. In scrophulous habits, it also seems as if irritation of a joint is much more easily produced, than in other constitutions; and no one can doubt, that when once excited in the former class of subjects, it is much more dangerous, and difficult of removal, than in other patients.

The doctrine of particular white-swellings being scrophulous diseases, is supported by many weighty reasons, the opinions of the most accurate observers, and the evidence of daily experience. Wiseman (*Book* 4, *chap.* 4,) calls the *spina ventosa* a species of scrophula, and tells us, that infants and children are generally the subjects of this disease. The disorder is said by Severinus to be exceedingly frequent in young subjects. Petrus de Marchettis has observed both male and female subjects affected with what are called strumous diseases of the joints, as late as the age of five and twenty; but not afterwards, unless they had suffered from scrophula before that period of life, and had not been completely cured. R. Lowerus also maintains a similar opinion. Even though a few persons have scrophulous diseases of the joints, for the first time, after the age of twenty-five, this occurrence, like the first attack of scrophula after this period, must be considered as extremely uncommon.

Another argument in favour of the doctrine, which sets down particular kinds of white-swellngs as scrophulous, is founded on the hereditary ature of such forms of disease.

Numerous continental surgeons, particularly Petit and Brambilla, have noticed how very subect the English are both to scrophula and white-wellings of the joints. We every day see, that young persons, afflicted with the present disease, re generally manifestly scrophulous or have once been so. Frequently enlarged lymphatic glands n the neck denote this fatal peculiarity of constiution; and very often the patients are known to ave descended from parents who had strumous isorders. (*Crowther.*) The disease is also requently combined with swelled mesenteric lands, or tuberculated lungs. (*Brodie's Pathol. Obs. p.* 221.) As the same author remarks, since he disease depends upon a certain morbid condiion of the general system, it is not surprising, hat we should sometimes find it affecting several oints at the same time, or that it should show itelf in different joints in succession; attacking a econd joint after it has been cured in the first, or after the first has been removed by amputation. (*P.* 230.)

Besides the general emblems of a scrophulous onstitution, which will be noticed in the article *Scrophula*, we may often observe a shining, coagulated, flaky substance, like white of egg, blended with the contents of such abscesses as occur in the progress of the disease. This kind of matter is almost peculiar to scrophulous abcesses, and forms another argument in support of he foregoing observations, relative to the share which scrophula frequently has in the origin and course of many white-swellings.

Mr. Brodie's experience leads him to believe, hat in scrophulous cases, the chance of ultimate recovery is much less, where the disease attacks he complicated joints of the foot and hand, than when it is situated in larger articulations of a more simple structure. (*Pathol. and Surg. Obs. p.* 235.)

Treatment of White-swellings.—In practice we meet with all these cases, both scrophulous and rheumatic, in two very opposite states; sometimes he diseased joint is affected with a degree of acute nflammation; in other instances, the malady is entirely chronic.

The imprudence of patients in walking about, and disturbing the diseased part, is very often the occasion of a degree of acute inflammation, which s denoted by the tenderness of the joint when handled by the surgeon, and also by the integuments feeling hotter than those of the healthy knee. When such state exists, there can be no doubt, that topical bleeding, fomentations, emollient poultices, or cold saturnine lotions, are means which may be eminently serviceable. The antiphlogistic regimen is now strongly indicated. Cooling purges of the saline kind should also be exhibited. Blood may be taken from the arm, and also from the diseased part, either by means of leeches or cupping. Mr. Latta gives the preference to the latter method, whenever it can be employed; and he very properly remarks, that little advantage can be expected from topical bleeding of any kind, unless the quantity of blood taken away be considerable. Ten or twelve ounces by cupping should be taken away at a time, and the operation should be repeated at proper intervals till the tenderness and heat of the skin have entirely subsided. When leeches are used, the number ought to be considerable, and Mr. Latta recommends the application of at least sixteen or twenty. (*System of Surgery, Vol.* 1, *chap.* 6.)

Although antiphlogistic means are judicious, when acute inflammation prevails; yet such practitioners as lose weeks and months in the adoption of this treatment, are highly censurable. While the skin is hot and tender, while the joint is affected with very acute and general pain, and while the patient is indisposed with the usual symptoms of inflammatory fever, great benefit may be rationally expected from the above plan. When, however, the disease is truly chronic, different plans are indicated. In ordinary cases of scrophulous disease of the joints, Mr. Brodie considers topical bleeding as usually unnecessary. (*Pathol. and Surg. Obs. p.* 240.)

It is quite unnecessary to expatiate on the mode of treating white-swellings, complicated with acute inflammation, particularly as the treatment of those cases, which consist of inflammation of the synovial membrane, has been already noticed, and may be said to be applicable to other forms of white-swelling, when they are attended with heat and inflammation of the soft parts. The most eligible plan of arresting the morbid process in the bones, cartilages, and soft parts surrounding the articulation, and the most successful method of lessening the chronic enlargement of the joint, are the subjects at present demanding our earnest investigation.

The works of Hippocrates, Celsus, Rhazes, Hieron. Fabricius, &c. compared with modern surgical books, will soon convince us, that the practice of the ancients, in the treatment of diseased joints, does not differ much from the plan now pursued by the best modern surgeons. Mr. Crowther remarks, that the ancients used local and general blood-letting, the actual and potential cautery, with vesicating and stimulating applications to the skin. They further maintained, that sores, produced by these means, should have their discharge promoted, and continued for a considerable length of time.

With regard to the cases, which Mr. Brodie describes as depending upon a total loss of the natural structure of the synovial membrane, which is converted into a pulpy substance, one quarter, or one half, of an inch in thickness, though the progress of the disease may be somewhat checked by rest and cold lotions, it is according to this gentleman incurable, and at length it ends in ulceration of the cartilages, abscesses, &c. When there is considerable pain in consequence of the cartilages beginning to ulcerate, partial relief may be derived from fomentations and poultices; but, nothing will effect a cure. Hence, when the health begins to suffer, he considers amputation to be indicated. (*Med. Chir. Trans. p.* 254.)

When white-swellings are accompanied with ulceration of the cartilages, all motion of the joint is extremely hurtful. Indeed, as Mr. Brodie well observes, keeping the limb in a state of perfect quietude, is a very important, if not the most important circumstance, to be attended to in the treatment. According to this gentleman, it is in these cases, in which ulceration of the cartilages occurs as a primary disease, that caustic issues are usually productive of singular benefit; but, he deems them of little use in any other diseases of the joints. He thinks setons and blisters, kept open with savine cerate, may also be used with advantage. Bleeding is indicated only when, from improper exercise, the articular surfaces are inflamed, and there is pain and fever. Mr. Brodie asserts, that the warm bath relieves the symptoms in the early stage, if it does not stop the progress of the disease; but he condemns plasters of gum ammoniac, embrocations, liniments, and frictions, as either useless or hurtful. (See *Med. Chir. Trans. Vol.* 6, *p.* 332—334.)

Topical applications, consisting of strong astringents of the mineral and vegetable kingdom, are of no service in examples of ulceration of the cartilages, or of the scrophulous form of the disease, though they often suffice for the cure of some mild descriptions of white-swelling, depending upon a thickening of the synovial membrane. A decoction of oak bark, containing alum, was recommended by Mr. Russell.

My own experience will not allow me to say any thing in favour of electricity, as an application for the relief of white-swellings; and it must be more likely to do harm than good, whenever the indication is to lessen irritation.

"If the tumour is quite indolent, (says Richerand) the application of galvanism may be proposed; it is not, however, exempt from danger, and on one occasion, where I employed it, lancinating pains and swelling of the joint were brought on by it." (*Nosogr. Chir. T.* 3, *p.* 174, *Ed.* 2.)

Mr. John Hunter had confidence in cicuta and sea-bathing, as possessing power over many scrophulous diseases, and, that such diseases of the joints are often materially benefited by the patient's going to the sea-side and bathing, is a fact, which cannot be doubted, whatever may be the mode of explaining the benefit thus obtained. I fully believe, that sea-air, and sea-bathing, have a beneficial influence over scrophulous diseases of the joints; but probably their effects are produced on the part through the medium of the constitution, and they should only be recommended as an auxiliary plan, to be adopted in conjunction with other still more efficacious measures.

Every one is well acquainted with the efficacy of friction in exciting the action of the absorbents To this principle we are to impute the great benefit, which arises from what is termed *dry rubbing*, in cases of white-swellings. This kind of friction is performed by the mere hands of an attendant, without using at the same time any kind of liniment, or other application whatsoever, excepting sometimes a little flour, or powdered starch, and the rubbing is continued several hours every day. At Oxford, many poor persons earn their livelihood by devoting themselves to this species of labour, for which they are paid a stimulated sum per hour. This practice, however, is chiefly advantageous in the chronic stage of white-swelling, arising from inflammation of the synovial membrane.

I look upon all mere emollient applications, such as fomentations and poultices, as quite destitute of real efficacy, except when great pain, or active inflammation is present, and, though they serve to amuse the patient, they ought not to be recommended. That surgeon, who merely strives to please his patient's fancy, without doing any real good to him, in regard to his affliction, may be considered as doing harm, because the semblance of something being done too often hinders other really useful steps from being pursued. The French surgeons are particularly liberal in the praises, which they bestow on warm emollient remedies, poultices, steam of hot water, fomentations, &c. and they adduce instances of white-swellings being cured in this manner. But the cases, to which they refer, were no doubt mere inflammations, and thickening of the synovial membrane; a disease, which in general readily yields to several other plans.

The only method of treatment, which my own personal experience enables me to recommend for scrophulous white-swellings in a chronic state, consists in keeping up a discharge from the surface of the diseased joints. The opportunities, which I have had of observing the effects of blisters, and caustic issues, rather incline me, however, to prefer the former to the latter. I have seen great good derived from both; but more from blisters, than the other kind of issue. There are instances, in which I should employ vesicating applications; there are others in which I should prefer making an eschar with caustic. In particular individuals, blisters create so much irritation, heat, fever, and suffering, that a perseverance in them would be rashness.

The blister should always be large. Many surgeons, instead of following Mr. Crowther's plan, prefer blistering first one side of the joint, and then the other alternately, for a considerable length of time. "Blisters (says Mr. Latta) may be put upon each side of the patella, and ought to be of such a size and shape, as to cover the whole of the swelling, on the inside, from the hinder part of the joint, at the edge of the hollow of the thigh, to the edge of the patella, over the whole extent of the swelling above and below. As soon as the blister is taken off from one side, it ought to be applied to the other, and thus repeated alternately, until both swelling and pain be completely removed. When this is the case, the patient ought to be directed to rub the joint well with a liniment, composed of half an ounce of camphor, dissolved in two ounces of oil, with the addition of half an ounce of spir. sal-ammon. caust. or, as it is now called, liquor ammoniæ. This is to be used three times a day; and in this way (continues Mr. Latta) I have successfully treated many cases of white-swellings." (*Syst. of Surgery, Vol.* 1, *chap.* 6.)

In the beginning, caustic issues are even more painful, than blisters; but they afterwards become more like indolent sores, and are more easily kept open, for a length of time, than blisters. Such issues are commonly made on each side of the diseased joint, and of about the size of a half-crown. The manner of making the eschars, and keeping these issues open, has been already explained. (See *Issue.*)

The question has been contested, among surgical writers and practitioners, whether blisters and issues produce benefit, upon the principle of counter-irritation, or in consequence of the discharge, which they occasion. They probably operate efficaciously in both ways; for there is no doubt, that mere rubefacients possess the power of rousing the action of the absorbents, and they may also modify the vascular action in diseased parts. These applications can obviously only act upon the principle of counter-irritation, and they have not been here recommended, particularly for white-swellings, because, it seems to me, that whenever some good might be derived from their employment, much more benefit might always be obtained from blisters and issues. This sentiment is confirmed by experience, and we must, therefore, impute a great degree of efficacy to the maintenance of a purulent discharge from the vicinity of the diseased part.

Though my own observations have led me to think issues and blisters as efficient, as any means hitherto devised for stopping the progress of scrophulous disease of the heads of the bones, I am far from meaning to say, that such disease can generally be stopped by these, or any other remedies, local or general. Mr. Brodie has seldom known any benefit derived from blisters, or stimulating liniments; nor has he seen the same degree of good produced by issues in scrophulous cases, as in examples of primary ulceration of the cartilages. Cold evaporating lotions in the early stage of the complaint; perfect quietude of the joint; attention to the patient's health; and riding in a carriage in the fresh air; are the means, which this gentleman particularly recommends in scrophulous diseases of the joints. During the formation of abscesses, he approves of fomentations and poultices. (*Pathol. Obs. p.* 242.)

We have noticed the efficacy of friction, in exciting the action of the absorbents, by which the thickened state of parts around the affected joint may be considerably lessened, and, on this principle, the utility of dry-rubbing arises. We have now to notice the method of producing the same effect by pressure. In St. Bartholomew's Hospital, I have seen a few cases, in which the swelling of the joints was materially diminished, by encircling them with strips of adhesive plaster, applied with moderate tightness.

A somewhat similar plan, though its modus operandi is differently accounted for, appears also to have been tried in France. "J'ai dans quelques occasions (says Richerand) obtenu les plus grands avantages de l'application d'un taffetas ciré autour de l'articulation tuméfiée. On coupe un morceau de cette étoffe, assez large pour envelopper la totalité de la tumeur; on enduit les bords d'une gomme dissoute dans le vinaigre, et susceptible de la faire adhérer intimement à la peau; on l'applique ensuite de manière que tout l'accès soit interdit à l'air entre lui et les teguments. Lorsqu'au bout de quelques jours on lève cet appareil, on trouve la peau humide, ramollie par l'humeur de la transpiration condensée en goutelettes à la surface interieure du taffetas. Dans ce procédé on établit un espèce de bain de vapeur autour de l'articulation malade." (*Nosogr. Chir. T.* 3, *p.* 175, *Edit.* 2.)

My friend, the late Mr. Clement Wilson Cruttwell, of Bath, sent me a very excellent case illustrative of the efficacy of treatment by pressure. He remarks, that, "after cupping the part, and endeavouring to quiet the inflammation, I used blisters; but they excited such intolerable pain, and produced so great a degree of swelling and inflammation, that I was under the necessity of healing them immediately. After two months strict confinement to bed, and the use of leeches and refrigerant washes, the inflammation having again subsided, and the pain being removed, I again ventured to apply one small blister, and again a similar attack of pain, swelling, and inflammation, was produced. The joint became distended with fluid, of which it had always contained a large quantity, and the irritation of the constitution was excessive. By the liberal use of opium, I once more succeeded in quieting the disturbance, and, convinced of the hazard of using blisters in such a subject, I applied moderate pressure, by means of a roller, together with a wash, containing a large proportion of spirit, in order to keep up a constant evaporation. The skin, which was before much inflamed, and hard, has become natural and flaccid, the pain has ceased, the swelling has diminished, and I have every prospect of effecting a cure, with the preservation of tolerably free motion in the joint."

Mr. Cruttwell, in a subsequent letter, informed me, that this case got completely well, by the treatment with pressure, and had remained so for upwards of six months, under full and free exercise.

This example clearly evinces the impropriety of using blisters in certain constitutions. In some remarks, annexed to the above case, Mr. Cruttwell expresses his conviction, that absolute rest, cold applications, and pressure, would succeed in very many cases, without local counter-irritation. Pressure, he adds, succeeds best, when fluid is effused, and the disease is indolent; but, he is convinced, that it may be used with advantage in later stages, when abscesses have formed, and sinuses already exist; and he reminds me, how very serviceable continued pressure is to the scrophulous finger-joints of children.

The good effects of pressure in scrophulous cases are confirmed by the observations of Mr. Brodie: when, says he, after several abscesses have taken place, the tendency to suppuration has ceased, and the swollen joint has become diminished, anchylosis is probably disposed to take place. At this period, pressure, by means of strips of linen, spread with soap-cerate, or some other moderately adhesive plaster, and applied in a circular manner round the limb, will be productive of benefit. (*Pathol. and Surg. Obs. p.* 243.) Whether any benefit would result, in these cases, from friction with the ointment of iodine, is a question, which future experience must decide.

When the knee is affected, the limb has a tendency to become permanently bent. It must undoubtedly be judicious to prevent this position, by means of splints, which will also serve to prevent all motion of the diseased joint, an object of the very highest importance. Were the disease to end in anchylosis, the advantage of having the limb in a state of extension need scarcely be mentioned.

In cases which commence in the cancellous structure of the heads of the bones, it seems rational to combine, with the local treatment, the employment of such internal remedies, as have been known to do good in other scrophulous diseases. "It is to be supposed, (as Mr. Brodie observes) that the air of a crowded city must be more or less unfavourable; and that a residence on the sea-coast is likely to be more beneficial, than a residence in the country elsewhere. The patient should live on a nourishing, but plain diet; he should be in the open air in summer, as much as he can, without exercising the joint. His mode of life should, in all respects, be regular and uniform." Mr. Brodie has found more benefit, derived from the long use of steel medicines, than any others, suspending their use, however, and substituting the mineral acids for them, when the formation of abscesses excites febrile action. With such means, in children, he combines the occasional exhibition of mercurial purgatives. (*Pathol. Obs. p.* 245.) In a work, which Mr. Lloyd has just published, it is assumed as a fact, that, in scrophula, there always is more or less disorder of the functions of the digestive organs, and primarily of no other important function. Hence, the regulation of diet, the state of the bowels, and the hepatic secretions, is with this gentleman a principal object; and, with the latter views, he employs, after Mr. Abernethy's plan, five grains of the blue pill every night, and half a pint of decoct. sars. twice a day, with opening medicines, if necessary to procure regular daily evacuations. When acidity of the stomach is present, he gives soda, and when the stomach is weak, cinchona, steel and mineral acids. (*On Scrophula, p.* 37, *&c.*) However, no doubt can be entertained, that these means, like many others, have no specific power over scrophulous diseases, and, like sea air and sea-bathing, only answer by sometimes improving the state of the constitution. In the local treatment of scrophulous joints, Mr. Lloyd commends quietude of the limb, which is to be confined in a sling, or in splints; the occasional resistance of inflammatory action by leeches, and a diminution of temperature; poultices when abscesses form; opening such collections of matter early; and, after all irritation has ceased, issues, setons, blisters, or the antimonial ointment; or compression upon Mr. Baynton's plan. (*P.* 152, *&c.*) With respect to opening these abscesses early, Mr. Lloyd differs from many excellent surgeons, especially Dr. Albers, who distinctly states, that it is generally best to allow them to burst of themselves. On this subject, however, great diversity of opinion prevails, and Langenbeck is amongst the advocates for making an early opening. (*Bibl. B.* 2, *p.* 39.) Hectic symptoms are those, which we commonly have to palliate in these cases. When the appetite is impaired, and the stomach will bear bark, this medicine should be given with the aromatic confection, or, the sulphate of quinine, may be exhibited. Above all, opium claims high recommendation, as it at once tends to keep off and relieve a debilitating diarrhœa, which too frequently prevails, at the same time that it alleviates pain, and procures sleep. The objection made against its exhibition, on the ground that it increases perspiration, seems exceedingly frivolous, when the above important benefits are taken into consideration.

The internal and external use of iodine is also deserving of trial. (See *Iodine.*)

Too often, however, the terrible disease of which we are now treating, baffles all human skill and judgment, and the unhappy patient's health having declined to the lowest state, he is necessitated to submit to amputation, as the only chance of preserving life. It has been explained in speaking of *Amputation*, that the condition of the patient's health, and not of the diseased joint, forms the principal reason for recurring to the severe operation of removing the limb. If the patient's constitution be equal to a longer struggle, no man can pronounce, that every prospect of saving the limb is at an end. Many diseased joints, apparently in the most hopeless condition, frequently take a favourable turn, and, after all, allow the limb to be saved.

The proposal of cutting out diseased joints, has been considered in the article *Amputation.*.

Disease of the Hip-joint.—This complaint is very analogous in its nature to the white-swelling of other articulations. In the same way as the latter disorder, it seems probable, that the disease of the hip has its varieties, some of which may be connected with scrophula, while others cannot be suspected to have any concern with it. Mr. Brodie's investigations lead him to believe, however, that the disease is of that nature, in which the first change is disease and ulceration of the cartilages. The present complaint is most frequently seen in children under the age of fourteen; but, no age, no sex, no rank, nor condition of life is exempt from the possibility of being afflicted, so that though children form a large proportion of those subjects, who are attacked; yet the number of adults, and even of old persons, is considerable.

The approach of the disease of the hip-joint is much more insidious, than that of a white-swelling. Some degree of pain always precedes the latter affection; but, the only forerunner of the former is frequently a slight weakness, and limping of the affected limb. These trivial symptoms are very often not sufficiently urgent to excite much notice, and, when observed by superficial practitioners, are commonly neither understood, nor treated according to the dictates of surgical science. As there is, also, sometimes an uneasiness in the knee, when the hip is affected, careless practitioners frequently mistake the seat of disease, and I have many times seen patients, on their entrance into an hospital, having a poultice on their knee, while the wrong state of the hip was not at all suspected.

This mistake is extremely detrimental to the patient, not on account of any bad effect, resulting from the applications so employed; but, because it is only in the incipient period of the complaint, that a favourable prognosis can be made. In this stage of the disease, mere rest and repeated topical bleeding, will do more good in the course of a fortnight, than large painful issues will afterwards generally acomplish in the long space of a twelvemonth.

The symptoms of the disease of the hip-joint, when only looked for in the situation of that articulation, are not very obvious. Though, in some instances, the attention of the surgeon is soon called to the right situation of the disease, by the existence of a fixed pain behind the trochanter major; yet, it is too often the case, that mere pain about an articulation, entirely destitute of visible enlargement and change of colour, is quite disregarded, as a complaint of no importance in young subjects, and as a mere rheumatic, or gouty affection, in adults. Patients frequently complain of their most painful sensations being in the groin, and all accurate observers have remarked, that, in the hip disease, the pain is not confined to the real seat of disease, but shoots down the limb, in the course of the vastus externus muscle to the knee.

The pain, says Mr. Brodie, is at first trifling, and only occasional; but, it afterwards becomes severe and constant. It resembles a good deal the pain of rheumatism, since it often has no certain seat. As the disease advances, the pain becomes exceedingly severe, particularly at night, when the patient is continually roused from his sleep by painful startings of the limb. Sometimes, he experiences a degree of relief in a particular position of the joint, and no other. As the pain increases in intensity, it becomes more fixed. In the greater number of instances, it is referred both to the hip and knee, and the pain in the latter joint is generally the most severe. At other times, there is pain in the knee, and none in the hip. A boy, in St. George's hospital, complained of pain in the inside of the thigh, near the middle; and another patient referred the pain to the sole of the foot. Wherever the pain is situated, it is aggravated by the motion of the joint, and especially by whatever occasions pressure of the ulcerated cartilaginous surfaces against each other. (*Brodie's Pathol. Obs. p.* 139.)

The early symptoms of disease in the hip-joint are only strongly delineated to such practitioners, as have acquired the necessary information relative to this part of surgery, from careful study, and extensive experience.

When the functions of a limb are obstructed by disease, the bulk of the member generally diminishes, and the muscles become emaciated. Nearly as soon as the least degree of lameness can be perceived, the leg and thigh have actually wasted, and their circumference has diminished.

If the surgeon make pressure on the front of the joint, a little on the outside of the femoral artery, after it has descended below the os pubis, great pain will be experienced.

"Soon after the commencement of the complaint, (as Mr. Brodie remarks,) the hip-joint is found to be tender, whenever pressure is made on it either before or behind. The absorbent glands become enlarged, and occasionally there is a slight degree of general tumefaction in the groin." The same gentleman has also adverted to the curious circumstance of there being in some cases a tenderness of the parts, to which, though not diseased themselves, the pain is referred from sympathy with the disease of the hip. This occurrence he has observed in the knee several times, and in one instance in the course of the peronæal nerve. He has also seen a slight degree of puffy swelling of the knee in a case, in which pain was referred to this joint, in consequence of disease of the hip. (*P.* 142, 143.)

The limping of the patient is a clear proof, that something about the limb is wrong, and, if such limping cannot be imputed to diseased vertebræ, or some recent accident, and if, at the same time, the above-mentioned emaciation of the limb exists, there is great cause to suspect, that the hip is diseased, particularly, when the pain is augmented by pressing the front of the acetabulum.

Diseased vertebræ, perhaps, always produce a paralytic affection of both legs at once, and they do not cause painful sensations about the knee, as the hip disease does.

The increased length of the limb, a symptom that has been noticed by all practitioners since De Haen, is a very remarkable and curious occurrence, in the early stage of the present disease. This symptom is easily detected by a comparison of the condyles of the os femoris, the trochanter major, and malleoli, of the diseased limb, with those parts of the opposite member, care being taken that the patient's pelvis is evenly situated. The thing is the more striking, as the increased length of the member is frequently as much as four inches. The rationale of this fact, John Hunter used to explain by the diseased side of the pelvis becoming lower, than the other. (*Crowther, p.* 266.) The same thing had also been noticed by Falconer, (*On Ischias, p.* 9) long before the period, when Mr. Crowther printed his second edition.

It is easy (says Mr. Brodie) to understand how the crista of one ilium becomes visibly depressed below the level of the other, when the position is remembered, in which the patient places himself when he stands erect. "He supports the weight of his body upon the sound limb, the hip and knee of which are in consequence maintained in the state of extension. At the same time, the opposite limb is inclined forward, and the foot on the side of the disease is placed on the ground considerably anterior to the other, not for the purpose of supporting the superincumbent weight, but for that of keeping the person steady, and preserving the equilibrium. Of course, this cannot be done, without the pelvis on the same side being depressed. The inclination of the pelvis is necessarily attended with a lateral curvature of the spine, and hence one shoulder is higher than the other, and the whole figure in some degree distorted." (*Pathol. Obs. p.* 146.) These effects, says Mr. Brodie, are in general all removed by the patient's lying in bed a few weeks, except when the deformity has continued a long time in a young growing subject.

In justice to the memory of the late respected Dr. Albers, of Bremen, I ought here to mention, that he appears in his work on Coxalgia, to have first pointed out the deformity of the spine in this disease, and the reason of such change, the tenor of his observations upon this point agreeing with those subsequently made by Mr. Brodie.

An appearance of elongation of the limb is not exclusively confined to the early stage of the morbus coxarius: it may attend other cases. I remember in one of the wards of St. Bartholomew's Hospital, a little girl, with a diseased knee, whose pelvis was considerably distorted in this manner, so that the limb of the same side appeared much elongated. Her hip-joint was quite sound. This case was pointed out to Mr. Lawrence and myself by Mr. Cother, of Gloucester.

Volpi, Albers, and several other foreign writers, point out the fact, that the early stage of this disease is sometimes attended with an appearance of elongation, sometimes with that of a shortening of the limb. An explanation of the circumstance is given by Mr. Brodie, as follows: "In a few cases, where the patient is in the erect position, it may be observed, that the foot, which belongs to the affected limb, is not inclined more forward, than the other, but the toes only are in contact with the ground, and the heel raised, at the same time, that the hip and knee are a little bent. This answers to the patient the same purpose of enabling him to throw the weight of his body on the other foot; but it produces an inclination of the pelvis in the opposite direction. The crista of the ilium is higher, than natural, and there is an apparent shortening, instead of elongation of the limb on the side of the disease." (*Pathol. and Surg. Obs. p* 147.)

The late Mr. Ford called the attention of surgeons to the alteration, with respect to the natural fulness and convexity of the nates, that part appearing flattened, which is usually most prominent. The glutæus magnus becomes emaciated, and its edge no longer forms so bold a line, as it naturally does at the upper and back part of the thigh, in the sound state of the limb.

Although this symptom, in combination with others, is of importance to be attended to, it has been explained by Mr. Brodie, that "it is not in itself to be regarded, as a certain diagnostic mark of disease in the hip; since, in its early stage, this symptom is wanting; and it is met with in other diseases, in which the muscles in the neighbourhood of the hip are not called into action, although the joint itself is unaffected." (See *Medico-Chir. Trans. Vol.* 6, *p.* 322.)

Though there may be more pain about the knee than the hip, at some periods of the malady in its incipient state, yet, the former articulation may be bent and extended, without any increase of uneasiness; but the os femoris cannot be moved about, without putting the patient to immense torture.

The patient soon gets into the habit of bearing the weight of his body chiefly upon the opposite limb, while the thigh of the affected side is bent a little forward, that the ground may only be partially touched with the foot. This position is found to be the most comfortable, and every attempt to extend the limb occasions an increase of pain.

This is the first stage of the disease, or that which is unaccompanied with suppuration.

The symptoms which precede the formation of pus, vary in different cases, according as there is acute, or chronic inflammation present. When the diseased joint is affected with acute inflammation, as generally happens, the surrounding parts become tense and extremely painful; the skin is even reddish; and symptoms of inflammatory fever prevail. When the severity of the pain abates, a swelling occurs in the vicinity of the joint, and a pointing quickly follows. In this stage, startings and catchings during sleep are said to be among the most certain signs of the formation of matter. "The shortening of the limb," says Mr. Brodie, "which usually takes place in the advanced stage of the disease, is usually, but not always, the precursor of abscess. The formation of matter is also indicated by an aggravation of the pain; by more frequent spasms of the muscles, by greater wasting of the whole limb, and by the circumstance of the thigh becoming bent forward, and being incapable of extension," and by the pulse becoming quick, the tongue furred, and the whole system being in a state of preternatural excitement. "The abscess usually shows itself in the form of a large tumor over the vastus externus muscle; sometimes on the inside of the thigh, near the middle; and occasionally two or three abscesses appear in different parts, and burst in succession." (*Brodie's Pathol. Obs. p.* 152.)

We have noticed the commonly lengthened state of the limb, in the first periods of the hip-disease. This condition is not of very long duration, and is sooner or later succeeded by a real shortening of the affected member The foot may be turned inwards; but, as Mr. Brodie observes, if left to itself, it is generally turned outwards. In other cases, the limb is shortened; the thigh is bent forwards; the toes are turned inwards, and do not admit of being turned outwards: (*Pathol. Obs. p.* 148.) and all the symptoms of a luxation of the thigh upwards and outwards may be observed, the head of the bone, indeed, being actually drawn into the external iliac fossa, and carried betwixt the os innominatum and glutæus minimus, which is raised up by it. (See *Richerand, Nosogr. Chir. T.* 3, *p.* 171, 172, *Ed.* 2.)

When the retraction is very considerable, it arises from nothing less, than an actual dislocation of the head of the thigh-bone, in consequence of the destruction of the cartilages, ligaments, and articular cavity. This retraction sometimes comes on long before any suppuration takes place. The head of the bone is sometimes dislocated, and the disease terminates in anchylosis, without any abscess whatever. However, if suppuration has not taken place, Mr. Brodie believes, it rarely happens, that the limb, after the cure, does not regain its natural degree of mobility. (See *Med. Chir. Trans. Vol.* 6, *p.* 325.)

It is worthy of particular notice, that the head of the bone is always luxated upwards and outwards; and the only exception to this observation, upon record, is a case related by Cocchi, in which a spontaneous dislocation of the thigh-bone, as it is termed, happened upwards, forwards, and a little inwards. (See *Léveillé, Nouvelle Doctrine Chir. T.* 3, *p.* 595.) On a également vu la tête du fémur luxée en dedans et en bas, et placée sur le trou obturateur, mais cette mode de déplacement consécutif, dans lequel le membre est alongé, est infiniment rare. (*Richerand, Nosogr. Chir. T.* 3, *p.* 172.)

The hip-disease generally induces hectic symptoms, after it has existed a certain time. In some subjects, they soon come on; in others, the health remains unaffected a very considerable time.

"The health of the patient (says Mr. Brodie) usually suffers, even before abscesses have formed, from the want of exercise, pain, and particularly from the continued disturbance of his natural rest. I recollect no instance of an adult, in whom abscesses had formed, and who did not ultimately sink exhausted by the hectic symptoms, which these induced. Children may recover in this ultimate stage of the disease;

but, seldom without a complete anchylosis of the joint." (*Med. Chir. Trans. Vol.* 6, *loco cit.*)

When abscesses of the above description burst, they continue, in general, to emit an unhealthy thin kind of matter for a long time afterwards.

With respect to the morbid anatomy of the disease in its incipient state, until lately little was known. A few years ago two dissections related by Mr. Ford, were, perhaps, the only ones throwing light upon this point. In one, there was a teaspoonful of matter in the cavity of the hip-joint. The head of the thigh-bone was a little inflamed, the capsular ligament a little thickened, and the ligamentum teres united in its natural way to the acetabulum. The cartilage lining the cotyloid cavity was eroded in one place, with a small aperture, through which a probe might be passed, underneath the cartilage, into the internal surface of the os pubis on one side, and on the other, into the os ischii; the opposite, or external part of the os innominatum showing more appearance of disease, than the cotyloid cavity. In the other instance, the disease was more advanced. These examples are important, inasmuch as they prove, that what is commonly called the disease of the hip-joint, primarily affects the cartilages, ligaments, and bones, and not the surrounding soft parts, as De Haen and some others, would lead one to believe.

As the disorder advances, the portions of the os ischium, os ilium, and os pubis, composing the acetabulum, together with the investing cartilage, and synovial gland, are destroyed. The cartilage covering the head of the os femoris, the ligamentum teres, and capsule of the joint, suffer the same fate, and caries frequently affects not only the adjacent parts of the ossa innominata, but also the head and neck of the thigh-bone. The bones of the pelvis, however, are always more diseased than the thigh-bone, a fact, which displays the absurdity of ever thinking of amputation in these cases. Mr. Ford observes, " In every case of disease of the hip-joint, which has terminated fatally, I have remarked, that the os innominatum has been affected by the caries in a more extensive degree, than the thigh-bone itself." (*Obs. on the Disease of the Hip-joint, p.* 107.)

Sometimes, however, the head and neck of the thigh-bone are annihilated, as well as the acetabulum.

Mr. Brodie has had opportunities of dissecting some diseased hip-joints both in the incipient and advanced stage of the complaint. From his observations, it appears; 1st. That the disease commences with ulceration of the cartilages, generally that of the acetabulum first, and that of the femur afterwards. 2. That the ulceration extends to the bones, which become carious; the head of the femur diminishing in size, and the acetabulum becoming deeper and wider. 3. That an abscess forms in the joint, which after some time makes its way by ulceration, through the synovial membrane and capsular ligament, into the thigh and nates, or even through the bottom of the acetabulum into the pelvis. Sir A. Cooper showed Mr. Brodie two specimens, in which the abscess had burst into the rectum. 4. In consequence of the abscess, the synovial membrane and capsular ligament become inflamed and thickened. The muscles are altered in structure; sinuses are formed in various parts, and, at last, all the soft parts are blended together in one confused mass, resembling the parietes of an ordinary abscess. (*Brodie, in Medico-Chir. Trans. Vol.* 4, *p.* 246, 247.)

Such are the beginning and progress of the ordinary disease of the hip-joint; but, it is admitted by Mr. Brodie, that there are other scrophulous cases, in which the mischief begins in the cancellous structure of the bones, and also other instances, which consist in chronic inflammation and abscesses of the soft parts in the neighbourhood of the hip. (*Op. cit. Vol.* 6, *p.* 326.)

External violence; lying down on the damp ground in summer time; and all kinds of exposure to damp and cold; are the causes to which the disease has sometimes been referred. No doubt, scrophula has, frequently, some concern in its origin; but, often, no rational cause is assignable for the complaint.

Treatment of the Disease of the Hip-joint.—The writings of Hippocrates, Celsus, Cælius Aurelianus, &c. prove, that the ancients treated the present disease much in the same way, as it is treated by the moderns. Forming an eschar, and keeping the sore open; topical bleeding; cupping, fomenting the part, &c. were all proceedings adopted in the earliest periods of surgery. Drs. Charlton, Oliver, and Falconer, have spoken of Bath water, as a most efficacious application to diseased hip-joints, previously to the suppurative stage. However, had not their accounts been exaggerated, all patients of this kind would long ago have flocked to Bath, and the surgeons in other places would never have had further occasion to adopt a more painful mode of treatment. The plan, pursued at Bath, is to put the patient in a warm bath, two or three times a week, for fifteen or twenty-five minutes.

In the first stage of coxalgia, the late Dr. Albers, however, had a very high opinion of warm bathing, fomentations with decoctions of herbs, and of bathing in mineral waters and the sea. But, though he commenced the treatment with the frequent use of the warm bath, and continued the plan a long while, it is to be remarked, that he also combined with it an issue. After the patient had been in the bath a period not exceeding half an hour, he was taken out, and his whole body well rubbed with flannel. It appears to me, that one objection to this practice must be the considerable disturbance occasioned by moving the patient in this manner every morning; for, if it be true, that most of these diseases commence in the cartilages of the joint, all motion of the limb must be particularly injurious.

In the early period of the disease, entire rest, the application of fomentations, and the employment of topical bleeding, particularly cupping, are highly proper. Such practice, also, is invariably judicious, whenever the case is attended with symptoms of acute inflammation. When the fomentations are not applied, the lotio plumbi acetatis may be used.

This method of treatment ought never to be employed, unless manifest signs of active inflammation be present. When no such state exists, this plan can only be regarded as preventing the adoption of a more efficacious one, and, therefore, censurable.

"Where the cartilages of the hip are ulcerated (says Mr. Brodie), the patient should, in the first instance, be confined to a couch, if not to his bed; and if the disease is far advanced, the limb should be supported by pillows properly disposed, so as to favour the production of an anchylosis, by allowing it to vary as little as possible from one position." (See *Med. Chir. Trans. Vol.* 6, *p.* 335.)

Quibus diuturno dolore, says Hippocrates, *ischiadico vexatis coxa excidit, iis femur contabescit et claudicant, nisi urantur.* Forming an eschar, or issue, is the most efficacious plan of treating the disease even now known. A caustic issue seems to me more beneficial than a blister. The depression, just behind and below the trochanter major, is the situation, in which surgeons usually make the issue, and the size of the eschar should be nearly as large as a crown piece. It is generally necessary to keep the issue open a very long time. When the thigh-bone is dislocated, and the patient survives, the case mostly ends in anchylosis.

For the cure of the disease in adults, Mr. Brodie, and Dr. Albers have also expressed a preference to caustic issues; but in children, and even in grown-up persons, when the complaint is recent, they agree in thinking blisters capable of affording complete relief. Mr. Brodie states, that, in these cases, they are more efficacious, when kept open with the savine ointment, than when repeatedly applied. With respect to issues, he acknowledges, that behind the great trochanter is the most convenient place for them; but, he believes, that they have more effect, when made on the outside of the joint, on the front edge of the tensor vaginæ femoris muscle. Instead of keeping the issue open with beans, Mr. Brodie has found it a more effectual practice to rub the sore, two or three times a week, with the potassa fusa, or sulphate of copper. In particular cases, where the pain was very severe, this gentleman made a seton in the groin, over the trunk of the anterior crural nerve, which plan, he says, affords quicker relief, though in the end it is less to be depended upon for a cure, than caustic issues.

In Dr. Albers's work, the great efficacy of issues and blisters in giving immediate relief to the severe pain in the knee, is illustrated by some valuable observations. He speaks also very favourably of the moxa, the employment of which he says is not very painful; a remark, in which Langenbeck concurs. (See *Bibl. B.* 2, *p.* 27.) Dr. Albers, in the hectical stages, recommends opium, as highly useful, especially when combined with musk, or camphor.

The occurrence of suppuration makes a vast difference in the prognosis. "The formation of even the smallest quantity of pus in the joint, in cases of this disease, in the young person considerably diminishes, and in the adult almost precludes, the hope of ultimate recovery." (*Brodie, in Medico-Chir. Trans. Vol.* 6, *p.* 347.) This gentleman is not much in favour of opening the abscesses early, at least, before the joint has been kept for some time perfectly at rest. He has seen no ill consequences arise from the puncture of the lancet remaining open, and he has not found, that, in cases of carious joints, the method of evacuating the matter, recommended by Mr. Abernethy (see *Lumbar Abscess*), is attended with any particular advantage.

Mr. J. Burns, in the second vol. of his "Dissertations on Inflammation," p. 311, has recorded a remarkable instance, in which this joint was affected with that intractable and fatal distemper, fungus hæmatodes. The case was at first supposed to be the disease, of which we have just been treating in the preceding columns. The limb seemed to be elongated, and issues were employed, without any material benefit. The upper part of the thigh swelled, while the lower wasted away. The patient lost his appetite, had a quick pulse, and passed sleepless nights. The part was rubbed with anodyne balsam, and laudanum given every night; but, these means were only productive of temporary benefit. After some months, a difficulty of making water came on, which ended in a complete retention. It being found impracticable to introduce a catheter, and a large elastic tumor, supposed to be the distended bladder, being felt within the rectum, a trocar was pushed into the swelling. A good deal of bloody fluid was thus discharged. Afterwards, a considerable quantity of high-coloured fetid urine continued to escape from the urethra. In about a week after this operation, the patient died.

On dissection, Mr. Burns found the hip-joint completely surrounded with a soft matter, resembling brain, enclosed in thin cells, and here and there other cavities, full of thin bloody water, presented themselves. The acetabulum and head of the os femoris were both carious. The muscles were quite pale, and almost like boiled liver, having lost their fibrous appearance. The same kind of substance was found in the pelvis, and most of the inside of the affected bones was carious. Large cells, containing bloody water, were observed in the diseased substance, and it was into one of these cavities, that the trocar had entered, when the attempt was made to tap the bladder.

Gil. Budæus, De Curandis Articularibus Morbis, 12*mo. Paris,* 1539. *J. G. Widdmann, De Genuum Structura eorumque Morbis, Helmstad,* 1744 (*Haller, Disp. Chir.* 4, 489). *Ford's Observations on the Disease of the Hip-joint, to which are added, some remarks on White-Swelling,* 8*vo. Lond.* 1794. *Doerner, De Gravioribus quibusdam Cartilaginum Mutationibus,* 8*vo. Tubingæ,* 1798. *Crowther on White-Swelling, &c. Edit.* 2, 1808. *J. Burns on Inflammation, Vol.* 2, *p.* 311. *Wm. Falconer, A Dissertation on Ischias, and on the Use of the Bath Waters as a Remedy,* 8*vo. Lond.* 1805. *Russell on Morbid Affections of the Knee,* 8*vo. Edinb.* 1802. *H. Park, An Account of a New Method of treating Diseases of the Joints of the Knee and Elbow,* 8*vo. Lond.* 1783. *Also H. Park and P. F. Moureau, Cases of the Excision of carious Joints; with Obs. by Dr. J. Jeffray,* 12*mo. Glasg.* 1806. *J. A. Albers, Abhandlungen über die Coxalgie, oder das sogenannte freywillige Hinken der Kinder,* 4*to. Wien.* 1807. *This work includes many valuable remarks, but, owing to the crowded state of this edition, it has been impossible to do its merit*

sufficient justice. G. Wirth, De Coxalgia, 12*mo. Wiceb.* 1809. *Paletta, Adversaria Chir. Prima,* 4*to. Hey's Practical Observations in Surgery, p.* 354, *&c. Edit.* 3. *Boyer, Traité des Maladies Chir. T.* 4, *Paris,* 1814. *Reimarus, De Tumore Ligamentorum circa articulos, Fungo articulorum dicto; Leydæ,* 1757. *Brambilla, in Acta Acad. Med. Chir. Vindob. T.* 1. *Brodie's Pathological Researches, respecting the Diseases of Joints, in Vols.* 4, 5, *and* 6 *of the Med. Chir. Trans.*—Also *his Pathological and Surgical Observations on the Joints,* 8*vo. Lond.* 1818, *and edit.* 2, 1822; *a work containing a great deal of correct and original information; and, in my estimation, the most scientific book ever published on the subject. Schreger Chirurgische Versüche, B.* 2, *p.* 209, *&c. Beiträge zur Nosologie der Gelenkkrankheiten,* 8*vo. Nurnberg,* 1818. *J. N. Rust, Arthrokakologie oder über die Verrenkungen durch innere Bedingung,* 4*to. Wien.* 1817:—*a publication of great merit. Dr. Tomaso Volpi, Abhandl. über die Coxalgie, aus dem Ital. übersetzt von Dr. P. Heineken: the original I have not seen, but the transl. contains copious extracts from the prize essay, which I drew up some years ago, with additional observations and cases. Richerand's Nosogr. Chir. T.* 3, *p.* 170, *&c. Ed.* 4. *Langenbeck, Neue Bibl. B.* 2. *p.* 337. *G. Gotz, De Morbis Ligamentorum,* 4*to. Berol.* 1799. *Delpech, Précis Elément. des Mal. Chir. T.* 2, *p.* 377, *T.* 3, *p.* 194, *p.* 470, *p.* 711, *&c. Paris,* 1816. *H. Mayo on an acute Form of Ulceration of the Cartilages of Joints, in Med. Chir. Trans. Vol.* 2, *p.* 104. *J. Wilson, Lectures on the Structure and Physiology of the Skeleton, and Diseases of the Bones and Joints,* 8*vo. Lond.* 1820. *E. A. Lloyd, A Treatise on the Nature, &c. of Scrophula,* 8*vo. Lond.* 1821. *The two last publications deserve attentive perusal.*

JUGULAR VEIN, how to bleed in. (See *Bleeding.*)

Jugular vein, internal, wounded. Dr. Giraud cursorily mentions a case, in which a French surgeon, at the military hospital of Toulouse, early in the year 1814, passed a ligature round the trunks of the common carotid artery and internal jugular vein. Both these vessels had been wounded by a musket-shot. On the sixth day from the application of the ligature, nothing unfavourable had occurred; but, the final result of the case is not related. (See *Journ. Générale de Med. &c. par Sedillot.*)

K.

KERATONYXIS. The term *keratonyxis,* derived from κερας, a horn, and νυξις, a puncture, is employed by the professors in Germany to denote the operation of couching performed through the cornea, or horny coat of the eye, the opaque lens being in this manner sometimes depressed, sometimes broken piecemeal, and, in other instances, merely turned, so as to place its anterior and posterior surface in the horizontal position. The latter method is what the German surgeons particularly imply by the phrase *reclination.* See *Cataract.*

KNEE, DISEASES, AND INJURIES OF THE. See *Dislocations; Fractures; Gunshot-Wounds; Joints, &c.*

L.

LACHRYMAL ORGANS, *Diseases of the.* The lachrymal gland cannot be said to be a part which is frequently the seat of disease. Richerand has seen no instance of an inflammation of this gland, unless by this expression be implied cases, in which all the contents of the orbit are more or less affected. (*Nosogr. Chir. T.* 2, *p.* 32.) I believe, that the surrounding cellular substance is more frequently attacked with inflammation and suppuration, than the gland itself. According to Professor Beer, (*Lehre von den Augenkr. B.* 1, *p.* 349,) true idiopathic inflammations of the lachrymal gland are very rare, and he declares, that, in the course of a practice of twenty-seven years, he has but seldom met with them. On this point he differs from Schmidt, who fancied that he had often had under his care cases of this description in gouty and scrophulous subjects. (*Ueber die Krankh. des Thränenorgans, p.* 134.) When the lachrymal gland is attacked with inflammation, its secretion, far from being augmented, as Richerand describes, is always considerably lessened, and therefore one of the earliest symptoms is an uneasy dry state of the eye, the secretion from the Meibomian glands, and mucous membrane of the eyelids, not being alone sufficient for keeping the eye duly moist and lubricated. This state is succeeded by a throbbing acute pain in the temple, shooting to the eyeball, forehead, upper and lower jaws, and back of the head. In the meanwhile, the temporal portion of the upper eyelid becomes swelled, tense, red, and exceedingly tender, the tunica conjunctiva being scarcely at all affected, and merely exhibiting a slight degree of redness and tumefaction towards the outer canthus. However, as the swelling of the gland increases, the eyeball becomes pushed more or less downwards, and inwards towards the nose. But, though there is little or no redness, nor any mark of inflammation, about the eye, this organ is tense, and extremely tender. The freedom of its movements towards the temple is much lessened in the beginning of the complaint, and, when the tumor has acquired a very large size, is quite destroyed. The impairment of vision is always proportionate to the protrusion of the eyeball, the pupil being diminished, and the iris motionless. The second, or suppurative, stage, Beer describes as ushered in by fiery appearances before the eye; an increased displacement of the eyeball; throbbing pain; great increase of the swelling of the upper eyelid, and of the conjunctiva, towards the temple; an annoying sensation of cold, and heaviness in the eye and orbit. Now, under febrile symptoms, rigors, &c. a yellowish point presents itself, either on the reddened portion of the conjunctiva, or on the outside of the eyelid, and a fluctuation becomes distinguishable. (*Beer*, *Lehre*, *&c. B.* 1, *p.* 350.) Beer speaks of abscesses sometimes forming in the vicinity of the lachrymal gland, and terminating in a small sinus, which communicates with one of the principal excretory tubes, and discharges occasionally a thin limpid fluid. (*Lehre von den Augenkr. B.* 2, *p.* 184.) The experience of this author leads him to consider these sinuses either as a consequence of an unskilfully treated abscess of the upper eyelid, or of a similar neglected affection of the cellular membrane, near the lachrymal gland; or, lastly, of the presence of a portion of the sac of a burst encysted tumor. According to Mr. Travers, the lachrymal gland often suppurates in children, and occasions an excessive swelling above the upper eyelid, depressing the tarsus so as completely to conceal the eye. The abscess, he says, may be conveniently opened, and discharged beneath the eyelid. (*Synopsis of the Diseases of the Eye*, *p.* 228.) With respect to the treatment of any local inflammation in and about the lachrymal gland, the best means of relief would be leeches, fomentations, emollient poultices, and other common antiphlogistic remedies. In the suppurative stage, Beer recommends mixing with the poultice a good deal of hemlock.

The lachrymal gland is subject to scirrhous enlargement, and, in cases of carcinoma of the eye, it is one of the parts, in which a return of the disease is apt to occur. Hence, it is now generally considered right to remove it, as soon as the eyeball has been taken away. (See *Eye*.) Sometimes, though rarely, the gland is primarily affected, and Guerin removed one in the state of scirrhus, and so much enlarged, that the eye was entirely covered by it. This operation was performed with such dexterity, that the external straight muscle was not at all injured. Mr. Travers removed a scirrhous and enlarged lachrymal gland. The vision of the eye had suffered considerably, during the growth of the tumor. The only deformity, after the operation, was a slight prolapsus of the eyelid. This gentleman recommends operations of this kind to be always done, if possible, beneath the eyelid. (*Synopsis*, *&c. p.* 228.) The lachrymal gland, in the state of scirrhus, has been successfully removed by Mr. Todd, (see *Dublin Hospital Reports*, *Vol.* 3,) and also by Mr. O'Beirne, of Dublin. (See also *Guthrie's Operative Surgery of the Eye*, *p.* 159, *&c.* and *J. Schmidt ueber die Krankheiten des Thränenorgans.*)

The caruncula lachrymalis is liable to chronic induration and enlargement, constituting the disease already spoken of in a foregoing part of this work, under the name of *Encanthis*, of which there is also a scirrhous, carcinomatous, or malignant form, quickly extending its effects to the eyeball, and the adjacent thin bones of the orbit. (*Beer*, *Lehre von den Augenkr. B.* 2, *p.* 188.)

From these subjects, I proceed to consider the diseases of the excreting parts of the lachrymal organs; cases which, though of the most various natures, were formerly all confounded together, under the title of *fistula lachrymalis*, and it is only within the last few years, that these complaints have been subjected to the same principles and distinctions, which are conceived to be highly useful in other branches of surgery. As Mr. M'Kenzie has judiciously remarked, the consequence of not distinguishing the different diseases of the excreting parts of the lachrymal organs from each other, has been an attempt to discover some single successful method of curing them all. "Now, there is no one method of treatment, by which this can be accomplished; and hence it is, that the several remedies, which have been proposed, being eminently successful in one or other of these diseases, but not adapted to all the rest, have at different times been held in such various degrees of estimation." (*On Diseases of the Lachrymal Organs*, *p.* 10, *8vo. Lond.* 1819.) And an intelligent critic observes, that in lachrymal diseases, obstruction of the nasal duct appears to be almost the only circumstance against which the treatment, recommended by the surgeons of France and England, has been directed. "On sait qu'au rétrécissement ou à l'oblitération du canal nasal, produits par une cause quelconque, est due, dans presque tous les cas, la maladie qui nous occupe; soit que, restées intactes, les parois du sac présentent une tumeur lachrymale, d'où les larmes refluent continuellement sur les joues, à travers les points lachrymaux: soit qu'en partie detruites et ulcérées, ces parois présentent une fistule, qui offre aux larmes un passage contre nature, sans cesse entretenue par elles; en sorte que ces deux états, la tumeur et la fistule, sont presque toujours des degrés différens d'une même affection, et que le traitement qui convient à l'une répose sur les mêmes bases que celui indiqué dans l'autre." (*Œuvres Chir. de Desault*, *T.* 2, *p.* 120.) It is evident from the writings of Pott and Ware, that even these authors considered the obstruction of the nasal duct, as the foundation of all the train of varied symptoms, presented by the excreting lachrymal organs. "An obstruction in the nasal duct is most frequently the primary and original cause of the complaint." "The seat of this disease is the same in almost every subject," says Mr. Pott (*Obs. on the Fistula Lachrymalis*); and Mr. Ware, in his observations on the same disease, sets out with the same assumption. Now, obstruction of the nasal duct is an occasional consequence merely of inflammation of the excreting lachrymal organs; in most of their diseases, obstruction of the nasal duct has no part; and one might, with as much propriety, treat all the affections of the bladder and urethra, by the dilatation of the latter part, as treat all the diseases of the excreting lachrymal organs, by dilating the nasal duct. The false assumption in question has led to most erroneous treatment. For instance, in blennorrhœa of the sac, and in hernia of the sac, though in both these diseases the nasal duct is patent, the common treatment, in this country, is to open the sac with a knife, and thrust down a style, or some other instrument, into the nose; thus destroying the organization of the parts which are affected merely with a gleety secretion in the one case, and with extreme relaxation in the other. Suppose (says the same critical writer) that some charlatan should make oath at the Mansion-house, that he had cured fifty, or a hundred, cases of gonorrhœa by opening the urethra in the perinæum, and passing a bougie through that tube, from behind forwards, who would approve of such an operation? Yet the laying open of the lachrymal sac, and thrusting a probe down into the nose, when the nasal duct is either perfectly patent, or, at the most, slightly tumid from inflammation, is neither less preposterous, nor less cruel. (See *Quarterly Journ. of Foreign Medicine*, *Vol.* 1. *p.* 293.) Indeed, it is somewhat surprising, that errors of this kind should have prevailed so long, particularly as experience had taught Mr. Pott, that slight cases might be benefited by the simple employment of a vitriolic collyrium; a fact which ought to have convinced him, that the disease did not always depend upon obstruction of the nasal duct. It is curious, therefore, that he did not fully see this mistake; for, that he knew of these diseases having great variety is evident, from the following remark:— "As the state and circumstances of this disease are really various, and differ very essentially from each other, the general custom of calling them all by the one name of fistula lachrymalis, is absurd." I believe that one great cause of deception has been the fact, that, though laying open the lachrymal sac, and the introduction of instruments down the nasal duct, have been frequently practised, when milder plans would have answered every purpose, yet a cure has often followed the practice, and thus confirmed the supposition of relief having been effected by the removal of the imaginary obstruction in the nasal duct. Thus, the late Mr. Ramsden, of St. Bartholomew's, with whom I served my apprenticeship, always followed the common plan of passing a probe down the nasal duct, and letting the patient keep a piece of bougie, or a style, in the part for two or three months afterwards; and I scarcely recollect an instance in which he failed to accomplish a cure, though I have no doubt, that the same benefit might sometimes have been obtained without any operation at all. And a discerning practitioner should never forget that, if no permanent obstruction exist in the nasal duct, a cure will generally follow, on the subsidence of inflammation, and a change taking place in the action of the parts, whether a probe, style, cannula, bougie, or seton, be employed, or not.

Erysipelas of the Parts covering the Lachrymal Sac.—Beer considers it highly necessary, that this case should be discriminated from inflammation of the sac itself, which is often but little affected, and this even when an abscess forms. Unless the true nature of the disease be comprehended, the surgeon is apt to suppose, that the matter is in the sac itself, and believes, that, when he makes an opening, he is puncturing that receptacle, whereas he is, in reality, merely dealing with a superficial abscess of the integuments. Nor, as Beer has observed, is the mistake free from ill consequences; for, imagining that the wound is made into the sac, the surgeon pokes about with his probe so long, that a good deal of unnecessary pain and inflammation is produced. According to the same author, the case is not very frequent, and is mostly met with in scrophulous subjects, who have had for a considerable time a blennorrhœa of the lachrymal sac. The inflammation partakes of the usual characters of erysipelas, and commonly extends to the eyelids, particularly the upper one. The absorption and conveyance of the tears into the lachrymal sac are interrupted, because the inflammation constantly affects the lachrymal ducts and papillæ, the latter appearing considerably shrunk. When the inflammation spreads over the side of the face, Beer says, there is usually a discharge of thin mucus from the nose; and when the affection extends more deeply, to the anterior portion of the lachrymal sac, as may easily happen, when the case is neglected, or treated in its first stage with stimulating applications, a bean-shaped, circumscribed, hard, painful tumor may be felt, or is even denoted by its very red appearance. The puncta lachrymalia are now completely closed, the papillæ shrivelled up, and the nostril on the affected side very dry and tender.

If in the first stage of the disorder, the lachrymal papillæ and canals have not been too violently affected, the former parts expand again, and the absorption of the tears recommences, with the second stage. But, at this period, according to the observations of Professor Beer, a good deal of mucus is secreted from the caruncula lachrymalis and Meibomian glands, and collects and glues the eyelids together, especially during sleep. At the same time, mucus generally accumulates in the lachrymal sac itself, and may be voided both through the puncta lachrymalia and nasal duct, by gentle pressure. The mucous discharge from the nostril also acquires a thicker consistence. Should the lachrymal papillæ and ducts have suffered more severely in the first stage of the disease, the due absorption of the tears does not begin after the subsidence of the inflammation, and a dropping of them over the cheek, a *stillicidium lachrymarum*, frequently continues a long while after the termination of the other symptoms. It depends upon the atony of the lachrymal puncta and ducts, and is very troublesome in cold wet weather. And, when the lachrymal sac itself has been a good deal inflamed in the first stage of the complaint, a large quantity of mucus collects within it in the second stage, and may be discharged by pressure. Sometimes the subcutaneous abscess actually communicates with the cavity of the sac; a case, which Beer terms a spurious fistula of the lachrymal sac, the matter not being formed in that receptacle itself, but getting into it from the external abscess. As the skin is generally rendered very thin, these abscesses near the bridge of the nose usually burst by several openings. Beer remarks, that it is easy to learn, whether the ulceration extends through the lachrymal sac; for when this has happened, the slightest pressure upon the superior part of the sac produces a discharge of pus and mucus from the external opening, and, if the lachrymal canals have already recommenced their functions, the discharge will also be mixed with tears. (See *M'Kenzie on Diseases of the Lachrymal Organs*, *p.* 22.) The quantity of matter, which flows out, is likewise so copious, that it is evident it could not have been all lodged between the skin and orbicularis palpebrarum muscle, but must have come partly out of the lachrymal sac. The use of a fine probe will remove any doubt which may be left. *(Beer, Lehre von den Augenkr. B.* 1, *p.* 332—35.)

On the subject of the causes of this complaint, the preceding author delivers no remark worthy of notice. In speaking of the prognosis, he observes, that when the case is not neglected, nor wrongly treated in its first stage, and the inflammation has not extended to the lachrymal sac, the prognosis is very favourable; for, after the subsidence of the inflammation, a temporary atony of the lachrymal puncta and ducts, an imperfect conveyance of the tears into the nose, and of course a slight oozing of them over the cheek, most troublesome in cold, wet weather, are the chief inconveniences which remain. But, when the lachrymal sac participates in the inflammation, the prognosis is much less favourable; because, when suppuration takes place, ulceration is apt to form an opening in the front part of the sac, or else, during the second stage, a large quantity of mucus may collect in the sac, and, if not skilfully treated, it frequently ends in a very obstinate blennorrhœa of that part. As Beer observes, this is a case which is often, though quite erroneously, named a fistula lachrymalis. *(B.* I, *p.* 336.)

The prognosis is also very favourable in the second stage of the complaint, as long as the suppuration is restricted to the integuments, and it is characterized by desquamation and scabbing; but, the case is more serious, when a large collection of matter forms, and particularly when the abscess makes its way into the lachrymal sac. In these last circumstances, an obstinate blennorrhœa from the sac often follows, notwithstanding the fistulous sore be treated in the most skilful manner, and sometimes the matter spreads so far around, as to spoil, and even annihilate, the lachrymal canals, and cause an irremediable dropping of tears over the cheek, during the rest of the patient's life. (*Beer.*)

The suppuration (says Mr. M'Kenzie) may destroy the ligamentous layer of the lower eyelid, and end in the total obliteration of the cavity of the sac. But, when the sac is not thus annihilated, and the lachrymal canals are destroyed, it is necessary that the cavity of the sac should be obliterated by artificial means; for otherwise a form of disease will follow, which Beer denominates *hydrops sacci lachrymalis*, and Mr. M'Kenzie, *mucocele*, as will be hereafter noticed.

"In common cases, a piece of folded linen, dipped in cold water, and applied to the parts affected, and the administration of gentle doses of sulphate of magnesia, make up the treatment. In severe cases, it will be found necessary, not only to continue the cold applications, and to open the bowels, but to administer an emetic of tartrate of antimony, to purge freely, and even sometimes to take away blood from the arm." (*M'Kenzie, p.* 24.)

In the second stage, a warm dry air, and a linen compress, are commended, with the exhibition of diaphoretics. In the two first of these means, I confess, that I should place little or no confidence. When the formation of matter cannot be prevented, poultices are to be used. Beer particularly cautions us not to leave the abscess to burst of itself, but to open it immediately a fluctuation can be felt, so as to prevent an ulcerated opening from taking place in the anterior part of the lachrymal sac. And, if the surgeon has not been consulted before such a communication has been established between the sac and subcutaneous abscess, he should avoid all unnecessary disturbance of the parts with probes and syringes, and, at most, only wash out the abscess once a day with Anel's syringe, filled with lukewarm water and a little of the vinous tincture of opium. Beer also recommends introducing into the superficial abscess, but not into the sac, a small quantity of lint, dipped in the tincture. If the blennorrhœa of the sac continue, it is to be treated as will be explained in considering the second stage of inflammation of that part.

Inflammation of the Lachrymal Sac.—According to Beer, the symptoms of the first stage of this complaint are as follows: in the corner of the eye, precisely in the situation of the lachrymal sac, a circumscribed, very hard, tender, swelling arises, of the shape of a bean, producing a lancinating pain when it is touched, and gradually acquiring considerable redness. The absorption and conveyance of the tears into the lachrymal sac, and thence into the nose, are completely interrupted; the lachrymal papillæ are shrunk; the puncta cannot be seen; and of course the tears fall over the cheek. The nostril on the affected side is at first very moist, but soon becomes perfectly dry, the mucous membrane being a good deal affected. As the inflammation also constantly spreads to the orbicular muscle and integuments in the corner of the eye, the complaint often presents an erysipelatous appearance, extending to the eyelids and down the cheek; but, the circumscribed swelling, caused by the inflamed sac, is still not only capable of being distinctly felt, but even seen. It rarely happens, in cases of common inflammation, that, on the change of the first stage into the second, the nasal duct is rendered impervious by an effusion of lymph; but such an occurrence is more frequent where the inflammation is not of a healthy description, and the patient is scrophulous. Under these circumstances, the lachrymal canals may also be permanently obliterated. In weak, irritable constitutions, towards the end of the first stage of the inflammation, a degree of symptomatic fever prevails, with severe head-ache, great redness and swelling of the whole inner canthus, involving the caruncula lachrymalis, the semilunar fold, the conjunctiva, the edges of the eyelids, and the lachrymal puncta.

Here, as in inflammation of every mucous membrane, at the very commencement of the second stage, a copious morbid secretion takes place, and accumulates in large quantity; for, either in consequence of the thickening of the mucous membrane, the adhesion of the sides of the nasal duct together, or there being no mixture of the tears, the secretion within the sac cannot escape either into the nostril, or out of the lachrymal puncta, and consequently it distends in a prodigious degree the anterior side of the sac, where it is uncovered by bone. Hence, the swelling is here very manifest, and a fluctuation may be felt in it, even before the suppurative stage has actually begun. According to Beer, whoever is induced by the fluctuation to open the lachrymal sac at this period, will certainly bring on a very hurtful suppuration of the part, exceedingly likely to render the excreting parts of the lachrymal organs completely unserviceable. At the beginning of the second stage, there is also a morbid secretion from the mucous membrane of the nostril and caruncula lachrymalis. Now, not only the swelling of the lachrymal sac increases more and more, but the redness acquires a deeper colour, the skin becomes more shining, the fluctuation still more evident; and, at length, in the centre of the tumor formed by the lachrymal sac, a yellowish, soft point presents itself. In this state of things, in order to prevent a true fistula, the surgeon should make an opening in the lachrymal sac, without the least delay; for, if the abscess be left to itself, the pus will at last make a passage for itself through the orbicular muscle and integuments; but it will only be a small fistulous opening, surrounded with callous hardness, and merely capable of letting some of the pus and mucus of the sac escape, so that the thicker part of the matter remains behind, and, consequently, though the swelling diminishes after the formation of a spontaneous opening, it does not entirely subside. A quantity of blood is also remarked to be blended with the discharge from the sac. This last is the case, which Beer denominates a *true fistula of lachrymal sac.* When the abscess bursts of itself, the fistulous opening in the sac is not always exactly opposite the aperture in the skin, and, though there is commonly but one communication with the sac, it sometimes happens, that several small external openings are produced more or less distant from the sac. The diagnosis is easy enough; for, on pressing upon the upper portion of that receptacle, mucus and pus, blended together, are immediately discharged from all the fistulous apertures. After the disease has lasted a good while, it not unfrequently happens, that tears are also voided from the fistulous opening; a circumstance, indicating the restored action of the lachrymal puncta and canals; but, according to Beer, such tears are never duly blended with the mucous and purulent matter. He further remarks, that, when the second period of the second stage, or the suppurative process is over, a morbid secretion of mucus still continues in the third period of the second stage, that secretion becoming whitish, thick, opaque, and only partly resembling pus. As, in consequence of its thickness, and the swelling of the mucous membrane of the nasal duct, the secretion cannot descend into the nose, it collects in the sac, and sometimes pushes off any piece of lint, or plaster, with which the external opening in the sac has been closed. At length, by means of judicious treatment, this third period of the second stage is also brought to a termination; the mucus is secreted again in due quantity; it becomes transparent like white-of-egg, and viscid; but white streaks may be for some time perceived in it. Afterwards the mucus becomes thinner, and, if the functions of the lachrymal puncta and ducts are not destroyed, it is thoroughly mixed with the tears. The opening in the lachrymal sac now either heals up of itself, or under skilful treatment; but, in general, a minute fistulous aperture still remains, from which the tears and mucus are occasionally voided, if the passage through the nasal duct be not free. However, if the small fistulous aperture should happen to heal up completely, the mucus and tears accumulate in the sac, and the patient is obliged to press them out through the puncta lachrymalia, several times a day.

When the surgeon is consulted early enough, and proper treatment is adopted, Beer sets down the prognosis in the first stage of the inflammation as very favourable. But, if the practitioner be called in later, it will not be in his power completely to disperse the inflammation, and prevent the morbid secretion, and accumulation of mucus in the lachrymal sac; the *blennorrhœa* of this part, of Professor Beer, or the *dacryops blennoideus*, of Schmidt; a state, however, which soon gives way to judicious treatment. But, when the case is neglected, or wrongly managed at the period, when the lachrymal sac is violently inflamed, a complete, or partial, closure of the nasal duct by adhesive inflammation is apt to be the consequence. And, the same effect may also be produced in the lachrymal canals, in which event, the absorption of the tears is for ever impeded, and the patient must remain the rest of his life afflicted with the stillicidium lachrymarum.

With regard to the prognosis in the second stage of inflammation of the lachrymal sac, Beer considers it as very dubious, on account of the impairment of the functions of the excreting parts of the lachrymal organs; for, says he, no surgeon can exactly know, what may have been the result of the first stage, in relation to the perviousness of the nasal duct and lachrymal canals, and an officious examination of the parts with a probe, for the purpose of obtaining information, would be attended with considerable mischief. However, generally speaking, the prognosis is most hopeful at the first period of the second stage, just when the morbid secretion of mucus is beginning; the suppuration may yet be moderated by right treatment, and the excreting parts of the lachrymal organs preserved. But, if the suppurative stage has already come on, much will depend upon the consideration, whether the matter has been originally formed in the lachrymal sac, has lodged there a good while, and the sac is ready to burst, or whether there is actually an opening in the sac opposite that in the skin, or, lastly, whether the openings do not correspond. In the first case, the suppuration yet admits of being regulated by judicious treatment, and the lachrymal sac can be punctured; but, in the other circumstances, the management of the case is far more difficult, especially when the patient's constitution is not good. However, the surgeon should be careful not to disfigure the patient with a large scar; and the aim should be to prevent atony of the lachrymal puncta and ducts, and a consequent stillicidium lachrymarum. These are the least serious evils to be apprehended from mismanagement; for, if the case be ill-treated, or neglected, in the later stage of the suppurative process, necessarily attending a fistulous state of the sac, the lachrymal organs may be rendered quite useless, or even entirely destroyed, and the nasal duct obliterated, or obstructed by the effects of caries. In some few instances, indeed, the whole lachrymal sac is destroyed, or will require to be so by art, as will be presently explained. It is always a favourable circumstance, when the tears are seen to issue from the fistulous opening with the mucus and pus, as it is a proof, that the absorption and conveyance of the tears into the lachrymal sac are established again, and that now the only question is about the state of the nasal duct, which point cannot be determined, before the fistula is completely healed, and the third period of the second stage is entirely obviated. (*Beer, Lehre von den Augenkr. B.* 1, *p.* 356—367.)

In the first stage, the indication is to endeavour to resolve the inflammation. "It is (as Mr. M'Kenzie observes) by combating the inflammation, that we are to cure this disease, and not by attacking merely one, or even several of the symptoms. Dilatation, for instance, by the introduction of probes through the canals into the sac, and even into the nose, would only be subjecting the inflamed parts to a new cause of irritation, and might thus produce effects, which would render a complete cure difficult, if not impossible." On the contrary, in the first stage, Mr. M'Kenzie joins Beer in praise of antiphlogistic measures; the application of cold lotions to the part; and, in severe cases, venesection and leeches are set down as proper, together with opening and diaphoretic medicines. (*On Diseases of the Lachrymal Organs*, *p.* 33, 34.)

In the second stage, when resolution is no longer practicable, emollient applications are the most beneficial, and all debilitating means are to be stopped, by the further use of which an incurable blennorrhœa of the lachrymal sac would be likely to be induced. And, as soon as the sac is so distended with mucus and matter, that the centre of the swelling begins to be soft, and a fluctuation is perceptible, the sac should be freely opened, so as to let its contents have a ready outlet. If, after this evacuation, there should be any deep-seated hardness of the lachrymal sac, Beer recommends the application of a camphorated hemlock poultice. Afterwards, the wound in the skin and sac is to have introduced into it a little bit of lint, dipped in the vinous tincture of opium, over which dressing a piece of diachylon plaster may be placed. When, under such treatment, the suppuration diminishes, but a preternatural secretion of mucus yet continues, Beer introduces into the wound every day a piece of lint, on which is spread a little bit of the following ointment: ℞. Butyri recentis insulsi, ℥ss. Hydrargyri Nitrico-Oxydi, gr. x. tutiæ, ptt. gr. vj, M. And, on changing the dressings, some of the following lotion may be dropped into the inner canthus, and injected lukewarm into the sac itself: ℞. Subacetatis Cupri, Potassæ Nitratis, Aluminis, āā gr. iij.—vj. Camphoræ tritæ gr. ij.—iv. Aquæ distillatæ ℥ss. Solve et cola. Liquori colato adde Vini Opii ʒj.—ʒij. Aquæ Rosæ ℥iv. M. Professor Beer makes a mass of the three first articles melted together in equal proportions, and terms it the *lapis divinus*, of which he makes the lotion, and then adds the other ingredients. When, by means of such treatment, the mucous secretion from the sac has been brought into a healthy state, and all the induration has subsided, the period has arrived for the surgeon to think of taking measures for the re-establishment of the passage through the nasal duct, if it should not already have become pervious of itself, which, when the inflammation has been of a healthy kind, and the treatment judicious, very frequently happens. (*Beer, Lehre, &c. B.* 1, *p.* 369—371.)

Chronic Blennorrhœa of the excreting Parts of the Lachrymal Organs.—Mr. M'Kenzie, whose essay contains a faithful account of Beer's opinions upon the present subject, describes the inflammation, with which this form of disease commences, as seldom considerable, and in scrophulous patients, it is said to be not unfrequently quite disregarded, no advice being taken until the lachrymal sac is much distended with mucus. By means of pressure upon the bean-shaped tumor, caused by such distention of the sac, a quantity of puriform mucus is forced out of the puncta lachrymalia, and overflows the eye; and so far are the lachrymal canals from being obstructed, that, excepting when any return of inflammation happens, they even absorb, and convey the tears into the sac. Pressure, however, will rarely make the contents of the sac pass through the nasal duct, on account of the thickened state of the mucous membrane, and therefore the nostril is generally very dry. "In the course of this tedious disease, the accumulated mucus varies much both in quantity and quality. For instance, the mucus accumulates more rapidly, and is much thicker after a good meal, than at other times. The secretion of it is very plentiful, but thinner than usual, when the patient continues long in a moist cold atmosphere. In this case, the overfilling of the sac takes place so rapidly, that the compression of the orbicularis palpebrarum in the action of winking is sufficient to evacuate the sac through the canals to such a degree, that the whole surface of the eyeball is suddenly overflowed, and the puriform fluid runs down upon the cheek. After the patient remains for a short time in a warm and dry atmosphere, the morbid secretion becomes sparing and ropy. We find, that this chronic blennorrhœa almost completely disappears in many individuals during warm weather, upon which the yet unexperienced patient and the unexperienced surgeon are apt to express a great, but a premature joy, for, on the very first change to cold and wet weather, the disease most frequently returns."

During chronic blennorrhœa, the lachrymal sac is extremely liable to repeated attacks of inflammation, and sometimes a fistula, with a good deal of induration of the surrounding cellular substance, is produced. Mr. M'Kenzie represents this disease as the most frequent of all those, to which the excreting parts of the lachrymal organs are liable, and as consisting in inflammation of these organs, modified by scrophula, general debility, disorder of the digestive organs, or other constitutional causes, which prolong its second stage. "Even regarded locally, the present disease is seldom a primary affection, but is most frequently excited by catarrhal inflammation of the Schneiderian membrane, or by a long-continued disorder of the Meibomian glands." (*M'Kenzie on Diseases of the Lachrymal Organs*, *p.* 37—40.)

Scarpa's opinions on the present subject are in some degree peculiar to himself; for he considers the affection of the Meibomian glands and inside of the eyelids, the *puriform palpebral discharge*, as he terms it, as constituting the first degree of all those complaints, which have usually gone under the name of fistula lachrymalis; the second degree, or effect, being the tumor of the lachrymal sac; and the third, the fistula, or ulcerated opening in the latter part. Scarpa asserts, that the chief part of the yellow viscid matter, which accumulates in the lachrymal sac, is secreted by the lining of the eyelids, and by the little glands of Meibomius; and that the altered quality of this secretion has a principal share in the cause of the disease. He states, that the truth of this fact may at once be ascertained by everting the eyelids, and especially the lower one of the affected side; and by comparing them with those of the opposite eye. The former will always exhibit an unnatural redness of the internal membrane, which has a villous appearance, all over the extent of the tarsus; while the edge of the lid is swollen; and numerous varicose vessels are distinguishable on it. The follicles of Meibomius are also turgid and prominent, and when examined with a magnifying glass, not unfrequently appear to be slightly ulcerated.

" The villous structure, then, which the surface of the internal membrane of the palpebra assumes in these cases, becomes an organ secreting a larger quantity of fluid than usual, resembling viscid lymph, which, as before stated, being mixed with the sebaceous matter, copiously effused from the glands of Meibomius, constitutes the whole of the viscid fluid, with which the eyelids are imbued, and which is continually carried by the puncta lachrymalia into the sac, so as to fill, and also frequently distend it, until it forms a tumor.

" If, indeed, the lachrymal sac is emptied of this matter, by means of compression, and the eye and internal surface of the palpebræ are carefully washed, so that none of the glutinous humour, pressed from the sac, may remain upon them, and the eyelids are everted half an hour afterwards, the internal surface, especially of the lower one, will be found covered with a fresh effusion of mucus mixed with sebaceous matter, which has evidently not flowed back from the lachrymal sac to the eye, but has been generated between the eye and the palpebræ." Another argument, brought forward by Scarpa, in support of his theory, is, that, if the morbid secretion of the eyelids be retarded, or suppressed, either accidentally, or by means of astringent applications, little, or none of the viscid secretion collects in the lachrymal sac, or can be forced out of the puncta lachrymalia. He has also constantly observed, that the puriform discharge may be radically cured at its commencement, and before it has induced any flaccidity of the sac, by a timely correction of the morbid secretion from the inside of the eyelids, and keeping the lachrymal passages cleansed, by means of injections of simple water through the puncta lachrymalia into the nose. As for the internal membrane of the sac itself, he argues, that its structure does not qualify it for secreting a tenacious unctuous matter, like what is chiefly discharged from it, as it is entirely destitute of sebaceous glands, and can in reality only furnish a thin mucus. However, he admits, that if the sac happen to be inflamed, and ulcerated, a turbid matter may issue from it with the tears; but, says he, this matter is true pus, and quite different from the curdy unctuous fluid, which takes place in the puriform palpebral discharge. (*On the Principal Diseases of the Eyes, Transl. by Briggs, Ed. 2, p.* 3—7.)

The foregoing opinions of Scarpa have not met with universal assent, and, though there is probably much truth in them, he may have overlooked too much the possible simultaneous affection of the mucous membrane of the lachrymal sac and nasal duct. To Scarpa's hypothesis, Himly and Flajani have made the following objections: First, that they have observed the fistula lachrymalis, without the least morbid alteration of the eyelids and Meibomian glands. Secondly, that every puriform discharge of the eyelids is not succeeded by a fistula lachrymalis. Lastly, that the fistula lachrymalis is cured by means of the operation alone, without any attention being paid to the morbid state of the eyelids, when it exists. And Mr. Travers also regards Scarpa's account of the origin of the disease, independently of a permanent stricture, as hypothetical; for, if founded in fact, the distention of the lachrymal sac, and the regurgitation of the fluid on pressure, would attend every severe lippitudo, or ophthalmia with puriform discharge, which is not the case. If Scarpa's account were correct, Mr. Travers sees no reason why the fluid, once admitted, should be arrested, or regurgitate, instead of passing into the nose, (see also *Nicod. in Revue Med. T.* 1, *p.* 155,) and he thinks, there is every reason to believe, that the fluid, so discharged, is the proper secretion of the sac, and cases are frequent, in which it is retained and cannot be expressed, owing to strictures both of the lachrymal and nasal ducts. (*Synopsis of the Diseases of the Eye, p.* 360.) Some of the arguments, with which Scarpa meets this reasoning, are already anticipated, especially that which refers to the difference between the secretion of the sac itself and that of the sebaceous glands of the eyelids. Also, in asserting, that the origin of the fistula lachrymalis generally manifests itself on the eyelids, before the lachrymal passages are affected, Scarpa declares, that he does not pretend thereby to exclude altogether the possibility ot a case, in which the membranes of the nasal duct and lachrymal sac may not be thickened and ulcerated, independently of the disease of the eyelids. That this is the case, I think is evident from the account, already delivered in the two first sections of this article, of Beer's opinions, respecting the consequences of inflammation of the integuments and other parts about the inner angle of the eye, as well as respecting the effects of acute inflammation of the lachrymal sac itself. However, Scarpa admits the fact, and the question left is, whether he is right in assigning the morbid secretion from the inside of the eyelids, as the most common cause of the swelling, ulceration, &c. of the lachrymal sac? That every puriform discharge from the eyelids is not followed by fistula lachrymalis, he allows, is unquestionable; and this, he conceives, most probably happens, because the lippitudo has not been entirely neglected, or because the secretion being less dense and viscid, than usual, descends freely with the tears into the nose through the lachrymal canals, which are large and pervious. But, in the acute stage of the purulent ophthalmia, he asserts, that the reason why the discharge is not conveyed into the sac is, that the inflammation and swelling actually close the puncta lachrymalia, and change their direction, so that both the puriform matter and the tears fall over the cheek, and cannot descend into the sac.

As for the instances of cure, without any remedies being applied for the correction of the state of the eyelids, Scarpa deems the argument inconclusive, because particular vices of the constitution, under the use of appropriate internal remedies and a well-regulated diet, disappear, or are transferred to other parts, without the use of topical remedies.

For my own part, I am disposed to believe, that, whether the disease begin in the eyelids, or elsewhere, generally both their lining, and that of the sac and nasal duct are also more or less affected; and, consequently, though Scarpa's theory may not be in every respect satisfactory, nor at all applicable to certain disorders of the excreting parts of the lachrymal organs, the practice, to which his sentiments lead, will, in the generality of cases, which Beer denominates *chronic blennorrhœa*, be highly advantageous.

According to Mr. M'Kenzie, the local treatment of chronic blennorrhœa does not differ essentially from that of inflammation of the excreting parts of the lachrymal organs. But, every possible means must also be employed for improving the general health; for, otherwise, all local remedies will be unavailing. In scrophulous cases, particular attention must be paid to diet and mode of living. In weakly persons, the preparations of iron will be highly beneficial; and, when the disease is connected with disorder of the digestive organs, the treatment, recommended by Mr. Abernethy, is that to which Mr. M'Kenzie expresses a preference. The employment of Anel's syringe and probe is strongly reprobated. "I grant, (says this author,) that the application of certain substances to the mucous membrane affected, is one of the most powerful means, which we possess, of correcting its disposition to chronic blennorhœa. But, he who believes, that the best manner of applying these substances, is to inject them with Anel's syringe, introduced through the puncta, is lamentably mistaken. He is, in fact, closing his eyes upon what he must know of the functions of the several parts of the lachrymal organs, and is doing that very thing, which is calculated to prolong and exasperate the disease. Except at the time of a smart renewal of the inflammation, the puncta and canals, during this disease, continue in the exercise of their functions. Whatever fluid, therefore, is dropped into the lacus lachrymarum, will be taken up by the puncta, conveyed through the canals, and applied to the whole internal surface of the sac. Even ointments, placed within reach of the puncta, will be absorbed in the same manner. We ought then first of all to empty the sac by pressure, and, if possible, through the nasal duct into the nose. Having placed the patient upon his back, we drop into the lacus lachrymarum a small quantity of a weak solution of corrosive sublimate. ℞. aq. ros. ℥iv. hydrarg. oxymuriatis grss. grj. Mucil. ʒj. vini opii ℈j. M. After remaining for a quarter of an hour in that position, he ought to rise, but without wiping away any of the collyrium, which may remain. After another quarter of an hour, the eyelids are to be carefully dried, and a little of Janins's ophthalmic ointment applied with a camel-hair pencil to the caruncula lachrymalis and edges of the eyelids. All this is to be carefully repeated twice a-day." Professor Schmidt recommends the following collyrium. ℞. Aq. rosæ, ℥vj. acid nitrici, ℈j. alcoholis, ʒj. M. For the removal of the induration over the sac, gentle friction, with camphorated mercurial ointment, is recommended. And, says Mr. M'Kenzie, if the blennorrhœa depend upon chronic inflammation of the Meibomian glands, the diluted citrin ointment is to be applied every evening at bed-time. (*On Diseases of the Lachrymal Organs, p.* 43, *&c.*) In the first stage of what Scarpa terms the puriform discharge of the palpebræ, when the weeping is incipient, this author states, that a cure may be effected, without dividing the sac, or any other painful operation. His practice consists in restraining the immoderate secretion from the Meibomian glands and internal membrane of the palpebræ, and in cleansing the viæ lachrymales through their whole extent by means of injections of warm water, rendered more active by the addition of a little spirit of wine, and thrown into the puncta lachrymalia every morning and evening; a measure, which, as already stated, is disapproved of by Mr. M'Kenzie, Schmidt, &c. Scarpa considers Janins's ophthalmic ointment, weakened with lard, or fresh butter, as the best application for correcting the morbid secretion of the eyelids. A portion, equal to the size of a barley-corn, is to be introduced upon the point of a blunt probe, every morning and evening, between the eye and eyelids, near the external angle, and the edges of the eyelids are to be smeared with it. The eye is then to be shut, and the eyelids gently rubbed, so that the ointment may be distributed upon the whole of their internal surface. A compress and bandage should be applied, and the eyelids kept closed for two hours. At the end of this time, the eye should be washed with the zinc collyrium. When there are superficial ulcerations at the edges of the eyelids, Scarpa applies to them either Janins's ointment, or the unguentum hydrarg. nitrat., and, in very obstinate cases, the argentum nitratum itself. If the vessels of the conjunctiva are varicose, he drops into the eye the tinctura thebaica. (*Scarpa, Ed.* 2, *by Briggs, chap.* 1.)

The late Mr. Ware was earlier, than Scarpa, in pointing out the advantage of making applications to the inside of the eyelids, for the relief of certain forms of disease, usually classed with fistula lachrymalis.

"When an epiphora (says he) is occasioned by an acrimonious discharge from the sebaceous glands on the edges of the eyelids, it must be evident, that injections into the sac will be very insufficient to accomplish a cure, because the sac is not the seat of the disorder. The remedies that are employed must be directed, on the contrary, to the ciliary glands themselves, in order to correct the morbid secretion that is made by them; and for this purpose, I do not know any application that is likely to prove so effectual as the unguentum hydrargyri nitratri, of the new London Dispensatory, which should be used here in the same manner, in which it is applied in common cases of the psorophthalmy. It will be proper to cleanse the eyelids every morning, from the gum that collects on their edges during the night, with some soft unctuous applications; and I usually advise to apply to them, two or three times in the course of the day, a lotion composed of three grains of white vitriol, in two ounces of rose, or elder-flower water." (*Additional Remarks on the Epiphora.*)

In a modern periodical work may be perused some interesting remarks by M. Nicod, which perfectly accord with the sentiment already expressed, that whatever may be its primary seat, the chronic inflammation is not generally limited to the inside of the eyelids, but extends throughout the membranous lining of the sac and nasal duct, and, that this circumstance, in conjunction with the altered and viscid nature of the secretions, accounts for their not readily descending into the nose, but regurgitating through the puncta. M. Nicod also relates cases exemplifying, that the ointment applied to the inside of the eyelids actually passes with the matter into the lachrymal sac, and thence into the nose, so as to act upon and cure the chronic inflammation of the sac and nasal duct, as well as that of the Meibomian glands and lining of the eyelids. (See *Revue Medicale Historique, &c. T.* 1, *p.* 156, 8*vo. Paris*, 1820.) The proceedings for adoption, when the nasal duct is obstructed, will now be considered.

Obstruction of the Nasal Duct.—That a permanent closure of this canal does not so frequently attend diseases of the lachrymal organs, as writers have generally imagined, must be evident from the remarks already delivered; and also that its perviousness, when interrupted partly by inflammation and thickening of its lining, and partly by the viscid curdy nature of the matter, may generally be restored, without thrusting any probes, tubes, or other instruments down the passage, (measures, more likely, under these circumstances, to do harm, than good,) is a fact, which is no longer questionable. The treatment, necessary in such cases, must be already intelligible from what has been said in the preceding sections, the indication being the diminution of the thickened state of the mucous membrane, by means adapted to the acute, or chronic form of the inflammation, and, in many cases, the correction also of the morbid state of the Meibomian glands and internal membrane of the eyelids. It is only when the treatment, conducted upon these mild principles, is found ineffectual, that the surgeon should think of examining the state of the nasal duct, and learning, by the introduction of a fine probe into the passage, whether any permanent stricture, or obstruction, is present. It does not appear to me, that it is a matter of much importance, whether the probe be made of whalebone, as Beer recommends, or of silver; but, that it should not be too thick is a thing certainly deserving greater attention. Supposing there is no direct opening through the skin into the lachrymal sac, one should be made with a lancet. However, a mere puncture will suffice, as a large incision, beginning just below the tendon of the orbicularis palpebrarum muscle, and extending in a semilunar form, nearly an inch downwards and outwards, as used to be the old practice, can here answer no rational object, the surgeon merely having occasion for a small direct opening, through which he may conveniently pass a small probe, for the purpose of ascertaining the state of the nasal duct. "The probe, (as Mr. M'Kenzie observes,) is to be introduced horizontally, till it touches the nasal side of the sac; it should then be raised into a vertical position, and its point directed downwards and a little backwards. Turning the probe upon its axis, we pass it from the sac into the duct; and as we continue to press it gently downwards, the instrument, if the sac is pervious, enters the nose. If its point meets with some obstruction, we must not immediately conclude, that there is an obliteration of the duct. We must press down the probe a little more strongly, yet without violence, turning it round between the fingers, and giving it different directions. By these means, the obstacle is frequently overcome, and the probe suddenly descends. If the obstacle remains as before, and is extremely firm, still this is not sufficient ground for us to conclude, that there is a real obliteration," because, as the author proceeds to point out, the difficulty may arise from a mere thickening of the mucous membrane and swelling and induration of its cryptæ. (*M'Kenzie on the Lachrymal Organs, p.* 78.)

When the probe has entered a good way down the nasal duct, and becomes, as it were, wedged, Beer leaves the instrument in this position, until the next time of dressing, taking care, however, to fix it to the forehead, so that it may not slip out again. At the same time, he introduces into the lachrymal sac a tent, which he keeps in with a piece of sticking plaster (*Lehre von den Augenkr. B.* 2, *p.* 168); a measure which, I conceive, may be advantageously dispensed with. When, at length, the probe can be made to pass with some trouble into the nostril, Beer recommends introducing the instrument regularly every day, until the increased diameter of the passage allows it to be put in and withdrawn without the slightest difficulty. The period is now arrived, when Beer conceives, that some measure should be taken for rendering the perviousness of the nasal duct complete and permanent, and thus entirely re-establishing the efficiency of the excreting parts of the lachrymal organs. But, says this author, whoever merely aims at restoring the natural diameter of the nasal duct by mechanical means, fulfils only one, and that not the most essential, indication. And, in order that the duct may retain its natural diameter, and the tears and mucus descend freely into the nose, it is necessary, that the morbid state of the mucous membrane be first removed, and the action of the excreting parts of the lachrymal organs rectified again; objects, which cannot be performed by any mechanical means. Hence, Beer places considerable stress upon the necessity of obviating every unfavourable state of the health, likely to affect the mucous membrane of the lachrymal sac. For the purpose of restoring the natural diameter of the nasal duct, the experience of many years has convinced him, that pieces of violin catgut, which are to be gradually increased in size, are the best. The end of the piece, which is to be introduced, is to be first softened a little between the teeth, straightened, and dipped in sweet oil. Then at least six inches of it are to be introduced, so that its lower end may be easily drawn out of the nostril; a business, which Beer always lets the patient do himself. The upper portion of the catgut is coiled up, and kept within a little linen compress on the patient's forehead. Beer also places in the opening of the sac a small dossil of lint, and covers it with a bit of sticking plaster. In two hours, the patient is to try to force the lower end of the catgut out of the nostril, by driving the air through the opening, while the mouth and opposite nostril are shut. As soon as the end of the catgut is secured, it is to be turned over the side of the nose, and fixed there with a piece of sticking plaster. The next day, the bit of plaster over the sac is to be loosened with warm water, and together with the dossil of lint, taken away, and one of the lotions, hereafter specified, injected down the passage. The upper end of the catgut on the forehead is next to be unfastened, and a fresh portion of it covered with some of the applications, presently mentioned, when the patient is to draw it into the sac and duct, by gently pulling the end, which hangs out of the nostril. The superfluous lower piece of catgut is now cut away, and the new piece turned up, and fixed to the side of the nose. The injection is again repeated, and the dressings applied, as before. The same method is to be continued, until the whole of the first piece of catgut is expended. Some water, coloured with the vinous tincture of opium, is now to be thrown down the sac, in order to see, whether any part of the fluid will pass into the nose, and what progress has been made. Then a larger piece of catgut is employed, exactly in the manner of the first, and when it is all exhausted, the coloured injection is to be used again, in order to learn what advance has been made in the re-establishment of the natural diameter of the passage. Lastly, a catgut of still larger size is to be used, after which the coloured injection will be found, when the patient inclines his head forwards, to run freely out of the nostril, and not merely drop into it, as it did previously. When this is the state of things, all further dilatation becomes unnecessary. (*Beer, Lehre von den Augenkr. B.* 2, *p.* 169—172.)

This author then repeats his decided opinion, that the mechanical treatment with catgut, bougies, cannulæ, &c., will only answer, when attention is paid to rectifying the morbid state of the mucous membrane of the lachrymal sac by means of suitable applications, the use of which, he thinks, ought to commence with the first employment of the catgut. And, he adds, that even such treatment will only succeed, when the diseased state of the membrane of the sac is entirely a local complaint, and uncomplicated with any unfavourable condition of the health. In the beginning, if the probe can be introduced without any great trouble, and the lining of the duct is only trivially thickened, Beer moistens the catgut, on its daily introduction into the passage, with the vinous tincture of opium, and injects into the sac a lukewarm lotion, containing the proportions of subacetate of copper, nitrate of potass, alum, camphor, and vinum opii, specified in one of the preceding columns. The lint, which Beer places in the orifice of the sac, is also dipped in the vinum opii. When the probe meets with more resistance, the catgut is smeared with the unguentum hydrargyri nitrati, which is to be at first weakened, and afterwards gradually increased in strength. The wound is also to be dressed with the same application, and some of the following lotion injected down the sac twice a day: ℞. Aq. Ros. ℥iv. Hydrarg. Oxymur. grj. ss. gr. j. Mucil. pur. ʒj. Vini opii ℈j. M. When any irregularities and indurated points are felt with the probe in the course of the nasal duct, Beer smears the catgut with an ointment, containing a small quantity of red precipitate, and directs frictions with a little camphorated mercurial ointment to be employed every day round the external opening.

Beer joins the generality of writers in believing, that a long perseverance in the mechanical means is necessary, in order to remove all disposition in the nasal duct to close again. (*P.* 176.) And, as the use of the probes, syringe, catgut, and dossils of lint, may be supposed to have done more or less injury to the lachrymal ducts, so as to cause some impediment to the due conveyance of the tears into the lachrymal sac, Beer advises a trial to be made, whether a couple of drops of some coloured fluid, introduced into the inner canthus, while the patient is lying upon his back, will pass into the lachrymal sac; and, if they will not do so, the same author thinks, that an attempt should be immediately made to clear the lachrymal ducts, by means of Anel's probe. (*P.* 177.)

According to Beer, the foregoing treatment is perfectly useless, whenever the lachrymal puncta and ducts are obliterated; because, even, if it were practicable to restore their perviousness, it would yet be impossible to communicate to the new-formed apertures and canals the power of absorbing the tears and conveying them into the lachrymal sac. He thinks, that, in this state of things, the practitioner need not trouble himself about the condition of the nasal duct; because, even if it were rendered duly pervious, this improvement would not continue long, as Beer's experience has fully convinced him, that, when the mucous secretion of the lachrymal sac is not blended with the tears, a closure of the nasal duct sooner or later ensues, and of course an accumulation of the mucus of the sac, a disease, sometimes termed, under such circumstances, *hydrops sacculi lachrymalis.* And, in order to prevent this complaint in the state of things just now described, Beer is an advocate for the total obliteration of the cavity of the sac with escharotics. (*B.* 2, *p.* 181.)

Such is the practice of Beer, with the view of clearing away obstruction in the nasal duct, and restoring its natural diameter. Let us now consider what methods have been suggested by others. Beginning then with the screw, invented by Fabricius ab Aquapendente, for compressing the distended lachrymal sac, I need only remark with M. Nicod, that, as this plan was not directed against the cause of the disease, it is not surprising, that it should have been unavailing, and ultimately banished from practice. In the year 1716, Anel invented a probe of so small a size, that it was capable of passing from the upper punctum lachrymale into the lachrymal sac, and nasal duct, the obstructions in which latter passage it was intended to remove. Anel also invented a syringe, whose pipe was small enough to enter one of the puncta, and by that means to furnish an opportunity of injecting a liquor into the sac and duct: and with these two instruments e pretended to be able to cure the disease whenver it consisted in obstruction merely, and the ischarge was not much discoloured. “ The irst of these, viz. the passage of a small probe hrough the puncta, (says Mr. Pott) has a plauible appearance, but will, upon trial, be found ery unequal to the task assigned ; the very small ize of it, its necessary flexibility, and the very ittle resistance it is capable of making, are maniest deficiencies in the instrument ; the quick ensation in the lining of the sac and duct, and ts diseased state, are great objections on the ide of the parts, supposing that it was capable f answering any valuable end, which it most ertainly is not.” (*Pott.*)

It must be at once obvious, that Anel's intruments were devised with the view of avoidng a puncture in the lachrymal sac ; but the rinciple has been strongly objected to by Beer, here being no comparison between the inconeniences of a small opening made in the sac, nd the injury done to the lachrymal puncta and anals by the long and repeated introduction of nstruments through them, whereby their funcions are likely to be for ever ruined, of which Beer has known some sad examples. (*Lehre, &c. B.* 2, *p.* 169.)

The next practice, deserving notice, is that of Laforest, who used to introduce into the termination of the nasal duct in the nostril a probe, with which he cleared away the obstruction in he passage. He also introduced into the same rifice a curved tube, which was left in the part hree or four months, for the purpose of employng injections. The method, however, was found not only troublesome and difficult, on account of the anatomical varieties, to which the termination of the nasal canal was liable, but also on account of the treatment, when practised, being subject to frequent failures.

Following up the principles of Anel, another French surgeon, Méjean, dilated the nasal duct with a seton, which was drawn up into the lachrymal sac by means of a thread, first introduced from the upper punctum lachrymale. But, it was soon discovered, that what was gained on one side, was lost on the other ; the lodgment of the thread in the lachrymal duct for several months, and the irritation of its orifice in changing the seton every day, not only causing inflammation of the punctum lachrymale, but even such ulceration and cicatrices, as sometimes destroyed the functions of the parts.

J. L. Petit, sensible of the inconveniences of Méjean's practice, and disgusted with the barbarous imitation of the ancients in cauterizing the fistula, sac, and os unguis, conceived that, instead of these plans, or that of perforating the os unguis, as proposed by Woolhouse, it would be better to endeavour to restore the natural passage, by removing the obstruction in the nasal duct, which obstruction Petit regarded as the cause of the disease. His method consisted in opening the lachrymal sac with a small bistoury, introducing through the wound, sac, and nasal duct a probe, down into the nostril, and then using bougies for the dilatation of the passage. This method may be said to be the model of that, which has been most extensively followed even down to the present time. Pellier and Wathen recommended introducing a metallic tube down the ductus nasalis, and leaving it for a time in that situation, with a view of preventing the duct from closing again ; and the use of a cannula is even now preferred by Dupuytren, the greatest surgeon of France.

The desire of avoiding any puncture of the sac has influenced many practitioners besides Anel, and given rise to various ingenious inventions. Thus, in 1780, Sir William Blizard proposed, instead of injecting water, to introduce quicksilver through a small pipe, communicating with a long tube full of this fluid. The specific gravity of the quicksilver, when the sac was distended with it, he believed, would have more power, than water propelled through a syringe, to remove the lachrymal obstruction.

The late Mr. Ware, after trying Sir William Blizard's plan, gave the preference to Anel's syringe, with which he generally injected warm water, through the lower punctum lachrymale, into the lachrymal sac, and put a finger over the superior punctum to prevent the fluid from escaping through it. With his finger, he also occasionally compressed the lachrymal sac, in order to assist in propelling the water down into the nose. He sometimes used the injection thrice a day, though, in general, much less frequently. (See *Ware on the Epiphora.*)

“ I in general begin the treatment by injecting some warm water through the inferior punctum lachrymale, and I repeat the operation four or five days in succession. If, in this space of time, none of the water pass through the duct into the nose, and if the watering of the eye continue as troublesome as it was before the injection was employed, I usually open the angular vein, or direct a leech to be applied near the lachrymal sac ; adding here a caution, that the leech be not suffered to fix on either of the eyelids, lest it produce an extravasation of blood in the adjacent cells. About the same time that blood is taken away in the neighbourhood of the eye, I usually vary the injection, and try the effects either of a weak vitriolic, or anodyne, lotion. In some instances, also, when I have found it impossible, after several attempts, to inject any part of the liquid through the duct, I have introduced a golden probe, about the size of a bristle, through the superior punctum lachrymale, and, attending to the direction of the duct, have insinuated its extremity through the obstruction, and conveyed it fully into the nose ; immediately after which I have found, that a liquid, injected through the inferior punctum, has passed without any difficulty ; and by repeating these operations, for a few successive days, I have at length established the freedom of the passage, and completed the cure. In other instances, I have recommended a strongly stimulating sternutatory to be snuffed up the nose, about an hour before the time of the patient's going to rest, which, by exciting a large discharge from the Schneiderian membrane, has sometimes also greatly contributed to open the obstruction in the nasal duct.

“ Cases occur very rarely which may not be relieved by some of the means above related.” (*Ware's Additional Remarks on the Epiphora.*)

When the discharge was fetid, Mr. Ware sometimes found, that a vitriolic lotion, injected into the sac, quickly corrected the quality of the matter.

In a subsequent tract, Mr. Ware observes, that if, after "about a week or ten days, there be not some perceptible advance towards a cure, or, if, from the long continuance of the obstruction, there be reason to fear, that it is too firmly fixed to yield to this easy mode of treatment, I do not hesitate to propose the operation which is now to be described. The only persons, with respect to whom I entertain any doubts as to the propriety of this opinion, are infants. In such subjects, I always think it advisable to postpone the operation, unless the symptoms be particularly urgent, until they are eight or nine years old.

"If the disease has not occasioned an aperture in the lachrymal sac, or if this aperture be not situated in a right line with the longitudinal direction of the nasal duct, a puncture should be made into the sac, at a small distance from the internal juncture of the palpebræ, and nearly in a line drawn horizontally from this juncture towards the nose, with a very narrow spear-pointed lancet. The blunt end of a silver probe, of a size rather smaller than the probes, that are commonly used by surgeons, should then be introduced through the wound, and gently, but steadily, be pushed on in the direction of the nasal duct, with a force sufficient to overcome the obstruction in this canal, and until there is reason to believe, that it has freely entered into the cavity of the nose. The position of the probe, when thus introduced, will be nearly perpendicular; its side will touch the upper edge of the orbit; and the space between its bulbous end in the nose and the wound in the skin will usually be found, in a full-grown person, to be about an inch and a quarter, or an inch and three-eighths. The probe is then to be withdrawn, and a silver style of a size nearly similar to that of the probe, but rather smaller, about an inch and three-eighths in lengths, with a flat head like that of a nail, but placed obliquely, that it may sit close on the skin, is to be introduced through the duct, in place of the probe, and to be left constantly in it. For the first day or two after the style has been introduced, it is sometimes advisable to wash the eye with a weak saturnine lotion, in order to obviate any tendency to inflammation which may have been excited by the operation; but this in general is so slight, that I have rarely had occasion to use any application to remove it. The style should be withdrawn once every day for about a week, and afterwards every second or third day. Some warm water should each time be injected through the duct into the nose, and the instrument be afterwards replaced in the same manner as before. I formerly used to cover the head of the style with a piece of dyachylon plaster spread on black silk; but have of late obviated the necessity for applying any plaster by blackening the head of the style with sealing wax."

Mr. Ware did not, on first trying this method, expect any relief, till the style was left off. However, he found, that the watering of the eye ceased, as soon as the style was introduced, and the sight became proportionably more useful and strong.

The wound, which Mr. Ware makes in the sac, when there is no suitable ulcerated aperture, is only just large enough to admit the end of the probe, or style; and this soon becomes a fistulous orifice, through which the style may be passed without the least pain. In short, in about a week or ten days, the treatment becomes so easy, that the patient, or any friend, is fully competent to do what is necessary. It merely consists in withdrawing the style, two, or three times a week, occasionally injecting some warm water, and then replacing the instrument as before.

Some, finding no inconvenience from the style, and being afraid to leave it off, wear it for years; many others disuse it in about a month, or six weeks, and continue quite well. The ulcerations, sometimes existing over the lachrymal sac, commonly heal, as soon as the tears can pass down into the nose; but Mr. Ware mentions two instances, in which such sores did not heal until a weak solution of the hydrargyrus muriatus, and bark, were administered. (See *Ware on the Fistula Lachrymalis.*)

Great as the recommendation of the foregoing practice is, as delivered by Mr. Ware, Mr. Travers is strongly disposed to doubt, whether any permanent benefit was ever derived from letting the style remain in the passage. When an abscess over the sac has been opened, this gentleman, instead of the introduction of a style into the ductus nasalis, recommends simply the examination of the duct with a fine probe. "If the probe passes without resistance into the nose, the case requires no further operative treatment, the integument recovers its healthy condition under an emollient application, the discharge gradually diminishes, and the wound heals. If, on the other hand, upon examination with the probe, introduced through the wound, into the sac, resistance is offered to its passage into the nose, no more favourable opportunity will be presented, for overcoming such resistance. This, therefore, should be accomplished, but to this the operative process should be limited, and the wound should be suffered to heal without further disturbance." When there is what Mr. Travers terms a stricture in the nasal duct, and the passage of the probe is more firmly resisted, he admits that some means must be employed for keeping the duct pervious, after it has been reopened. He never interferes with the integuments, except in the case of abscess discolouring the skin, and threatening to produce a fistula; and for the purpose of restoring the passage, he uses a set of silver probes, of about five inches long, of various sizes, flattened at one end, and slightly bulbous at the point. When there is no obstruction, these, he says, may be introduced with perfect facility from either of the puncta lachrymalia into the nostril. "If the punctum be constricted, it is readily entered, and dilated by a common pin; and, upon withdrawing it, by one of the smaller probes. The direction and relative situation of the lachrymal ducts, the sac, and nasal canal, point out the proper course of the instrument. It is confirmed by its advance, without the employment of force, and the sensation conveyed by the free and unincumbered motion of its point. Until the point is fairly within the sac, it is necessary to keep the eyelid gently stretched and slightly everted; the upper lid being drawn a little upward toward the brow; the lower, as much downward toward the zygoma. The point carried home to the sac, and touching lightly its nasal side, the lids may be left at liberty, while a half circular motion is performed by the instrument; the surgeon neither suffering the point to recede, nor, on the other hand, allowing it to become entangled in the membrane. The probe now rests, in a perpendicular direction, upon the eyebrow, towards its inner angle, and, in this direction, it is to be gently depressed, until it strikes upon the floor of the nostril, where its presence is readily ascertained by a common probe passed beneath the inferior turbinated bone. The probe, of smallest dimensions, is of sufficient firmness to preserve its figure in its passage through the healthy duct, but it is too flexible to oppose any considerable obstruction. For the stricture of the lachrymal ducts, it is of sufficient strength. Very many cases of recent origin, and in which the stricture has no great degree of firmness (Mr. Travers says) are completely cured by three or four introductions of the probe into the nostril, at intervals of one, or two days. I have seldom met with a stricture so firm as not to yield to the full-sized probe." When the resistance is not altogether removed, after this plan has been tried some days, Mr. Travers introduces a style, having a small flat head, a little sloped, through the punctum lachrymale into the nose, and leaves it in the nasal duct for twenty-four hours. If worn longer, he says, that it causes ulceration of the orifice. A day or two is to elapse, before the style is again introduced, which must now be passed through the other lachrymal duct. On the intervening days, tepid water should be injected with Anel's syringe. (*Synopsis of the Diseases of the Eye*, *p.* 369, 370, 372, 374.)

Thus, we see, that Mr. Travers's practice bears a considerable resemblance to that of Anel, inasmuch as the sac is never opened, except when likely to ulcerate, and nearly every thing is done with probes and injections, introduced through the lachrymal puncta and ducts. I wish that my views of the nature of these diseases, and of the parts concerned, would allow me to think the latter proceedings, in the case of stricture of the nasal duct, as commendable as another part of Mr. Travers's practice, where, in cases of slighter obstruction, he contents himself with opening the sac, clearing away the stoppage of the nasal duct with a probe, and healing up the wound, without leaving any style, cannula, or seton, in the passage. Where the obstruction is very slight, such practice must be judicious. But, if, in other cases, it be deemed right for the prevention of a relapse, that the nasal duct should be either filled with some dilating instrument a certain time, or repeatedly probed, I am decidedly of opinion with Professor Beer, M. Nicod, &c., that the object of not making a small opening in the sac is attended with no advantage, at all likely to counterbalance the mischief, which must be done to the lachrymal puncta and ducts, not only by the repeated introduction of probes and of syringes, but by the lodgment of the former in them for the space of twenty-four hours together. If there be an opening in the sac, its convenience in permitting the easy use of a probe is generally acknowledged; and, in order to gain this advantage, and avoid the evils, which are inseparable from taking too much liberty with the lachrymal puncta and ducts, surely a slight puncture in the sac, if there be no opening already, must be the most rational, simple, and successful practice.

When the perviousness of the nasal duct cannot be restored by any use of the probe, and the obstructed part has a very elastic feel, is of inconsiderable extent, and near the termination of the duct in the nostril, Beer recommends a perforation to be made with a trocar-shaped probe, the point of which is to be covered with a bit of wax, in order that it may not hurt the parts in its passage downward. Some discharge of blood from the nose indicates, that the perforation is made. The sharp-pointed probe is then to be withdrawn, a blunt one used for the purpose of dilating the passage, and, at length, the catgut, as already explained. (*Beer*, *B.* 2, *p.* 181.)

Supposing the nasal duct to be obliterated for a considerable part of its extent, by a firmer substance, what practice should then be followed? Ought the formation of an artificial passage to be attempted? On this point, modern practitioners differ, but, as the expedients adopted for this purpose cannot be judged of previously to their description, it will be better in the first place briefly to notice them. As Mr. Pott has remarked, the upper and hinder part of the lachrymal sac is firmly attached to the os unguis, a small, and very thin bone, just within the orbit, which bone is so situated, that, if it be by any means broken through, the two cavities of the nose and orbit communicate with each other: consequently, the os unguis forms the partition between the hinder part of the lachrymal sac, and the upper part of the cavity of the nose; and it is by making a breach in this partition, that the formation of an artificial passage has been attempted. In Mr. Pott's time, the cautery had long been disused for making an aperture in the os unguis, and various instruments were recommended for this object, such as a large strong probe, a kind of gimblet, a curved trocar, &c. each of which, says this practical writer, if dexterously and properly applied, will do the business very well; the one necessary caution is, so to apply whatever instrument is used, that it may pierce through that part of the bone which lies immediately behind the sacculus lachrymalis, and not to push too far up into the nose, for fear of injuring the os spongiosum behind, while it breaks its way. Mr. Pott adds, that he himself has always used a curved trocar, the point of which should be turned obliquely downward, from the angle of the eye, towards the inside of the nose. The accomplishment of the breach will be known by the discharge of blood from the nostril, and of air from the wound, upon blowing the nose. Care must be taken to apply the instrument to the part of the bone, anterior to the perpendicular ridge, which divides it.

As soon as the perforation is made, a tent of lint should be introduced, of such size as to fill the aperture, and so long as to pass through it into the cavity of the nose: this should be permitted to remain in two, three, or four days, and afterwards a fresh one should be passed every day, until the clean granulating appearance of the sore makes it probable, that the edges of the divided membrane are in the same state. The business now is to prevent the incarnation from closing the orifice; for which purpose, the end of the tent may be moistened with diluted vitriolic acid; or a piece of lunar caustic, so included in a quill, as to leave little more than the extremity naked, may at each dressing, or every other, or every third day, be introduced; by which the granulations will be repressed, and the opening maintained; and when this has been done for some little time, a piece of bougie of proper size, or a leaden cannula, may be introduced instead of the tent; and leaving off all other dressings, the sore may be suffered to contract as much as the bougie will permit; which should be of such length, that one extremity of it may lie level with the skin in the corner of the eye, and the other be within the nose.

The longer time the patient can be prevailed upon to wear the bougie, the more likely will be the continuance of the opening; and, when it is withdrawn, the external orifice should be covered only by a superficial pledget, or plaster, and suffered to heal under moderate pressure. (*Pott.*)

After the perforating instrument was withdrawn, Mr. Ware recommended a nail-headed style, about an inch long, to be introduced through the aperture, in the same way in which it is introduced through the nasal duct, in cases, in which the obstruction is not so great as to prevent its passing in this direction; and it may remain here with as much safety, as in this last-mentioned instance, for as long a time as its continuance may be thought necessary to establish the freedom of the communication.

Unfortunately for the scheme of making an artificial passage, nature was generally so busy, that she completely frustrated the aim of the surgeon by gradually filling up the new aperture again. Hence, some practitioners were not content with drilling a hole through the os unguis, but actually removed a portion of this bone; either with the forceps proposed by Lamorier in 1729, (see *Mém. de l'Acad. des Sciences,*) or with cutting instruments, amongst which the most celebrated is the sharp-edged kind of cannula devised by Hunter. While this was being applied, however, it was necessary to support the os unguis with something passed up the nose, and a piece of horn was found to answer very well. Instead of these methods, Scarpa prefers destroying a portion of the os unguis with the actual cautery passed through a cannula; a practice, long ago banished from good surgery, and most justly condemned by Richter.

I do not feel it necessary to enter very particularly into the details of these methods of forming an artificial passage between the lachrymal sac and nostril. I have never seen a case, in which I should have deemed such practice advisable; and that the necessity for it must be rare may be inferred from what Mr. Travers has observed, viz. that he does not believe the perforation of the os unguis ever really required. (*Synopsis, &c. p.* 379.) Beer's remarks are also decidedly against the practice; for, he states, that, in order that the new opening may not be closed with lymph, it must be made too high up to serve the purpose of a drain, through which the mucus can descend by its own gravity. He has not met with a single case, either in his own practice, or amongst the patients whom he has had opportunities of seeing under other practitioners, where the perforation of the os unguis had a successful result. On the contrary, in one healthy lad, the operation, which had been done by an experienced surgeon, was followed by the destruction of the nasal process of the upper maxillary bone, one of the ossa nasi, and all the bones contributing to the formation of the passage from the orbit into the nose. (See *Lehre von den Augenkr. B.* 2, *p.* 182.) Hence, Beer thinks, that the patient had better either submit to the inconvenience of being obliged to empty the distended sac by pressure several times a day, or let the cavity of the sac be obliterated by means, calculated to excite the adhesive inflammation in it. But, if the lachrymal puncta and ducts, as well as the nasal duct, are obliterated, Beer conceives, that there is no alternative, because, if the cavity of the sac be left, the case, which he terms hydrops sacculi lachrymalis, will ensue, whenever the fistula is closed.

Of Hernia and Hydrops of the Lachrymal Sac.—The diseases, described by Beer under these appellations, are not discriminated in this country, although they are characterized by widely different symptoms, and require opposite methods of treatment. In the case of hernia, or simple relaxation, the lachrymal sac forms a tumor, which never surpasses the size of a common horse-bean, the integuments are of their natural colour, the tumor is soft and yielding to pressure, by which the contents of the sac are readily discharged through the puncta, or nasal duct. Hydrops grows to the size of a pigeon's egg, is purplish from the beginning, very hard, and incapable of being emptied by the strongest pressure. Hernia is cured by compression, and the application of astringents to the relaxed parts; hydrops requires the incision of the sac. In hernia, the nasal duct is natural; in hydrops, it and sometimes the puncta are obstructed.

Stillicidium Lachrymarum.—According to Beer, the valuable treatise of Schmidt is the only work, in which the important practical distinction is drawn between stillicidium lachrymarum and epiphora; the immediate cause of the first complaint being some impediment to the passage of the tears from the lacus lachrymarum into the lachrymal sac; while the other affection consists in a redundant and extraordinary secretion of the tears. The curable form of stillicidium, here to be noticed, arises from relaxation of the lachrymal puncta and canals, in consequence of previous inflammation of the parts. The puncta are widely open; but, in other respects, have quite a natural appearance. When touched with Anel's probe, they do not contract, as in the healthy state. The tears, which from time to time fall over the cheek, are not in considerable quantity, only trickling from the inner canthus by drops at intervals; and the nostril on the affected side is found to be rather drier, than natural.

Erysipelatous inflammation of the eyelids and parts over the lachrymal sac, and the purulent kinds of ophthalmy, frequently cause this sort of stillicidium. The latter cases indeed the more readily produce the disorder, inasmuch as the semilunar fold of the conjunctiva is relaxed and swelled, so as to push the puncta out of their right position for the due performance of the absorption of the tears, and obstruct this function more, than would be the case, if the diminished action of those orifices and the lachrymal ducts were the only thing concerned.

Beer delivers an exceedingly favourable prognosis, observing, that the complaint often disappears of itself on the approach of warm dry weather, and may almost always be readily cured, by means of astringents. Amongst other remedies specified by this author, I need only mention a solution of the sulphate of iron, to which a small quantity of camphorated spirit, or tincture of opium, has been added. It is to be dropped out of a pen into the inner angle frequently in the course of the day, the patient lying upon his back for some time after each application, so as to let the medicine have more effect upon the parts. (See *Lehre von den Augenkr. B.* 2, *p.* 41—43.)

Mr. Travers mentions a constricted state of the lachrymal puncta, and canals, which is curable by the introduction of a small probe. (*Synopsis, &c. p.* 356.) All modern writers agree, that the obliterated puncta, and canals, can never be restored. (See *Mémoires de l'Academie de Chirurgie, T.* 5, *Edit.* 12*mo. in which are several essays on fistula lachrymalis: viz. one by M. Bordenave, entitled, "Examen des Réflexions critiques de M. Molinelli, insérées dans les Mémoires de l'Institut de Bologne, contre le Mémoire de M. Petit, sur la Fistula Lachrymale, inséré parmi ceux de l'Acad. Royale des Sciences de Paris, année* 1734. *Another essay by M. de la Forest, styled "Nouvelle Méthode de traiter les Maladies du Sac Lachrymal, nommées communément Fistules Lachrymales." A third by M. Louis, called "Réflexions sur l'Operation de la Fistule Lachrymale." G. E. Stahl, Programma de Fistula Lachrymali, Halæ,* 1702. *J. C. Scholunger, De Fistula Lachrymali, Basil,* 1730. *J. D. Metzger, Curationum Chir. quæ ad Fistulam Lachrymalem sive usque fuêre adhibitæ, Historia Critica, 8vo. Monasterii,* 1772. *P. A. Lepy, Quæstio, &c. An fistulæ lachrymali cauterium actuale? Paris,* 1738. *J. L. Petit, Traité des Mal. Chir. T.* 1, *p.* 289, *&c. 8vo. Paris*, 1774. *M. A. Magnabal, De Morbis Viarum Lachrymalium, ac præcipue de fistula lachrymali, Montp.* 1765. *A. Bertrandi, Traité des Opérations, p.* 297, *8vo. Paris*, 1784. *Anel has described his plan of treatment in various works: "Observation singulière sur la fistule lacrymale, dans laquelle l'on apprendra la méthode de la guérir radicalement." Turin*, 1713, *in 4to. "Nouvelle Méthode de guérir les fistules lacrymales." Turin*, 1713, *in 4to. "Suite de la Nouvelle Méthode," &c. ibid.* 1714, *in 4to. "Dissertation sur la nouvelle découverte de l'hydropisie du conduit lacrymal." Paris*, 1716, *in* 12*mo. And, lastly, Anel has published in the Mém. de l'Acad. des Sciences, année* 1713, *"Précis de sa nouvelle manière de guérir les fistules lacrymales." Méjean, in Mém. de l'Acad. de Chir. T.* 2, *p.* 193, *4to. Palucci, Methodus curandæ fistulæ lachrymalis, Vindob.* 1762; *a tube preferred. Sabatier, Médecine Opératoire, T.* 2, *Ed.* 2. *Richter's Anfangsgründe der Wundarzneykunst, B.* 2, *Kap.* 11. *Pott's observations relative to the disorder of the corner of the eye, commonly called the Fistula Lachrymalis, 8vo. Lond.* 1758. *Sir W. Blizard, A New Method of treating the Fistula Lachrymalis, 4to. Lond.* 1780. *Ware on the Epiphora and Fistula Lachrymalis; 8vo. Lond.* 1792—95. *Scarpa sulle principali Malattie degli Occhi, Capo* 1. *Wathen's New and Easy Method of applying a Tube for the Fistula Lachrymalis, Lond.* 1781, *and 2d Ed.* 1792. *Sprengel, Geschichte der Wichtigsten Chir. Operationen, p.* 105. *Nicod, Mémoire sur la Fistule Lachrymale in Revue Méd. Historique, &c. livr.* 1 *et* 2, *8vo. Paris*, 1820. *Fournier, Diss. de l'Appareil des voies lachrymales; Montpellier*, 1803. *J. L. Angely, Commentatio Medica de Oculo Organisque Lachrymalibus ratione Ætatis, Sexus, Gentis, et Variorum Animalium, 8vo. Erlangæ*, 1803. *Reil, Diss. de Chir. Fistulæ Lachrymalis Curatione, Berol.* 1812; *Flajani, Collezione d'Osservazioni, T.* 3. *Desault, Œuvres Chir. T.* 2, *p.* 119, *8vo. Paris*, 1801. *J. C. Rosenmüller, Partium Externarum Oculi Humani, imprimis Organorum lachrymalium, Descriptio Anatomica; iconibus illustrata, 4to. Lips.* 1810. *C. H. T. Schreger, Versuch einer Vergleichenden Anatomie des Auges und der Thränenorgane des Menschen und der übrigen Thierklassen, 8vo. Leipz.* 1810. *Beer, Lehre von den Augenkrankheiten,* 2 *B. 8vo. Wien*, 1813—1817. *Wm. Mackenzie, An Essay on the Diseases of the Excreting Parts of the Lachrymal Organs, 8vo. Lond.* 1819; *contains many valuable observations from the writings of Beer. B. Travers, A Synopsis of the Diseases of the Eye, p.* 228—359, *&c. 8vo. Lond.* 1820. *Ph. v. Walther ueber die steinigen Concretionen der Thränenflussigkeit, in Journ. für Chirurgie von C. Graefe, B.* 1, *p.* 163, *8vo. Berlin*, 1820. *J. A. Schmidt über die Krankheiten des Thränenorgans; a work of the highest reputation.*

LAGOPHTHALMIA, or LAGOPHTHALMOS. (from λαγος, a hare; and οφθαλμος, an eye.) *The Hare's Eye. Oculus Leporinus.* A disease, in which the eye cannot be completely shut. The following complaints may arise from it; a constant weeping of the organ, in consequence of the interruption of the alternate closure and opening of the eyelids, which motions so materially contribute to the propulsion of the tears into the nose; blindness in a strong light, in consequence of the inability to moderate the rays, which enter the eye; on the same account, the sight becomes gradually very much weakened; incapacity to sleep where there is any light; irritation, pain, and redness of the eye, from this organ being exposed to the extraneous substances in the atmosphere.

An enlargement, or protrusion of the whole eye, or a staphyloma, may obviously produce lagophthalmos. But, affections of the upper eyelids are the common causes. Heister saw the complaint produced by a disease of the lower one. Now and then lagophthalmos depends on paralysis of the orbicularis muscle. A cicatrix, after a wound, ulcer, or burn, is the most frequent cause.

When lagophthalmos arises from a paralytic affection of the orbicularis palpebrarum, the eyelids may be rubbed with a liniment containing the tinctura lyttæ, or the linimentum camphoræ. Electricity and cold bathing are also considered principal means of cure (*Chandler*), together with the exhibition of bark, the use of the shower-bath, &c.

When the affection arises from spasm of the levator palpebræ superioris, electricity, a small blister on the neighbouring temple, and rubbing the eyelid and eyebrow with the tinctura opii, are recommended, together with antispasmodic medicines.

When lagophthalmos arises from the contraction of a cicatrix, its relief is to be attempted precisely on the same principles as the ectropium. (See *Ectropium.*) However, when the eyelid is shortened as well as everted, nothing will remove the deformity.

The inconveniences, depending on the eye being unable to shelter itself from the light, are to be obviated by wearing a green shade.

Whoever is acquainted with German, and is desirous of more minute information on this subject, may find an excellent account of lagophthalmos in *Richter's Anfangsgr. der Wundarzn. B. 2. Von dem Hasenauge.* See also *Beer's Lehre von den Augenkr. B.* 2, *p.* 239, *&c. 8vo. Wien*, 1817.

LARYNGOTOMY. (from λαρυγξ, the larynx; and τεμνω, to cut.) The operation of making an opening into the larynx. (See *Bronchotomy.*)

LATERAL OPERATION. One mode of cutting for the stone. (See *Lithotomy.*)

LENTICULAR (from *lenticulaire,* doubly convex). An instrument, contained in every trephining case, and employed for removing the irregularities of bone from the edge of the perforation, made in the cranium with the trephine. One side of its blade is convex, the other concave; and one of its edges is sharp. On the end of the blade is fixed a little shallow cup, with its concavity towards the handle of the instrument. This part serves the purposes of receiving the little pieces of bone, when detached, keeping the end of the blade from hurting the dura mater, and, when applied under the margin of the opening, enables the operator to guide the edge of the instrument all round it, with steadiness and security.

LEUCOMA (from λευκος, white). Leucoma and albugo are often used synonymously, to denote a white opacity of the cornea. Both of them, as Scarpa remarks, are essentially different from the nebula of the cornea; for, they are not the consequence of chronic ophthalmy, with varicose veins, and an effusion of a milky serum into the texture of the delicate continuation of the conjunctiva over the cornea; but, are the result of violent acute ophthalmy. In this state, a dense coagulating lymph is extravasated from the arteries; sometimes superficially, at other times deeply into the substance of the cornea. On other occasions, the disease consists of a firm callous cicatrix on this membrane, the effect of an ulcer, or wound, with loss of substance. The term *albugo*, strictly belongs to the first form of the disease; *leucoma* to the last, more particularly when the opacity occupies the whole, or the chief part, of the cornea.

The recent albugo, remaining after the cure of severe acute ophthalmy, is of a clear milky colour; but, when of ancient date, it becomes pearl-coloured.

The recent albugo, (provided the organization of the cornea be not destroyed), may generally be dispersed by the means employed for the relief of the first and second stages of acute ophthalmy; viz. general and topical blood-letting with internal antiphlogistic medicines, and topical emollients for the first; slightly irritating and corroborant applications for the second. As soon as the inflammation has subsided, the latter should be employed; for, by making the absorbents remove the coagulating lymph, deposited in the cornea, they restore the transparency of this membrane.

But, though this may often be accomplished in the recent state of albugo, it is more difficult when the long duration of the disease has paralysed the absorbents of the affected part; or when the deposition of a dense tenacious substance into the cornea has subverted its organization. (*Scarpa.*)

The recent condition of the disease, without disorganization of the structure of the cornea; its occurrence in young subjects, whose absorbents are readily excited by external stimulants; are circumstances favourable to the cure. In children, the albugo, arising from severe ophthalmy after the small-pox, and insulated in the centre of the cornea, very often disappears of itself in the course of a few months. Heister, Langguth, and Richter, make the same observation. The event can only be imputed to the vigorous action of the lymphatics in children, and to the organization of the cornea not being destroyed. For promoting this absorption, Scarpa recommends the following collyrium: ℞. Ammon. muriatæ, ℈ij. Cupri acetati, gr. iv. Aquæ Calcis, ℥viij. Misce. The fluid is to be filtered, after standing twenty-four hours. He praises also this ointment: ℞. Tutiæ præpar. ʒj. Aloes. s. p. gr. ij. Hydrargyri submur. gr. ij. Adipis suillæ, ℥ss. Misce. And the unguentum ophthalmicum of Janin. He mentions the gall of the ox, sheep, pike, and barbel, applied to the cornea, two or three times a day, with a small hair pencil, if too much irritation should not be produced. In some subjects, when the eyes are very irritable, and cannot bear the latter applications, Scarpa has found the oil of walnuts a useful application. But it is generally necessary to persevere, at least three or four months, before the case can be reckoned incurable.

All the expedients, proposed for the inveterate albugo or leucoma from a cicatrix, consisting of scraping or perforating the layers of the cornea, and exciting ulceration there, are unavailing. For, though the enlargement of the cornea should be lessened by such means, its diaphanous state could not be restored; or should the patient perceive a ray or two of light immediately after the operation, the benefit would only be transient; for, as soon as the wound had healed, the opacity would recur. The formation of an artificial ulcer might prove useful, if leucoma depended on a mere extravasation of lymph; but, the fact is, the disease arises from the deposition of an opaque substance, and the disorganization of the texture of the cornea, conjointly: in this lies the difference between albugo and leucoma.

See *Scarpa sulle Malattie degli Occhi*, 8*vo. Venezia*, 1802. *Richter*, *Anfangsgründe der Wundarzn. B.* 3. *Essays on the Morbid Anatomy of the Eye*, *by J. Wardrop*, *Edinb.* 1808, *chap.* 11.

LIGATURE. In the article *Hemorrhage*, it has been explained, that the immediate effect of a tight ligature on an artery, is to cut through its middle and internal coats, a circumstance that tends very much to promote the adhesion of the opposite sides of the vessel to each other. Hence, I think with Dr. Jones, in opposition to Scarpa, that the form and mode of applying a ligature to an artery should be such, as are most certain of dividing the above coats of the vessel, in a regular manner. A broad flat ligature does not seem likely to answer this purpose well; because it is scarcely possible to tie it smoothly round the artery, which is apt to be thrown into folds, or to be puckered by it, and, consequently, to have an irregular bruised wound made in its middle and internal coats. (*Jones.*) A ligature of an irregular form is likely to cut through these coats more completely at some parts, than others; and if it does not perfectly divide them, though adhesion may yet take place, it is a slower and less certain event, and secondary hemorrhage more likely to follow. The fear of tying a ligature too tight may often lead to the same disadvantages. These, and many other important circumstances, are noticed in the article *Hemorrhage.*

Ligatures are commonly made of inkle, and rubbed with white wax. They should be round, and very firm, so as to allow being tied with some force, without risk of breaking. (See *Jones on Hemorrhage*, *p.* 172.)

The principles, which should guide the surgeon in the use of the ligature, were not known, until the late Dr. Jones published his valuable treatise on hemorrhage. As an able surgeon has observed, " he has banished (at least in this country) the use of thick and broad threads, of tapes, of reserve ligatures, of cylinders of cork and wood, linen compresses, and all the contrivances, which, employed as a security against bleeding, only served to multiply the chances of its occurrence." (*Lawrence, in Med. Chir. Trans. Vol.* 6, *p.* 162.)

In the article *Amputation*, I have noticed the method of cutting off both ends of the ligature close to the knot, on the face of the stump, with the view of lessening the quantity of extraneous matter in the wound, and promoting a complete union of the divided parts, without suppuration.

This plan has been tried by Mr. Lawrence: " The method I have adopted (says this gentleman) consists in tying the vessels *with fine silk ligatures*, and cutting off the ends as close to the knot as is consistent with its security. Thus the foreign matter is reduced to the insignificant quantity, which forms the noose actually surrounding the vessel, and the knot, by which that noose is fastened. Of the silk, which I commonly employ, a portion sufficient to tie a large artery, when the ends are cut off, weighs between $\frac{1}{50}$ and $\frac{1}{60}$ of a grain: a similar portion of the thickest kind I have tried, weighs $\frac{1}{20}$ of a grain, and of the slenderest $\frac{1}{80}$."

Mr. Lawrence states, that the kind of silk twist, which is commonly known in the shops by the name of dentists' silk, and which is used in making fishing lines, is the strongest material, in proportion to its size, and therefore the best calculated for our purpose, which requires considerable force in drawing the thread tight enough to divide the fibrous and internal coats of the arteries. This twist is rendered very hard and stiff by means of gum, which may be removed by boiling it in soap and water; but the twist then loses a part of its strength. The stoutest twist, which Mr. Lawrence has used, is a very small thread, compared with ligatures made of inkle. The quantity of such a thread, necessary for the noose and knot on the iliac artery, weighs $\frac{1}{20}$ of a grain; or, if the gum has been removed, about $\frac{1}{25}$. But, the finest twist, kept in the silk shops, is strong enough in its hard state, for any surgical purpose; and the noose and knot, according to Mr. Lawrence's statement, would not weigh $\frac{1}{40}$ of a grain.

It further appears, from the report of this gentleman on the subject, that there is no danger of these ligatures cutting completely through the vessel, as some surgeons have apprehended; and that, although he has not yet ascertained what becomes of the pieces of ligature after the wound is united, he has never seen abscess nor any other bad symptom occasioned by them. At the time, when Mr. Lawrence wrote, he had employed this method of securing the arteries in ten or eleven amputations, in six operations on the breast, and in the removal of two testicles. The cases all did well, excepting a man who lost his thigh, and who died of an affection of the lungs. (See *Lawrence on a New Method of tying the Arteries in Aneurism*, *&c. in Medico-Chir. Trans. Vol.* 6, *p.* 156, *&c.*)

The foregoing method was tried by myself in several amputations, which I performed in 1815 at Brussels, and in a larger number of cases by my friend, Mr. Collier. Our ligatures, however, though small, were not so small as those judiciously recommended by Mr. Lawrence; and, on this account, no accurate inferences can be drawn from our examples, which, however, as far as I could learn, were not unfavourable to the practice.

This subject was mentioned by Mr. Guthrie, as follows: —" Some military surgeons, both French and English, have lately adopted the practice of cutting off both ends of the ligatures, close to the knot on the artery; uniting the parts, if possible, over them, and allowing the knots to find their way out as they can. The edges of the wound, in some instances, have united thoroughly in a few days, and when the knots have come off the ends of the arteries, they have caused small abscesses to be formed, which point at the nearest external surface, and are discharged with little uneasiness. I know, that many cases, treated in this manner, in the campaign of 1813, ended successfully, and healed in as short a time as the most favourable ones by the usual method; and, at Montpellier, in June, 1814, Mons. Delpech, Professor of Surgery in that university, showed me at least twenty cases, in which he had practised, and was still practising, this method with success. I have seen, however, in two or three instances some ill-looking abscesses formed by them, and I suspect some disagreeable consequences will ensue, if this practice be continued.

"I consider this improvement as very valuable in all cases, that will not unite by the first intention. The ligatures, if there be many, form into ropes, are the cause of much irritation, and are frequently pulled away with the dressings; by cutting them off, these evils are avoided, and the knots will come away with the discharge." (*On Gun-shot Wounds of the Extremities, p.* 93, 94.)

With respect to the abscesses, which this gentleman saw produced by the method, it is properly observed by Mr. Lawrence, that as this statement is not accompanied by any description of the materials, or size of the ligature, nor by any details of the unfavourable cases, we cannot judge, whether the events alluded to are to be attributed to the method itself, or to the way in which it was executed. (See *Med. Chir. Trans. Vol.* 6, *p.* 171.)

M. Roux tried the plan in three operations on the breast; the cases did well; and no ill consequences arose from the presence of the bits of thread under the cicatrix. (See *Relation d'un Voyage fait à Londres en* 1814, *ou Parallèle de la Chirurgie Angloise avec la Chirurgie Françoise; Paris,* 1815, *p.* 134—436.) For other remarks, connected with the foregoing topic, see *Amputation, Aneurism*, and *Hemorrhage*.

LINIMENTUM ACIDI SULPHURICI. —℞. Olei Olivæ, ℥iss. Acid. Sulph. ℥ss. M. Recommended by Mr. Brodie, for the removal of the effects left by inflammation of the synovial membrane. (See *Joints.*)

LINIMENTUM AMMONIÆ FORTIUS. —℞. Liq. ammon. ℥j. Olei olivæ, ℥iij. Misce. Properties stimulating.

LINIMENTUM CALCIS.—℞. Aquæ calcis, Olei olivæ, sing. ℥viij. Spirit. vinosi rectificati, ℥i. Misce. A common application to burns and scalds.

LINIMENTUM CAMPHORÆ COMPOSITUM.—℞. Camph. ℥ij. Aq. ammon. ℥vj. Spirit. lavend. ℥xvj. Sixteen ounces are to be distilled of the last two ingredients, from a glass retort, and the camphor then dissolved in the distilled fluid. For bruises, sprains, rigidities of the joints, incipient chilblains, &c.

LINIMENTUM CAMPHORÆ ÆTHEREUM.—℞. Camphoræ drach. j. Ætheris unc. ss. Olei viperarum drach. ij. Misce. The camphor is to be dissolved in the æther, and the oil afterwards incorporated with it. The late Mr. Ware sometimes used this application, in certain obscure affections of the eye, in which it was not easy to determine, whether the imperfection of the sight proceeded from an incipient cataract, or a defect of sensibility in the optic nerve. The outside and edges of the eyelids were rubbed with it, every morning and evening, for two or three minutes.

LINIMENTUM HYDRARGYRI COMPOSITUM.—℞. Ung. hydrargyri fortioris, adipis suillæ, sing. ℥i. Camph. ʒij. Spirit vinos. rectif. ʒij. Liq. ammon. ℥j. The camphor being dissolved in the spirit of wine, add the liq. ammon. and the ointment previously blended with the hog's lard. (*Pharm. Sancti. Barthol.*) An excellent formula for all surgical cases, in which the object is to quicken the action of the absorbents, and gently stimulate the surfaces of parts. It is a capital application for diminishing a chronic indurated state of particular muscles, every now and then met with in practice; and it is particularly well calculated for lessening the stiffness and chronic thickening of joints.

LINIMENTUM POTASSÆ SULPHURETI.—℞. Saponis Albi ℥iv. Olei Amygdalæ, ℥viij. Potassæ Sulphureti, ʒvj. Olei Thymi, gr. xv. vel ℈j. This liniment, used twice a day, will cure the itch in five days, or, at latest, in eight. It has very little unpleasant smell, and would be preferable to sulphur ointment, if equally efficacious. (See *London Medical Repository, Vol.* 3, *p.* 242, *and Cross's Sketches of the Medical Schools of Paris, p.* 176.)

LINIMENTUM SAPONIS COMPOSITUM.—℞. Sapon. ℥iij. Camph. ℥j. Spirit. rorismar. ℔j. Dissolve the soap in the spirit, and then add the camphor. Uses the same as those of the linimentum camph.

LINIMENTUM SAPONIS CUM OPIO. ℞. Lin. sapon. comp. ℥vj. Tinct. opii, ℥ij. Misce. For dispersing indurations and swellings attended with pain, but no acute inflammation.

LINIMENTUM TEREBINTHINÆ.—℞. Ung. resinæ flavæ, ℥iv. Ol. terebinthinæ, q. s. Misce. The well known application for burns, recommended by Kentish. (See *Burns.*)

LINIMENTUM TEREBINTHINÆ SULPHURICUM.—℞. Olei olivæ, ʒx. Ol. terebinth. ʒiv. Acidi Sulph. ʒiij. Misce. Said to be efficacious in chronic affections of the joints, and in the removal of the old effects of sprains and bruises. (*Pharm. Chirurgica.*)

LIP, CANCER OF. The lips are subject to ulcers, which put on a very malignant aspect, although some of them are not in reality malignant; and many, situated just on the inside of these parts, will be found to depend on the bad state of the constitution, and the irritation and disturbance which the sores are continually suffering from the incessant motion of the parts, and their rubbing against a projecting, or rough tooth.

"The continual irritation, arising from the introduction of food, the effort of speaking, and the constant flow of saliva, (as Mr. Earle remarks) are sufficient to keep up the morbid disposition, and to prevent any reparative effort of nature from being carried into effect. After a time, the neighbouring glands will often become enlarged, which confirms the surgeon in the opinion he had been induced to form of the nature of the affection." (See *Med. Chir. Trans. Vol.* 12, *p.* 272.) It is not an uncommon belief, that the irritation of tobacco-pipes frequently gives rise to very malignant, and even truly cancerous, diseases of the lip. The use of segars may have the same effect. (See *Vol. cit. p.* 278.)

Arsenic is frequently useful in subduing the obstinacy and malignity of certain ulcers and diseases of the lip, reputed to be cancerous. (*Stark, De Cancro Labii Inferioris.*) Of this essay, Professor Langenbeck speaks in high terms. The following formula is recommended. "℞. Arsenici Albi drachm. dimid. Aq. comm.

stillaticiæ unc. sex. M. Digerantur vase vitreo clauso in balneo arenæ justi caloris ope per horas sex, tum adde Potassæ Carbonatis puræ drachm. dimid. antea solut. in aq. Cinnamon. simpl. unc. duab. M. Digerantur denuo per aliquot horas in loco temperato. Hac solutione bis terve quotidie ad guttas 8—10—15, utimur."

When cancer takes place, it is usually in the lower, and very seldom in the upper lip. Sir A. Cooper, in his extensive practice, has seen but one instance of it in the latter part. (*Lancet, Vol.* 3, *p.* 109.)

The disease sometimes puts on the appearance of an ulcerated, wart-like excrescence, occasionally acquiring a considerable size. Sometimes it is seen in the form of a very destructive ulcer, which consumes the surrounding substance of the lip; and, in other examples, the disease resembles a hard lump, which, at length, ulcerates. The disease, in its infancy, is often no more than a pimple, which gradually becomes malignant. As the disease advances, the glands under the jaw enlarge. Whenever there is reason to believe, that the disease is of an unyielding, cancerous nature, and it does not soon give way to arsenic, iodine, hemlock, or mercurials, the sooner it is extirpated the better. For this purpose, some surgeons admit the propriety of using caustic, when the whole disease can be completely destroyed by one application. But as the action of caustic is not capable of being regulated with so much precision as the extent of a wound can be, and as caustic will not allow the parts to be united again, the knife is the only justifiable means, especially as it also occasions less pain. Two incisions are to be made, meeting at an angle below (supposing it to be the lower lip), and including the whole of the disease. The sides of the wound are then to be united by the twisted suture. (See *Hare-lip.*) When the affection is extensive, however, the surgeon is frequently necessitated to remove the whole of the lip, or too much of it to admit of the above plan being followed. This circumstance is particularly unpleasant, as unless some attempt can be made to succour the patient by the Taliacotian practice, in the manner mentioned by Mr. Earle, (*Med. Chir. Trans. Vol.* 12, *p.* 276,) the patient's spittle can only be prevented from continually running over his chin by some artificial contrivance. The deformity also is very great, and pronunciation and swallowing can only be imperfectly performed. In a very interesting case of malignant ulcer, published by Mr. Earle, he removed the angle of the mouth, and a large portion of each lip, together with a considerable part of the cheek, yet succeeded in uniting the wound, which object was facilitated by the extraction of five teeth from the lower jaw previously to the operation, which were useless, in consequence of having no corresponding ones in the upper jaw. (*Med. Chir. Trans. Vol.* 12, *p.* 274.)

LIPPITUDO. (from *lippus*, blear-eyed.) *Blearedness.* The ciliary glands, and lining of the eyelids, only secrete, in the sound state, a mere sufficiency of a sebaceous fluid to lubricate the parts in their continual motions. But, it sometimes happens, from disease, that this sebaceous matter is secreted in too great a quantity, and glues the eyelids together during sleep, so that, on waking, they cannot be easily separated. Hence, the margin of the eyelids becomes red all round, and the sight itself even weakened.

The best remedies are the unguentum hydrargyri nitrati, smeared, at night, on the edges and inside of the eyelid with a hair pencil, after being melted in a spoon; the unguentum tutiæ, applied in the same way; and a collyrium, composed of ℈j. of the sulphate of zinc in ℥viij of rose water.

When alterative medicines are requisite, a grain of calomel may be exhibited daily, or the compound calomel pill, containing one grain of calomel, one of sulphur antimonii præcipitatum, and two of guaiacum, put together with soap.

Persons who have lippitudo and cataracts together, bear couching much better than one would expect from the appearance of the eyes; and Mr. Hey never rejected a patient on this account, provided such state were habitual. (*Pract. Obs. p.* 51.) Scarpa, however, recommends the lippitudo to be removed, before the operation is undertaken.

LIQUOR AMMON. ACET. (L. P.)—This is given in the dose of half an ounce in many surgical cases, in which the object is to keep up a gentle perspiration.

LIQUOR ARSENICALIS.—℞. Arsenici. Oxydi præparati in pulverem subtilissimum triti, Potassæ Subcarbonatis ex tartaro singulorum gr. 64, Aq. distill. ℔j. coque simul in vase vitreo, donec arsenicum omne liquetur. Liquori frigefacto adjice Spiritûs Lavandulæ com. ʒiv. Denique adjice insuper Aq. distil. quantum satis sit, ut mensuram octarii accurate impleat. For internal use the dose is iv. drops gradually increased to xx. twice a day. It is frequently given in cases of anomalous ulcers, and cancerous affections of the lip. It is also used as an external application in similar cases, and especially in hospital gangrene. (See *Arsenic*, and *Hospital Gangrene.*)

LIQUOR CALCIS (L. P.)—Sometimes used as an astringent injection, or lotion; also in gargles; it has been given internally as a lithontriptic.

LIQUOR CUPRI SULPHATIS CAMPHORATUS.—℞. Cupri sulphatis. Boli Gallici sing. unc. ss. Camphoræ drach. j. Aquæ ferventis, lib. iv. Boiling water is to be added to the other ingredients, and the liquor filtered when cold. It is chiefly employed in a diluted state, as a collyrium; but it may also prove of service as an application to foul ulcers.

When used for the cure of the purulent ophthalmy, the lotion is to be injected under the eye-lids, by means of a blunt syringe, and, if necessary, the application may be repeated once or twice every hour. (See *Ophthalmy.*)

LIQUOR POTASSÆ (L. P.) Has been given with the view of dissolving stone in the bladder. (See *Urinary Calculi.*)

The dose is from ten to twenty drops, twice a day, in some linseed tea, veal broth, or table beer. It has been found useful, in lepra, psoriasis, and some other cutaneous diseases. (See *Paris's Pharmacologia, Vol.* 2, *p*, 281, *Ed.* 5.)

LIQUOR POTASSÆ SUBCARBONATIS (L. P.)—This remedy is principally deserving of notice on account of its having been given to dissolve calculi in the bladder, so as to remove the necessity of performing the dangerous and painful operation of lithotomy. It may be exhibited in doses of 20 or 40 drops, or of a dram, in a basin of gruel. Experience does not seem to justify the indulgence of much hope, with regard to the complete efficacy of the medicine in dissolving urinary calculi, and on some kinds it is not calculated to act at all, even on chemical principles; but, it would appear, from the reports of writers, that it has often materially palliated the pain which attends the presence of a stone in the bladder. (See *Urinary Calculi.*)

LIQUOR POTASSÆ ARSENICATÆ.—℞. Potassæ Arsenicatæ, grana duo. Aquæ Menthæ Sativæ uncias quatuor. Spiritus Vinosi tenuioris unciam. Misce et cola. Two drams of this may be given thrice a day in cases of cancer. My friend, Mr. Barnes, of Exeter, when formerly a student at St. Bartholomew's, showed me a case of lupus, or noli me tangere, which was greatly benefited by this remedy externally applied. Mr. Barnes was using the lotion with double the proportion of arsenic. There are many ulcerations round the roots of the nails of the fingers and toes, to which Plunket's caustic is sometimes applied; but, the liquor kali arsenicati would, in all probability, be quite as efficacious, and, certainly, it is a neater application.

LIQUOR PLUMBI ACETATIS.—Is used, largely diluted with water, as a common application to inflamed parts. (See *Inflammation.*) One dram to a quart of water is quite strong enough for common purposes. Mr. Justamond and Dr. Cheston used to apply it, mixed with an equal proportion of a spirit resembling the tinctura ferri muriati, to the edges of cancerous sores.

LITHONTRIPTICS. (from λιϑος, a stone; and ϑρυπτω, to break.) Medicines for dissolving stones in the bladder. (See *Urinary Calculi.*)

LITHONTRIPTOR. The name of an instrument, invented by Dr. Civiale of Paris, for reducing calculi in the bladder into small particles or a powder, which is voided with the urine, and lithotomy thus rendered unnecessary. The lithontriptor consists of a straight silver catheter, of considerable diameter, and enclosing another of steel, the lower extremity of which consists of three branches, calculated to grasp the stone on withdrawing the steel catheter a short way within the outer one, when they become approximated. The cavity of the inner catheter is capable of admitting a steel-rod, to which may be affixed, at the surgeon's option, a simple quadrangular drill, or a strawberry-shaped file, or a trephine. By means of a spring, the latter part of the apparatus is pressed evenly inwards, and it is made to revolve with velocity through the medium of a bow, after the manner of a common hand drill. Chaussier and Percy were requested by the Royal Academy of Medicine at Paris to examine the merits of this new invention, and to draw up a report on the subject. "This report (as a respectable journal states,) speaks in very strong terms of the success, which the reporters witnessed, in repeated trials by the inventor; and there can be no doubt, from the distinct and precise evidence adduced by them, that none of the means, previously suggested for the same purpose, can compete with the instrument now proposed. The first case, in which the reporters witnessed its application, was that of a man, 32 years old, who had a mulberry calculus of considerable size. The experiment was made in presence of Chaussier, Percy, Larrey, and several other surgeons of eminence. The instrument having been introduced, and the stone caught at the first attempt, 'at every stroke of the bow those present heard a crackling sound, which announced both the hardness of the stone, and the rapidity of its demolition.' The operation was continued at occasional intervals for 40 minutes, during which the patient complained rather of uneasiness, than of decided pain. The instrument was then withdrawn, and the patient immediately discharged with his urine a quantity of powdery detritus, which was supposed to form a third part of the stone. The operation was renewed eleven days afterwards, in presence of the same persons, and of Magendie and Serres; and again a third time, ten days afterwards. The quantity of powdery matter, then discharged, appeared to be equivalent to the size of the stone, and no calculus could be afterwards discovered in the bladder by the most careful sounding. The second case was that of a man, affected with a calculus, of which the nucleus was a kidney-bean. The urethra had been previously dilated by the successive introduction of sounds of larger and larger diameters. The sound, caused in this instance, was dull and obscure. The bladder being irritable and disposed to contract, the operation was continued for a shorter period, than in the former case, and was resumed every third day. Four operations removed the whole of the stone, the patient being sounded after the fourth by one of the most dexterous lithotomists in Paris. The stone in this case came off in sundry particles, and little fragments loosely agglutinated by a viscous animal matter. At the third operation, the forceps caught and brought away the bean, deprived of its epidermis; and, at the next, the crust came away with the remaining fragments of the stone. In the third case, the stone was of the size of a pigeon's egg, and moderately hard. After three operations, the cure, at the period of the delivery of the report, was considered as nearly completed. Nothing unusual occurred in this case, except that, on one occasion, the operator failed in catching hold of the stone. The plan is evidently inadmissible when the stone is too large to be seized with the forceps, when it is adherent, encysted, or formed on a nucleus of a metallic, or bony nature." (See *Arch. Gen. de Med. May*, 1824, and *Edinb. Med. and Surg. Journ. Jan.* 1825.) The lithontriptor, as the foregoing account proves, will effect the removal of much larger calculi, than can be got rid of by means of the urethral forceps, made by Mr. Weiss, (see *Lithotomy,*) and, in this respect, is superior, to the latter instrument, and a truly great improvement. But, for other cases, in which the calculi are numerous and not too large to be drawn out entire through the urethra, the urethral forceps seems to me to merit the preference.

LITHOTOMY. (from λιθος, a stone; and τεμνω, to cut.) The operation of cutting into the bladder, in order to extract a stone.

It has been correctly remarked, that no single operation of surgery has attracted so much notice, or had so much written upon it, as lithotomy. A full and minute account of the sentiments of every writer, who has treated of the subject, and a detail of the infinite variety of particular modes of making an opening into the bladder, would occupy as many pages as are allotted to the whole of this Dictionary. It must be my endeavour, therefore, rather to describe what is most interesting and important, than pretend to offer an article which is to comprehend every thing.

Throughout the following columns, I suppose the reader to be already well informed of all that relates to the anatomy of the bladder and adjacent parts, and that of the perinæum? Without correct knowledge of this kind, a man must be presumptuous, indeed, to set himself up for a good lithotomist; and if he were to distinguish himself at all, it would only be by the murders which he committed, while his successful feats, if he achieved any, could redound little to his honour, since every young student would soon find out, that they were not the effect of science, but of mechanical habit and imitation. I would particularly recommend every one, who wishes to understand well the anatomy of the pelvic viscera and perinæum, with a view to lithotomy, in the first place to dissect those parts himself, and then avail himself of the valuable instructions to be derived on the subject from Winslow's Anatomy; Le Dran's Parallèle de Tailles; Le Cat's Deuxième Recueil, planches 5 et 6; Haller's Inst. Med. of Boerhaave, and Elem. Physiol. T. 5; Morgagni, Adversar. Anat. 3, p. 82, 97; Camper's plates; Lizars's plates; John Bell's Principles of Surgery; Deschamp's Traité Historique, &c. de l'Operation de la Taille, T. 1, p. 7, &c.; and Langenbeck's description of the parts, and the matchless plate, which he has given of them in his valuable work on lithotomy, cited at the end of this article.

A few subjects, closely connected with the present, will be found in other parts of this Dictionary. For instance, the nature of stones in the bladder will be considered under the head of *Urinary Calculi*, where also will be seen some observations on lithontriptics. The manner of searching for the stone, or, as it is now more commonly expressed, of sounding, will be explained in the article *Sounding*.

Here I shall principally confine myself to the symptoms of the disease, and the chief methods of executing the much diversified operation of lithotomy.

SYMPTOMS OF THE STONE.

The symptoms of a stone in the bladder are, a sort of itching along the penis, particularly at the extremity of the glans; and hence the patient often acquires the habit of pulling the prepuce, which becomes very much elongated; frequent propensities to make water, and go to stool; great pain in voiding the urine, and difficulty of retaining it, and often of keeping the feces from being discharged at the same time; the stream of urine is liable to stop suddenly, while flowing in a full current, although the bladder is not empty, so that the fluid is expelled by fits, as it were; the pain is greatest towards the end of, and just after, the evacuation; there is a dull pain about the neck of the bladder, together with a sense of weight, or pressure, at the lower part of the pelvis: and a large quantity of mucus is mixed with the urine; and, sometimes, the latter is tinged with blood, especially after exercise. (*Sharp, Earle, Sabatier.*)

Frequently (says Deschamps) a patient will have a stone in his bladder a long while without the occurrence being indicated by the symptoms. (See *Case in Howship on complaints affecting the Secretion and Excretion of the Urine, p.* 125.) Most commonly, however, the presence of the stone is announced by pain in the kidneys, more especially in adults and old persons, children scarcely ever suffering in this way, because in them the stone is hardly detained in the kidneys and ureters at all, but descends immediately into the bladder.

It seldom happens, that calculous patients void blood with their urine, before the symptoms, usually caused by the stone, have taken place. It is not till after the foreign body has descended into the bladder, acquired some size, and presented itself at the orifice of that viscus, that pain is occasioned, particularly when the surface of the stone is unequal. The patient then experiences frequent inclination to make water, attended with pain. The jolting of a carriage, riding on horseback, and much walking, render the pain more acute. The urine appears bloody, and its course is frequently interrupted, and sabulous matter and particles of stone are sometimes discharged with it. The want to make water becomes more frequent and more insupportable. The bladder is irritated, and inflames; its parietes become thickened and indurated; and its diameter is lessened. A viscid, more or less, tenacious matter is observed, in greater or lesser quantity, in the urine, and is precipitated to the bottom of the vessel. The urine becomes black and putrid, and exhales an intolerable alkalescent smell, which is perceived at the very moment of the evacuation, and is much stronger a little while afterwards. The patient can no longer use any exercise, without all his complaints being redoubled. Whenever he walks in the least, the urine becomes bloody; the pain about the hypochondria, which was dull in the beginning, grows more and more acute; the ureters and kidneys participate in the irritation with the bladder; they inflame and suppurate, and very soon the urine brings away with it purulent matter. The fever increases, and changes into one of a slow type; the patient loses his sleep and appetite; becomes emaciated; and exhausted; and death at length puts a period to his misery. (See *Traité Historique et Dogmatique de l'Operation de la Taille, par J. F. L. Deschamps, T.* 1, *p.* 163. *Paris,* 1796.)

It is acknowledged by the most experienced surgeons, that the symptoms of a stone in the bladder are exceedingly equivocal, and may be produced by several other disorders. "Pain in making water, and not being able to discharge the urine without the feces, are common consequences of irritation of parts about the neck of the bladder, from a diseased prostate gland, and other causes. The urine stopping in a full stream is frequently caused by a stone altering its situation, so as to obstruct the passage; but the same thing may happen from a tumor, or fungus in the bladder. I have seen an instance of this, where a tumor, hanging by a small pedicle, would sometimes cause obstruction, and by altering the posture, would retire, and give a free passage.

The dull pain at the neck of the bladder, and the sensation of pressure on the rectum, are frequently owing to the weight of the stone, &c.; but these may proceed from a diseased enlargement of the prostate gland. Children generally, and grown persons frequently, are subject to a prolapsus ani, from the irritation of a stone in the bladder; but it will likewise be produced by any irritation in those parts." (*Earle.*) The rest of the symptoms are equally fallacious; a scirrhous enlargement of the os tincæ, and disease of the kidneys may occasion a copious quantity of mucus in the urine, with pain, irritation, &c. "The least fallible sign (says Sir James Earle) which I have remarked, is the patient making the first portion of urine, with ease, and complaining of great pain coming on when the last drops are expelled. This may readily be accounted for, from the bladder being at first defended from contact with the stone by the urine, and, at last, being pressed naked against it. But, to put the matter out of all doubt, and actually to prove the existence of a stone in the bladder, we must have recourse to the operation of sounding."

A stone in the ureter, or kidneys, or an inflammation in the bladder from any other cause, will sometimes produce the same effects; but if the patient cannot urine, except in a certain posture, it is almost a sure sign that the orifice of the bladder is obstructed by a stone. If he finds ease by pressing against the perinæum with his fingers or sitting with that part upon a hard body, there is little doubt the ease is procured by taking off the weight of the stone; or, lastly, if, with the other symptoms, he thinks he can feel it roll in his bladder, it is hardly possible to be mistaken; however, the only sure judgment is to be formed from searching. (*Sharp on the Operations.*)

An enlarged prostate gland is attended with symptoms resembling those of a stone in the bladder; but, with this difference, that the motion of a coach, or horse, does not increase the grievances, when the prostate is affected, while it does so in an intolerable degree in cases of stone. It also generally happens, that the fits of the stone come on at intervals; whereas, the pain from a diseased prostate, is neither so unequal, nor so acute. (*Sharp in Critical Enquiry, p.* 165, *Edit.* 4.)

Though, from a consideration of all the circumstances above related, the surgeon may form a *probable* opinion of there being a stone in the bladder, yet he must never presume to deliver a *positive* one, nor ever be so rash as to undertake lithotomy, without having greater reason for being certain that there is a stone to be extracted. Indeed, all prudent surgeons, for centuries past, have laid it down as an invariable maxim, never to deliver a decisive judgment, nor undertake lithotomy, without having previously introduced a metallic instrument, called a sound, into the bladder, and plainly felt the stone.

I know of, at least seven cases, and at two of them I was present, where the patients were subjected to all the torture and perils of this operation, without there being any calculi in their bladders. The maxim, therefore, cannot be too strictly enforced, that the operation ought never to be attempted, unless the stone can be *distinctly* felt with the sound or staff. In one of the examples, of which I was a spectator, not only the symptoms, but the feel, which the sound itself communicated when in the bladder, made the surgeons imagine, that there was a calculus, or some extraneous body in this organ. Most of the above cases, I understand, recovered, which may be considered fortunate; because when the stone cannot be found, the disappointed operator is apt to persist in roughly introducing his fingers, and a variety of instruments, so long, in the hope of catching what cannot be got hold of, that inflammation of the bladder and peritoneum is more likely to follow, than when a stone is actually present, soon taken out, and the patient kept only a short time upon the operating table.

In a valuable practical work is recorded an instance, in which what is called a horny cartilaginous state of the bladder made the sound communicate a sensation, like that arising from the instrument actually touching a stone, and the surgeon attempted lithotomy. This patient unfortunately died in twenty-four hours. (See *Desault's Parisian Chir. Journal, Vol.* 2, *p.* 125.)

However, were the symptoms most unequivocal, there is one circumstance which would always render it satisfactory to touch the stone with an instrument, just *before* venturing to operate; I mean the possibility of a stone being actually in the bladder to-day, and *not to-morrow.* It is said, that stones are occasionally forced, by the violent contractions of the bladder, during fits of the complaint, between the fasciculi of the muscular coat of this viscus, together with a portion of the membranous lining of the part, so as to become what is termed encysted. The opening into the cyst is frequently very narrow, so that the stone is much bigger, than the orifice of the cyst, in consequence of which it is impossible to lay hold of the extraneous body with the forceps, and the operation would necessarily become fruitless. (*Sharp's Critical Enquiry, p.* 228, *Edit.* 4.)

In the article *Urinary Calculi*, I have noticed the probability of this having occurred in some of the instances, in which Mrs. Stevens's medicine was supposed to have actually dissolved the stone in the bladder; for, an encysted stone is not likely to be hit with the sound, nor to cause any inconvenience, compared with what a calculus, rolling about in the bladder, usually occasions.

It is remarked by Deschamps, that when the stone is lodged in an excavated corner of the bladder, in a particular cyst, or depression; when it projects but very little; when it cannot shift its situation in the bladder, so as to fall against the orifice of this viscus; and when it is also smooth, polished, and light; the patient may then have it a long while, without experiencing any afflicting symptoms. He may even live to an advanced age, if not without some degree of suffering, at all events, with such pain as is very supportable. Daily experience proves, that persons may live a considerable time, with one, two, or even three stones in the bladder, and, during the whole of their lives, have not the least suspicion of the existence of these foreign bodies.

According to Deschamps, this must have been the case of M. Portalieu, a tailor. This individual, eighty years old, was frequently attacked with a retention of urine from paralysis, and Deschamps introduced a sound several times, and distinctly felt a stone in the bladder. The patient, however, never had any symptom of the disorder, nor even at the end of two years from the time when Deschamps was first consulted. Very large and exceedingly rough stones have also been found in the dead bodies of persons, who had never complained of the symptoms of the disease. Thus, at the Anatomical Theatre of La Charité, Richerand found an enormous mulberry stone in the bladder of a person, who died altogether of another disease, and never had any symptom, that led to the suspicion of the stone. (*Nosographie Chir. T.* 3, *p.* 530, *Edit.* 4.) But, cases of this kind must be rare, because it is well known, that the pain, which a stone produces, is less in a ratio to its size, than to its shape and situation. A small stone, owing to its situation, may be more painful, than an enormous calculus, which fills the bladder, as is proved by the following case, by Deschamps.

Pochet, a watchmaker, until the age of forty-five, had never had any infirmity, except that of not being able to retain his water a long while. One day, while he was carrying a very heavy clock, he made some exertions, which, probably, by changing the situation of the calculus, caused at the instant an acute pain in the hypogastric region. Symptoms of the stone soon came on; the pain became intolerable, and the patient went into the Hôpital de la Charité. He was sounded; the stone was felt, and judged to be of considerable size. The incision in the neck of the bladder not sufficing for its extraction, the patient was put to bed again. The next morning, he was operated upon above the pubes by Frère Come, who extracted an oval calculus that weighed twenty-four ounces. The patient died, four-and-twenty hours after this second operation. This case proves, then, that very large stones may lie in the bladder without occasioning any serious complaints, since the preceding patient apparently had had such a calculus a long time, without suffering inconvenience from it, and it seems likely, that he might have continued well still longer, had it not been for the accidental effort, which first excited the symptoms. (*Traité Historique, &c. de la Taille, T.* 1, *p.* 166, 167.)

A priest, in whom Morand had ascertained the presence of a stone by sounding, could not be persuaded, that his case was of this nature. However, he bequeathed his body at his decease to the surgeons, and the examination of the bladder fully justified Morand's prognosis. The celebrated D'Alembert also died with a stone in his bladder, having always refused to be sounded. (*Richerand, Op. cit. T.* 3, *p.* 538.)

A question may here suggest itself: ought lithotomy to be practised where calculi are under a certain size? Certainly not, because they frequently admit of being extracted through the urethra, or discharged with the urine, without any operation at all, even from the male subject; and how much more likely this is to happen in females, must be plain to every body who recollects the direct course, the shortness, ample size, and dilatability of the meatus urinarius. On this subject, various facts, and, in particular, the dilator used by Sir A. Cooper, will be adverted to in considering lithotomy in women. Sometimes, also, when a calculus is too large to pass completely through the male urethra, it lodges in this passage, where it may be more safely cut upon and removed, than from the bladder; and sometimes it is actually discharged by an ulcerative process. Thus, Dr. R. A. Langenbeck has published an example, in which a stone made its way out by ulceration, and was discharged immediately behind the testes. (See *J. C. Langenbeck's Bibl. für die Chir., Gött.* 1809.) And G. Coopmans has recorded an almost incredible case, in which a calculus, weighing five ounces, one drachm and a half, was discharged on the left side of the urethra of an elderly man, a little below the glans penis. In fact, without some further explanation, this case would be pronounced impossible; but, it should be recollected, that after a small calculus has made its way out of the urethra by ulceration, if the urine have still access to it, it will continue to increase in size in its new situation; and this is what happened in the present example; for, the extraneous body, when first felt externally, was not larger than a pea. The calculus is now preserved in Camper's museum. (*Neurologia, 8vo. Franequeræ,* 1795.) I am not meaning, however, to recommend surgeons to let the patient encounter all the sufferings which must inevitably attend leaving the business to be completed by ulceration, because, as soon as the nature of the case is known, an incision should be made into the swelling, and the foreign body taken out. In many cases, also, small calculi may be voided by dilating the male urethra with elastic gum catheters of very large diameter, and then desiring the patient to expel his urine, with considerable force, a plan which Baron Larrey has found repeatedly answer. The idea of withdrawing calculi from the bladder through the urethra, by suction, and dilatation of the passage, seems to have been entertained by several practitioners of former days, especially Alpinus, Muys, Verduc, Mayerne, and Le Dran. (See *Dr. Kerrison's Paper in Med. Chir. Trans. Vol.* 12, *p.* 315.) Desault even tried experiments with a kind of forceps, which admitted of being protruded, and of opening and shutting at the extremity of a cannula, which was introduced into the bladder; but no instance of his success on the human subject is recorded. (See *Journ. de Chir. T.* 2, *p.* 375, *Paris,* 1791.) The honour of bringing the plan to perfection was reserved for Sir Astley Cooper: "The instrument (says he) which I first had made for the purpose of removing these stones from Mr. Buller, were merely common forceps, made of the size of a sound, and similarly curved; but, Mr. Weiss, surgeons' instrument maker in the Strand, showed me a pair of bullet forceps, which, he thought, would with a little alteration better answer the purpose I had in view. He removed two of the blades of these forceps, (for there were four,) and gave them the form of the forceps, which I had had constructed: the blades of this instrument could be opened whilst in the bladder, by means of a stilette, so as to grasp and confine the stone, and they appeared so well constructed for the purpose as to induce me to make trial of them, on the 23d of November, 1820; and the manner in which they were used was as follows: Mr. Buller was placed across his bed, with his feet resting on the floor, and a silver catheter was then introduced, and the bladder emptied of urine. I then passed the forceps into the bladder, and was so fortunate in my first operation as to extract eight calculi. The instrument gave but little pain on its introduction, but, when opened to its greatest extent, and the stones admitted between its blades, their removal was painful, more especially at the glans penis, which appears to be the portion of the urethra, which makes the greatest resistance to the removal of the stones. A dose of opium was given after each operation." (*Med. Chir. Trans. Vol.* 11, *p.* 358.) Sir A. Cooper thus removed from the above patient 84 calculi at different times. From one patient, Mr. Brodie also extracted in the same manner about sixty calculi, of various sizes; but the largest measured half an inch in one diameter, and five-eighths in the other. (*Op. cit. Vol.* 12, *p.* 383.) In one case, Sir A. Cooper took out with the urethral forceps a calculus, that weighed fifty-four grains, after having gradually dilated the urethra with bougies. (*Vol. cit. p.* 387.) Other convincing examples of the practicableness and success of the practice are also related by the same distinguished surgeon. According to his valuable observations, when a great number of calculi are found in the bladder, they are generally attended with an enlargement of the prostate gland, and are lodged in a sacculus formed directly behind it. (*Vol.* 11, *p.* 357.)

To me the establishment of the preceding practice by Sir Astley Cooper seems one of the greatest triumphs of modern surgery, and I have no doubt, that his name will receive from the latest posterity all the honour which cannot fail to attach itself to an improvement, by which the necessity for a severe and highly dangerous operation is rendered considerably less frequent. Even when the stone cannot be drawn completely out of the urethra, but only into it, the advantage is great, because, it may then be easily cut down to, and extracted, without any wound, or injury of the bladder. (See *Med. Chir. Trans. Vol.* 11.)

I shall next describe the various methods of cutting for the stone, beginning with the most ancient, called the *apparatus minor,* and ending with the modern proposal of employing a knife in preference to a gorget.

OF THE APPARATUS MINOR, CUTTING ON THE GRIPE, OR CELSUS'S METHOD.

The most ancient kind of lithotomy was that practised upwards of two thousand years ago, by Ammonius, at Alexandria, in the time of Herophilus and Erasistratus, and by Meges, at Rome, during the reign of Augustus; and, being described by Celsus, is named *Lithotomia Celsiani.* As the stone, fixed by the pressure of the fingers in the anus, was cut directly upon, it has been called *cutting on the gripe,* a knife and a hook being the only instruments used. The appellation of the *lesser apparatus* was given to it by Marianus, in order to distinguish it from a method which he described, called the *apparatus major,* from the many instruments employed.

The operation was done in the following way. The rectum was emptied by a glyster, a few hours previously; and immediately before cutting, the patient was desired to walk about his chamber, to bring the stone down to the neck of the bladder; he was then placed in the lap of an assistant, or secured in the manner now practised in the lateral operation. The surgeon then introduced the fore and middle fingers of his left hand, well oiled, into the anus; while he pressed with the palm of his right hand on the lower part of the abdomen, above the pubes, in order to promote the descent of the stone. With the fingers the calculus was next griped, pushed forward toward the neck of the bladder, and made to protrude, and form a tumor on the left side of the perinæum. The operator then took a scalpel, and made a lunated incision through the skin and cellular substance, directly on the stone, near the anus, down to the neck of the bladder, with the horns towards the hip. Then, in the deeper and narrower part of the wound, a second transverse incision was made on the stone into the neck of the bladder itself, till the flowing out of the urine showed, that the incision exceeded in some degree the size of the stone. The calculus, being strongly pressed upon with the fingers, next started out of itself, or was extracted with a hook for the purpose. (*Celsus, lib.* 7, *cap.* 26. *J. Bell's Principles, Vol.* 2, *p.* 42. *Allan on Lithotomy, p.* 10.)

The objections to cutting on the gripe, are; the impossibility of always dividing the same parts; for, those which are cut will vary, according to the degree of force employed in making the stone project in the perinæum. When little exertion is made, if the incision be begun just behind the scrotum, the urethra may be altogether detached from the prostate: if the stone be much pushed out, the bladder may be entered beyond the prostate, and both the vesiculæ seminales and vasa deferentia inevitably suffer. Lastly, if the parts are just sufficiently protruded, the bladder will be cut upon its neck, through the substance of the prostate gland. (*Allan on Lithotomy. Burns, in Edinb. Surg. Journal, No. XIII. J. Bell, Vol.* 2, *p.* 59.)

The preceding dangers were known to Fabricius Hildanus, who attempted to obviate them by cutting on a staff, introduced through the urethra into the bladder. He began his incision in the perinæum, about half an inch on the side of the raphe; and he continued the cut, inclining the knife, as he proceeded, towards the hip. He continued to divide the parts till he reached the staff; after which, he enlarged the wound to such an extent, as permitted him easily with a hook to extract the stone, which he had previously brought into the neck of the bladder, by pressure with the fingers in the rectum. (*Burns.*) In this way Mr. C. Bell has operated with success. (*J. Bell.*)

The apparatus minor, as practised by Fabricius, with the aid of a staff, is certainly a very simple operation on children, and some judicious surgeons doubt the propriety of its present neglected state. You cut, says an eminent writer, upon the stone, and make of course, with perfect security, an incision exactly proportioned to its size. There is no difficult nor dangerous dissection; no gorget, nor other dangerous instrument, thrust into the bladder, with the risk of its passing betwixt that and the rectum; you are performing, expressly, the lateral incision of Raw and Cheselden, in the most simple and favourable way. The *prisca simplicitas instru-*

mentorum seems here to have been deserted, for the sake of inventing more ingenious and complicated operations. (*J. Bell.*)

Celsus has delivered one memorable precept in his description of lithotomy, *ut plaga paulo major quàm calculus sit;* and he seems to have known very well, that there was more danger in lacerating, than cutting the parts.

The simplicity of the apparatus minor, however, formerly emboldened every quack to undertake it; and as this circumstance was necessarily followed by the evils and blunders, unavoidably originating from ignorance, at the same time that it diminished the emolument of regular practitioners, the operation fell into disrepute. (See *Heister.*) It was longer practised, however, than all the other methods, having been continued to the commencement of the 16th century; and it was performed at Bourdeaux, Paris, and other places in France, on patients of all ages, by Raoux, even as late as 150 years ago. Frère Jacques occasionally had recourse to it; and it was successfully executed by Heister. (*Part* 2, *chap.* 140.) A modern author recommends it always to be preferred on boys, under fourteen. (*Allan, p.* 12.)

APPARATUS MAJOR.

So named from the multiplicity of instruments employed; or the Marian method, from having been first published by Marianus Sanctus, in 1524, as the invention of his master, Johannes de Romanis.

This operation, which came into vogue, as we have noticed, from avaricious causes, was rude and painful in its performance, and very fatal in its consequences. The apology for its introduction was the declaration of Hippocrates, that *wounds of membranous parts are mortal.* It was contended, however, that such parts might be dilated with impunity; and, on this principle of dilatation, Romanis invented a complex and dangerous plan of operating; one very incompetent to fulfil the end proposed; one, which, though supposed only to dilate, really lacerated the parts. (*Burns.*)

The operator, kneeling on one knee, made an incision, with his razor, along the perinæum, on one side of the raphe; and, feeling with his little finger, for the curve of the staff, he opened the membranous part of the urethra; and, fixing the point of the knife in the groove of the staff, gave it to an assistant to hold, while he passed a probe along the knife into the groove of the staff, and thus into the bladder. The urine now flowed out, and the staff was withdrawn. The operator next took two conductors, a sort of strong iron probes; one, named the female conductor, having in it a groove, like one of our common directors: the other the male conductor, having a probe point, corresponding with that groove. The grooved, or female conductor, being introduced along the probe into the bladder, the probe was withdrawn, and the male conductor passed along the groove of the female one, into the bladder. Then commenced the operation of dilating. The lithotomist took a conductor in each hand, and, by making their shafts diverge, dilated, or, in plain language, tore open the prostate gland. (*J. Bell.*)

It would be absurd in me to trace the various dilating instruments, contrived for the improvement of this barbarous operation, by the Colots, Maréchal, Le Dran, Paré, &c. Among the numerous glaring objections to the apparatus major, we need only notice the cutting of the bulb of the urethra, not dividing the membranous part of the urethra, nor the transversalis perinæi muscle, which forms a kind of bar across the place where the stone should be extracted; violent distention of the membranous part of the urethra and neck of the bladder; laceration of these latter parts; large abscesses, extravasation of urine, and gangrene; frequent impotency afterwards; and extensive fatality. Bertrandi even saw the urethra and neck of the bladder torn from the prostate by the violence, employed in this vile method of operating. (*Operations de Chir. p.* 169.) However, Paré, Le Dran, Le Cat, Mery, Morand, Mareschal, Raw, and all the best surgeons in Europe, most strangely practised this rash method, for two hundred years, till Frère Jacques, in 1697, taught at Paris the original model of lithotomy, as commonly adopted at the present day.

THE HIGH OPERATION

Was first practised in Paris, in 1475, by Colot, as an experiment on a criminal, by permission of Louis the 11th; and the patient recovered in a fortnight. The earliest account of this method of operating was published in 1556, by Pierre Franco, in his Treatise on Hernia, Ed. 1. He performed it on a child, two years old, after finding the calculus too large to admit of being extracted from the perinæum, where he had first made an opening; his remarks, however, tend to discourage the practice. Rossetus recommended it, with great zeal, in his book intitled *Partus Cæsarius*, printed in 1591; but he never performed the operation himself. Tolet mentions the trial of it in the Hôtel-Dieu, but, without entering into the particular causes of its discontinuance, merely says, that it was found inconvenient. About the year 1719, it was first done in England, by Mr. Douglas; and after him, practised by others.—(*Sharp's Operations.*)

The patient being laid on a square table, with his legs hanging off, and fastened to the sides of it by a ligature, passed above the knee, his head and body lifted up a little by pillows, so as to relax the abdominal muscles, and his hands held steady by some assistants; as much barley-water as he could bear, which was often about eight ounces, and sometimes twelve, was injected through a catheter, into the bladder.

In order to prevent the reflux of the water, an assistant grasped the penis, the moment the catheter was withdrawn, holding it on one side, in such a manner as not to stretch the skin of the abdomen; then, with a round-edged knife, an incision, about four inches long, was made between the recti and pyramidal muscles, through the membrana adiposa, as deep as the bladder, bringing its extremity almost down to the penis; after this, with a crooked knife, the incision was continued into the bladder, and carried a little under the os pubis; and immediately upon the water's flowing out, the forefinger of the left hand was introduced, which directed the forceps to the stone. (*Sharp's Operations.*) Sabatier disapproves of making the cut in the bladder from below upward, lest the knife injure the peritonæum. (*Méd. Opératoire*, *T.* 3, *p.* 160.)

Although this method of operating appears at first view feasible enough, several objections soon brought it into disuse. 1. The irritation of a stone often causes such a thickened and contracted state of the bladder, that this viscus will not admit of being distended, so as to rise above the pubes. 2. If the operator should break the stone, the fragments cannot be easily washed away, but, remaining behind, form a nucleus for a future stone. 3. Experience has proved, that the high operation is very commonly followed by extravasation of urine, attended with suppuration and gangrenous mischief in the cellular membrane of the pelvis. This happens because the urine more readily escapes out of the wound in the bladder, than through the urethra; and also because when the bladder contracts, and sinks behind the os pubis, the wound in it ceases to be parallel to that in the linea alba and integuments, and becomes deeper and deeper. For the prevention of these ill consequences, says Sabatier, it will be in vain to make the patient lie in a horizontal posture, and keep a catheter introduced, as Rousset and Morand recommended: the bad effects being still neither less frequent, nor less fatal. (See *Médecine Opératoire*, *T.* 3, *p.* 161. *Edit.* 2.) And Sir Everard Home confesses, that while the high operation for the stone had no other channel but the wound for carrying off the urine, it seemed to him a method, which ought never to be adopted; "the urine almost always insinuating itself into the cellular membrane behind the pubes, producing sloughs, and consequently abscesses." (*On Strictures*, *Vol.* 3, *p.* 359, *8vo. Lond.* 1821.) 4. The danger of exciting inflammation of the peritonæum. 5. The injection itself is exceedingly painful, and, however slow the fluid be injected, the bladder can' seldom be dilated enough to make the operation absolutely secure; and, when hastily dilated, its tone may be destroyed. (See *Sharp*, *Allan*, *Sabatier*, *&c.*)

Some judicious surgeons of the present day are decidedly of opinion, that when a stone in the bladder is known to be very large, no attempt ought ever to be made to extract it from the perinæum. Scarpa declares, that the lateral operation should not be practised, when the calculus exceeds twenty lines in its small diameter. (See *Memoir on the Cutting Gorget of Hawkins*, *p.* 8, *transl. by Briggs.*) In such cases, it is true, the surgeon may do the lateral operation, and try to break the stone. But, ought this proceeding to be preferred to the high operation? I speak particularly of cases, in which the stone is known to be of very large dimensions before any operation is begun. Were the lateral operation commenced, the stone, if too large for extraction, must of course be broken; for, it is then too late to adopt the high operation with advantage. That such things have been done, however, and yet the patients escaped, is a truth, which cannot be denied. Deschamps mentions an instance, in which M. Lassus, after using Hawkins's gorget, could not draw out the calculus, and he therefore immediately did the high operation, and the patient recovered. Indeed, the second example of the high operation on record was done by Franco under similar circumstances, and the patient was saved. I have also heard of a modern French surgeon, who began with the lateral operation, but finding a large calculus, ended with performing the high operation, without the least delay, or hesitation: the patient died.

Mr. S. Sharp, an excellent practical surgeon in his time, after noticing with great impartiality the objections which were then urged against the high operation, says, that he should not be surprised, if hereafter it were revived and practised with success; an observation, which implied, that he foresaw, that the method was capable of being so improved, as to free it from its most serious inconveniences. In fact, since his time, various attempts have been made to introduce the high operation anew, and upon improved principles. Frère Côme, in particular, knew very well, that there were circumstances, as for instance, a calculus above a certain size, disease of the urethra, or prostate gland, &c., where the lateral operation was liable to great difficulties and disadvantages, and where the high operation, if it could be perfected, would be a fitter and safer mode of proceeding. However, it was only in such cases, and not in all, that Frère Côme thought the method better, than the lateral operation. He had also discernment enough to perceive, that it was extremely desirable to invent some means, whereby the painful and hurtful distention of the bladder, for the purpose of making this organ rise behind the pubes, would be rendered unnecessary, at the same time, that some measure was adopted for letting the urine have a more depending outlet, than the wound in the hypogastric region. In the early editions of this dictionary, the error was committed of representing Côme to have cut the neck of the bladder, as well as its fundus; a mistake which I first became aware of upon the perusal of Mr. Carpue's interesting work on lithotomy. The fact is, that Côme did not wound the bladder in two places; but operated after the following way: he first introduced through the urethra into the bladder a staff, which was then held by an assistant. An incision, an inch in length, was now made in the perinæum, in the same direction, as in the lateral operation. Another incision was made in the membranous part of the urethra along the groove of the staff, as far as the prostate gland. A very deeply grooved director was then passed along the staff into the bladder, and the latter instrument was withdrawn. By means of the director, a *sonde à dard*, or kind of catheter furnished with a stilette, was now introduced into the bladder, and the director taken out. An incision was then made, about three or four inches in length, just above the symphysis of the pubes, down to, and in the direction of, the linea alba. A trocar, in which there was a concealed bistoury, was next passed into the linea alba, close to the pubes, and the blade of the knife then started from its sheath towards the handle of the instrument, while its other end remained stationary. In this manner, the lower part of the linea alba was cut from below upwards, and an aperture was made, which was now enlarged with a probe-pointed curved knife, behind which a finger was kept, so as to push the peritonæum out of the way. Côme then took hold of the *sonde à dard* with his right hand, and elevating its extremity, lifted up the fundus of the bladder, while with the fingers of his left hand he endeavoured to feel its extremity in the wound. As soon as the end of the instrument was perceived, it was taken hold of between the thumb and middle finger, the peritonæum was carefully kept up out of the way, and the stilette was pushed by an assistant from within outwards, through the fundus of the bladder. The bladder being thus pierced, the operator introduced into a groove in the stilette a curved bistoury, with which he divided the front of the bladder, from above downwards, nearly to its neck. He then passed his fingers into the opening, and keeping up the bladder with them, withdrew the *sonde à dard* altogether. But, as it was desirable that both his hands should be free, the bladder was prevented from slipping away by means of a suspensory hook, held by an assistant as soon as the opening was found to be already ample enough, or had been enlarged to the necessary extent. Côme next introduced the forceps, took out the stone, and passed a cannula, or elastic gum catheter through the wound in the perinæum into the bladder, so as to maintain a ready outlet for the urine, and divert this fluid from the wound in the bladder. In women, of course, the catheter was passed through the meatus urinarius. And, I ought here to observe, that Côme, like Scarpa, thought the high operation especially advisable for females, because his experience had taught him, that the division, or dilatation, of the meatus urinarius was generally followed by an incontinence of urine. (See *Nouvelle Méthode d'extraire la Pierre de la Vessie par dessus le Pubis, &c. 8vo. Bruxelles,* 1779.)

Another modification of the high operation was suggested by Deschamps, who, instead of opening the membranous part of the urethra, as Côme did, perforated the bladder from the rectum, and through the cannula of the trocar effected the same objects, which the latter lithotomist accomplished by means of the incision in the membranous part of the urethra. Of the two plans, that devised by Côme is unquestionably the best, because not attended with a double wound of the bladder; a thing which, I conceive, must always be highly objectionable.

Dr. Souberbielle, who practises Côme's method, introduces a silver wire through the cannula of the *sonde à dard*, and passes it through the wound made in the linea alba. The wire is then held while the *sonde à dard* is withdrawn, and a flexible gum-catheter is passed by means of the wire into the bladder through the wound in the membranous part of the urethra. The wire is now withdrawn, and the catheter is fixed with tapes, passed round the thighs and pelvis, and a bladder is tied to it for the reception of the urine. "A piece of soft linen, half an inch wide, and six or eight inches long, is to be introduced, by means of a pair of forceps into the bottom of the bladder;" the object of which slip of linen is to carry off such urine, as may not escape through the catheter. Lint and light dressings are applied, and a bandage round the abdomen. Great care is to be taken to keep the catheter pervious, and, usually on the third day, the slip of linen may be taken out, and the wound closed with adhesive plaster. (See *Carpue's History of the High Operation, p.* 171, 172.)

Sir Everard Home made trial of Dr. Souberbielle's method in St. George's Hospital, and though some difficulty and delay occurred in the operation, on account of the stone being encysted, the result was successful. Subsequently to this case, however, Sir Everard has invented and practised another method, which, as far as I can judge, is better than that of Côme, or Souberbielle, though its principles are the same. When it is considered, that in the operation of these last lithotomists, the neck of the bladder is not opened, and the catheter enters this receptacle through the prostatic portion of the urethra, it must be immediately obvious, that the incision in the perinæum cannot answer any material object, because a tube may be placed in the same position by passing it through the urethra from the orifice in the glans. The retainer, or bracelet, invented for keeping the catheter in the bladder, in cases of enlargement of the prostate gland, seemed to Sir Everard Home peculiarly applicable to the high operation, since it keeps the tube steadily in the natural canal, and renders the wound in the perinæum unnecessary. Bracelets, for this purpose, extremely elastic, and producing no irritation, are sold by Mr. Weiss, of the Strand. They are furnished with small rings, to which the outer end of the catheter is fixed by means of string.

Sir Everard Home performed his new operation, for the first time, in St. George's Hospital, on the 26th of May, 1820. "An incision was made in the direction of the linea alba, between the pyramidales muscles, beginning at the pubes, and extending four inches in length: it was continued down to the tendon. The linea alba was then pierced close to the pubes, and divided by a probe-pointed bistoury to the extent of three inches. The pyramidales muscles had a portion of their origin at the symphysis pubis detached to make room. When the finger was passed down under the linea alba, the fundus of the bladder was felt covered with loose, fatty cellular membrane. A silver catheter, open at the end, was now passed along the urethra into the bladder, and, when the point was felt by the finger in the wound, pressing up the fundus, a stilet, that had been concealed, was forced through the coats of the bladder, and followed by the end of the catheter. The stilet was then withdrawn, and the opening, through the fundus of the bladder, enlarged towards the pubes, by a probe-pointed bistoury, sufficiently to admit two fingers, and then the catheter was withdrawn. The fundus of the bladder was held up by one finger, and the stone examined by the forefinger of the right hand. A pair of forceps, with a net attached, was passed down into the bladder, and the stone directed into it by the finger: the surface being very rough, the stone stuck upon the opening of the forceps, and being retained there by the finger, was extracted. A slip of linen had one end introduced into the bladder, and the other was left hanging out of the wound, the edges of which were brought together by adhesive plaster. A flexible gum catheter, without the stilet, was passed into the bladder by the urethra, and kept there by an elastic retainer surrounding the penis. The patient was put to bed, and laid upon his side, in which position the urine escaped freely through the catheter." As no blood had been lost in the operation, twelve ounces were taken from the arm. The next day the slip of linen was withdrawn, as useless and irritating, the catheter while pervious, preventing any urine from escaping by the wound. Sir Everard thinks, that in future the linen need only be left in the external wound, so as to prevent collections of matter, and carry off any urine, which may issue from the opening in the bladder, when the catheter happens to be stopped up. For this operation, Sir Everard particularly recommends catheters, with their insides polished like their outsides, in order that they may better resist the effects of the urine. Suffice it to add, with respect to the above case, that the boy soon recovered, the bladder having resumed its healthy functions in ten days, although the calculus was of the roughest possible kind.

Sir Everard Home repeated his new method on a gentleman, who went out in his carriage, with the external wound completely healed, on the 14th day after the operation. The only particulars, which need here be noticed, in regard to the latter case, are, that some difficulty was experienced in bringing the point of the catheter, forwards toward the pubes, and the slit in the front of the instrument made it so incapable of bearing lateral motion, that the two sides were twisted over one another. (*On Strictures*, *Vol.* 3, *p.* 359, *8vo. Lond.* 1820.) Some other cases, however, which have occurred in St. George's Hospital, have had the effect of satisfying numerous very good judges, that, as a general practice, the high operation ought to be abandoned.

Whoever follows this method of operating should always be provided with several tubes and stilets, of different lengths and curvatures; for, in the only case, in which I have seen the operation attempted, the extremity of the catheter could not be made to project the fundus of the bladder towards the pubes, and, after long protracted endeavours had been made to bring the end of the instrument upwards and forwards, the tube broke, and the operation was left unfinished. The impression upon my mind was, that no resistance of the bladder could account for what happened, and that the fault lay in the instrument itself, which should have been exchanged for another of more suitable form, as soon as it was found to be inapplicable. And, I believe, that, if attention be paid to the suggestion of always having at hand a sufficient number of tubes and stilets, of different lengths and curvatures, Sir Everard Home's new method will be the best modification of the high operation yet proposed. The slip of linen, however, I think is more likely to do harm by its irritation, than any good, as a conductor of the urine, or matter out of the wound. At all events, as Sir Everard has observed, it should never be passed into the bladder itself. Whenever I am asked my opinion of the high operation, I always restrict my approval of further trials of it to cases, in which the calculus is known beforehand to be of very large size, or the urethra and prostate gland are diseased. The reasons, urged by Mr. Carpue, in favour of the high operation in most cases are: 1. Because, it is generally performed in less time; a point, which may be disputed, though it is perhaps not worth contesting, since the danger of an operation cannot always be truly estimated by the length of time, which the patient remains in the operating room, slow and gentle proceedings sometimes contributing to his safety. 2. There is less pain; a remark, the justness of which must depend, perhaps, upon the manner in which each operation is done. 3. There is no fear of a fatal hemorrhage; a consideration, which I admit is one good reason, in favour of the high operation; though the lateral operation is only subject to risk of hemorrhage, when the incisions are directed in a manner not sanctioned in this dictionary. 4. There is no division of the prostate and inferior part of the bladder; no, but there is one of the fundus, so that perhaps on this point the two operations stand upon an equality. As for there being no danger in the high operation of wounding the rectum, it is undoubtedly an advantage, though the accident, as far as I have seen, is not followed by any serious consequences, and can only happen from inattention to rules easily followed. 5. The stone, if of a certain size, cannot be extracted by the lateral operation, but admits of being so by the high operation. Of all the reasons for the latter practice, this appears to me the strongest, with the exception, perhaps, of disease in the urethra and prostate. 6. A small stone is more readily discovered in this method, than in the lateral operation; a point, which I consider questionable, and, at all events, not sufficiently important to form a ground for the high operation. Indeed, the long time, which several patients in St. George's Hospital were subjected to the agony caused by repeatedly groping and *fishing* for the stone in vain, has now filled a great many judicious surgeons, with strong aversion to a continuance of the attempts to revive in this country the practice of the high operation. 7. If a stone breaks, the particles can be extracted with more certainty, than in the lateral operation; on this question, authors differ, and the remarks in the foregoing passage are rather against the correctness of the statement. 8. The high operation enables the surgeon to remove encysted calculi with greater ease; a reason, which may perhaps be generally true, but which is somewhat weakened by the consideration that encysted calculi are not very frequent. Mr. Carpue allows, that the high operation should not be selected, when the patient is corpulent, and the bladder is thickened and diseased, so that its fundus cannot be raised above the pubes. (See *Hist. of the High Operation*, *p.* 173, *8vo. Lond.* 1819.)

Although Scarpa thinks the lateral operation unlikely to answer, when the calculus exceeds twenty lines in its lesser diameter, he considers the high operation also useless in such a case, and even fatal; because according to his observations, when the stone is very large, the bladder and kidneys are almost always too much diseased for the patient to recover. (*Osservazioni sul Taglio Retto Vesicale*, *p.* 3 *and* 48. *4to. Pavia*, 1823.)—He has only met with two cases to the contrary. However, in another place, in considering the advantages and disadvantages of the high operation, as compared with that performed through the rectum, in cases where the stone is too large to be extracted by the perinæum, he gives his decided preference to the former, (p. 47.) The high operation he also considers the only method, by which women can be cured without leaving them afflicted with an incontinence of urine, (p. 49.) However, after the facts related by Sir A. Cooper, Mr. Thomas and others, in the Med. Chir. Trans., few surgeons would think of having recourse to so dangerous an operation, in preference to the simple and safe plan of dilating the meatus urinarius. I decline entering into any strict consideration of the inconveniences, to which this method is exclusively subject, especially, the greater vicinity of the wound to the peritonæum and small intestines, and the division of that membrane and protrusion of the viscera: accidents, which will be found by any body, who chooses to look over the cases on record, not to have been unfrequent.

In December, 1818, Mr. Kirby, of Dublin, performed the high operation for the extraction of an elastic gum catheter, which had slipped into the bladder through the cannula of a trocar, with which paracentesis had been performed. No contrivance was found necessary for lifting up the fundus of the bladder. The puncture, already made, was enlarged, and, after the operation was finished, a catheter was placed in the wound, but was withdrawn on the 4th day, as the urine passed out by the side of it. The case terminated well. (See *Kirby's Cases*, *p.* 92, *&c.* *8vo. Dublin*, 1819.)

LATERAL OPERATION.

So named from the prostate gland, and neck of the bladder, being laterally cut.

From some quotations made by Mr. Carpue from the works of Franco, it appears clear enough, that the latter was not only the inventor of the lateral operation, but that he placed his patients in the position adopted at the present time, used similar instruments to those now employed, (excepting that his gorget had no sharp side,) and made the same incisions. Now, as this claim of Franco to an invention of such importance had been nearly, or quite forgot, when Mr. Carpue's work made its appearance, the latter gentleman deserves much praise for reminding the profession of what is due to the memory of an old surgeon, whose name must flourish, as long as the history of the rise and progress of surgery is interesting to mankind. But, though Franco appears probably to have practised the lateral operation, or something very much like it, he never established the method as a permanent improvement in surgery, which measure was left to be completed long afterwards by an ecclesiastic, who called himself Frère Jacques: he came to Paris in 1697, bringing with him abundance of certificates of his dexterity in operating; and making his history known to the court and magistrates, he got an order to cut at the Hôtel-Dieu, and the Charité, where he operated on about fifty persons. His success however did not equal his promises, and according to Dionis, some loss of reputation was the consequence.

Frère Jacques used a large round staff without a groove, and when it was introduced into the bladder, he depressed its handle, with an intention of making the portion of this viscus, which he wished to cut, approach the perinæum. He then plunged a long dagger-shaped knife into the left hip, near the tuber ischii, two finger-breadths from the perinæum, and pushing it towards the bladder, opened it in its body, or as near the neck as he could, directing his incision upward from the anus. He never withdrew his knife, till a sufficient opening had been made for the extraction of the stone. Sometimes he used a conductor to guide the forceps, but more commonly directed them with his finger, which he passed into the wound after withdrawing the knife. When he had hold of the stone, he used to draw it out in a quick rough manner, heedless of the bad consequences. His only object was to get the stone extracted, and he disregarded every thing else; all preparatory means, all dressings, all after-treatment. (*Allan, p.* 23.)

But although Frère Jacques, totally ignorant of anatomy, and rude and indiscriminate in practice, sunk into disrepute, some eminent surgeons conceived, from consideration of the parts, which he cut, that his method might be converted into a most useful operation. (*Sharp's Operations.*)

The principal defect, in his first manner of cutting, was the want of a groove in his staff, and the consequent difficulty of carrying the knife into the bladder. At length, Frère Jacques was prevailed upon to study anatomy, by which his judgment was corrected, and he readily embraced several improvements, which were suggested to him. Indeed, we are informed, that he now succeeded better, and knew more, than is generally imagined. Mr. Sharp says, that when he himself was in France in 1702, he saw a pamphlet, published by this celebrated character, in which his method of operating appeared so much improved, that it scarcely differed from later practice. Frère Jacques had learnt the necessity of dressing the wound after the operation, and had profited so much from the criticisms of Mery, Fagon, Felix, and Hunauld, that he then used a staff with a groove, and, what is more extraordinary, had cut thirty-eight patients successively, without losing one. (*Sharp's Operations.*)

In short, as a modern writer has observed, he lost fewer patients, than we do at the present day, in operating with a gorget. He is said to have cut nearly 5000 patients in the course of his life, and, though persecuted by the regular lithotomists, he was imitated by Maréchal at Paris, Raw in Holland, and by Bamber, and Cheselden in England, where his operation was perfected. (*Allan.*)

For a particular history of Frère Jacques, and his operations, Allan refers us to *Bussiere's Letter to Sir Hans Sloane, Philos. Trans.* 1699. *Observations sur la Manière de tailler dans les deux Sexes, pour l'Extraction de la Pierre, pratiquée par F. Jacques, par J. Mery.* *Lister's Journey to Paris in* 1698. *Cours d'Operations de Chirurgie, par Dionis. Garengeot, Traité des Operations, T.* 3. *Morand, Opuscules de Chirurgie, Part* 2.

Among the many, who saw Frère Jacques operate, was the famous Raw, who carried his method into Holland, and practised it with amazing success. He never published any account of it himself, though he admitted several to his operations; but, after his death, his successor Albinus, gave the world a very circumstantial detail of all the processes; and mentions, as one of Raw's improvements, that he used to open the bladder, between its neck and the ureter. But either Albinus, in his relation, or Raw himself in his supposition, was mistaken; since it is almost impossible to cut the bladder in that part upon the common staff, without also wounding the neck. (*Sharp, in Operations and Critical Enquiry.*)

Raw's method was objectionable, even when accomplished, as the urine could not readily escape, and it became extravasated around the rectum, so as to produce terrible mischief. There is little doubt, that Raw's really successful plan was only imitative of Frère Jacques's second improved one, though he was not honourable enough to confess it.

Dr. Bamber was the first man in England, who made a trial of Raw's method on the living subject, which he did in St. Bartholomew's Hospital. Cheselden, who had been in the habit of practising the high operation, gladly abandoned it, on receiving the account of Raw's plan and success, and, a few days after Bamber, he began to cut in this way in St. Thomas's Hospital.

Cheselden used at first to operate in the following manner. The patient being placed, and tied much in the same way, as is done at this day, the operator introduces a hollow grooved steel catheter into the bladder, and with a syringe, mounted with an ox's ureter, injects as much warm water into it, as the patient can bear without pain. The water being kept from running out by a slip of flannel tied round the penis, the end of the catheter is to be held by an assistant, whose principal care is to keep it from rising, but not at all to direct the groove to the place, where the incision is to be made.

With a pointed convex-edged knife, the operator beginning about an inch above the anus, on the left side of the raphe, between the accelerator urinæ, and erector penis, makes an incision downwards, by the side of the sphincter ani, a little obliquely outwards as it descends, from two and a half to four inches in length, according to the age of the patient, or size and structure of the parts. This incision he endeavours to make all at one stroke, so as to cut through the skin, fat, and all, or part of the levator ani, which lies in his way. This done, he passes his left forefinger into the middle of the wound, in order to press the rectum to one side, that it may be in less danger of being cut; and taking a crooked knife in his other hand, with the edge on the concave side, he thrusts the point of it through the wound, close by his finger, into the bladder, between the vesicula seminalis and os ischium of the same side. This second incision is continued upwards, till the point of the knife comes out at the upper part of the first. The incision being completed, the operator passes his left forefinger through the wound into the bladder, and having felt, and secured the stone, he introduces the forceps, pulls out his finger, and extracts the stone.

As the bladder was distended, Cheselden thought it unnecessary to cut on the groove of the staff, and that, as this viscus was sufficiently pressed down by the instrument, the forceps could be very well introduced without the use of any director except the finger. (*Postscript to Douglas's History of the Lateral Operation*, 1726.)

With respect to this first of Cheselden's plans, Sharp says, the operations were exceedingly dexterous; but the wound of the bladder retiring back, when it was empty, did not leave a ready issue for the urine, which insinuated itself among the neighbouring muscles and cellular substance, and four out of the ten patients on whom the operation was done perished, and some of the others narrowly escaped. (*Sharp's Operations.*)

Cheselden, finding that he lost so many patients, in imitating Raw, according to the directions given by Albinus, began a new manner of operating, which he thus describes: "I first make as long an incision as I well can, beginning near the place, where the old operation ends, and cutting down between the musculus accelerator urinæ and erector penis, and by the side of the intestinum rectum: I then feel for the staff, and cut upon it the length of the prostate gland straight on to the bladder, holding down the gut all the while with one, or two fingers of my left hand." (*Anatomy of the Human Body, Edit.* 1730.)

It deserves remark, that it was Cheselden's second manner of cutting, which was described in the *Opuscules de Chirurgie* of Morand, who was deputed, and had his expenses defrayed, by the Royal Academy of Sciences in Paris, to come over to England, and learn from Mr. Cheselden himself, his way of operating for the stone; and, accordingly, we find, that most French authors, taking their account from Morand, describe Cheselden's second, not his third operation, as that which he invented, and bears his name. But, that Mr. Cheselden never resumed his second manner of cutting may be inferred from his continuing to describe the third only in all the editions of his anatomy published after 1730. (*See a note by J. Thomson, M.D., if annexed to his new edition of Douglas's Appendix. Edinb.* 1808.)

The instruments, which Cheselden employed in his third, and most improved, mode of cutting for the stone, were a staff, an incision knife, a gorget, a pair of forceps, and a crooked needle carrying a waxed thread. The patient being placed on a table, his wrists are brought down to the outsides of his ankles, and secured there by proper bandages, his knees having first been bent, and his heels brought back near his buttocks.

Cheselden used then to take a catheter, first dipped in oil, and introduce it into the bladder, where having searched for, and discovered the stone, he gave the instrument to one of his colleagues, whom he desired to satisfy himself, whether there was a stone, or not. The assistant, standing on his right hand, held the handle of the staff between his fingers and thumb, inclined it a little towards the patient's right thigh, and drew the concave side close up to the os pubis, in order to remove the urethra as far as possible from the rectum.

The groove of the staff being thus turned outwardly and laterally, Cheselden sat down in a low chair, and, keeping the skin of the perinæum steady with the thumb and fore-finger of his left hand, he made the first or outward incision, through the integuments, from above downwards, beginning on the left side of the raphe, between the scrotum and verge of the anus, almost as high up as where the skin of the perinæum begins to form the bag containing the testicles. Thence, he continued the wound obliquely outwards, as low down as the middle of the margin of the anus, at about half an inch distant from it, and consequently, beyond the tuberosity of the ischium. He was always careful to make this outward wound as large as he could with safety. Having cut the fat rather deeply, especially near the rectum, he used to put his left fore-finger into the wound, and keep it there till the internal incision was quite finished; first to direct the point of his knife into the groove of the staff, which he now felt with the end of his finger; and secondly, to hold and prevent the rectum from being wounded, by the side of which his knife was to pass. This inward incision Cheselden made with more caution, than the former. His knife first entered the groove of the rostrated, or straight part of the staff, through the side of the bladder, immediately above the prostate, and its point was afterwards brought along the same groove in the direction downwards, and forwards, or towards himself. Cheselden thus divided that part of the sphincter of the bladder which lay upon the prostate gland, of which he next cut the outside of one half obliquely, according to the direction and whole length of the urethra within it, and finished the internal incision, by dividing the membranous portion of the urethra, on the convex part of his staff.

A sufficient opening being made, Cheselden used to rise from his chair, his finger still remaining in the wound. Next he put the beak of his gorget in the groove of the staff, and then thrust it into the bladder. The staff was now withdrawn, and, while he held the gorget with his left hand, he introduced the forceps with the flat side uppermost, with great caution, along the concavity of the gorget. When the forceps was in the bladder, he withdrew the gorget, and taking hold of the two handles of the forceps with both his hands, he searched gently for the stone, while the blades were still kept shut. As soon as the calculus was felt, the forceps was opened, and an attempt made to get the lower blade under the stone, in order that it might be more conveniently laid hold of. This being done, the stone was extracted with a very slow motion, in order to give the parts time to dilate, and the forceps was gently turned in all directions.

When the stone was very small, and did not lie well in the forceps, Cheselden used to withdraw this instrument, and introduce his finger into the bladder, for the purpose of turning the stone, and disengaging it from the folds of the lining of the bladder, in which it was sometimes entangled. Then the gorget was passed in again on the upper side of his finger, and turned as soon as the latter was pulled out. Lastly; the forceps was introduced, and the stone extracted. With the view of hindering a soft stone from breaking, during its extraction, Cheselden used to put one or more of his fingers between the branches of his forceps, so as to prevent any greater pressure upon it, than what was just necessary to hold it together. But, when it did break, or there were more calculi than one, he used to extract the single stones, or fragments, one after another, repeating the introduction of his fingers and forceps, as often as there was occasion. Cheselden took care not to thrust the forceps so far into the bladder as to bruise or wound its opposite side; and he was equally careful not to pinch any folds of its inner coat. In this way, Cheselden saved 50 patients out of 52, whom he cut successively in St. Thomas's Hospital. (*Appendix to the History of the Lateral Operation, by J. Douglas.* 1731.)

Cheselden, with all the enthusiasm of an inventor, believed, that he had discovered an operation, which was not susceptible of improvement; yet, he himself changed the manner of his incision not less than three times, in the course of a few years. 1st, He cut into the body of the bladder, behind the prostate, when he imitated Raw. 2dly, He cut another part of the bladder, viz. the neck and the thick substance of the prostate; this is his lateral mode of incision. 3dly, He changed a third time, not the essential form of the incision, but, the direction, in which he moved the knife; for, in his first operation, when imitating the supposed operation of Raw and Frère Jacques, he passed his knife into the body of the bladder, betwixt the tuber ischii and the vesiculæ seminales, and all his incision lay behind the prostate gland. In this second operation, he pushed his knife into the membranous part of the urethra, immediately behind the bulb, and ran it down through the substance of the gland; but his incision stopped at the membranous part, or body, of the bladder. But, in his third operation, after very large external incisions, he passed his knife deeply into the great hollow under the tuber ischii, entered it into the body of the bladder immediately behind the gland, and, drawing it towards himself, cut through the whole substance of the gland, and even a part of the urethra, "cutting the same parts the contrary way." By carrying the fore-finger of the left hand before the knife, in dissecting towards the body of the bladder, he protected the rectum more perfectly, than he could do in running the knife backwards along the groove of the staff; and by striking his knife into the body of the bladder, and drawing it towards him, through the whole thickness of the gland, he was sure to make an ample wound. (*J. Bell's Principles of Surgery, Vol. 2, Part 1, p.* 152.) And, as Mr. Key has correctly stated, Cheselden's aim was to divide the prostate, in the depending part of its left lobe: the edge of the knife was turned upward, and in this position carried into the neck of the bladder behind the prostate gland. (*On the Section of the Prostate Gland, &c. p.* 10.)

LATERAL OPERATION AS PERFORMED AT THE PRESENT DAY WITH CUTTING GORGETS.

The gorget has the same kind of form as one of the instruments used by F. Colot and others in the performance of the apparatus major, and the common opinion, that the conductor of Hildanus was the first model of it, is not exactly true; but it differs from the instruments, employed by these ancient surgeons, in having a cutting edge. Sir Cæsar Hawkins thought, that, if its right side were sharpened into a cutting edge, it might be safely pushed into the bladder, guided by the staff, so as to make the true lateral incision, in the left side of the prostate gland, more easily, and with less risk of injuring the adjacent parts, than Cheselden could do with the knife; and surgeons were pleased with a contrivance, which saved them from the responsibility of dissecting parts, with the anatomy of which all were not equally well acquainted. (*J. Bell. Allan.*)

As Scarpa observes: To render the execution of the lateral operation easier to surgeons of less experience, than Cheselden, was the motive, which induced Hawkins to propose his gorget. He thought, that two great advantages would be gained by the use of this instrument; one of executing invariably the lateral incision of Cheselden; the other, of constantly guarding the patient, through the whole course of the operation, from injury of the rectum, and of the arteria pudica profunda. The utility of the latter object (says Scarpa) cannot be disputed, as it is evident, that *the convexity of the director of the instrument defends the rectum from injury*, and that *its cutting edge not being inclined horizontally, towards the tuberosity and ramus of the ischium, but, turned upwards in the direction of the longitudinal axis of the neck of the urethra, cannot wound the pudic artery*. But, with respect to the first advantage, or that of executing precisely the lateral incision of Cheselden, it must be admitted, that it does not completely fulfil the intention, which he proposed, not only on account of the cutting edge of his instrument not being raised enough above the level of the staff, to penetrate sufficiently the substance of the prostate gland, and consequently to divide it to a proper depth; but, because being too much turned upwards, at that part of it, which is to lay open the base of the prostate gland, it does not divide it laterally, but rather at its upper part, towards the summit of the ramus of the ischium, and the arch of the pubes; an opening, of all others, in the perinæum, the most confined, and presenting the greatest impediment to the passage of the stone from the bladder. (See also *Key on Lithotomy, p.* 10.) The breadth of the point of the director is, besides, so disproportionate to the diameter of the membranous part of the urethra, that, from the great resistance, with which it meets, the instrument may easily slip from the groove of the staff, and pass between the bladder and rectum, *a serious accident, which has very often happened even in the hands of experienced surgeons.*

Scarpa considers all the modifications of Hawkins's gorget, proposed by B. Bell, Desault, Cline, and Cruikshanks, as deteriorations of the original instrument. B. Bell (he observes) has diminished the breadth of the director, but given the cutting edge a horizontal direction. The horizontal direction of the cutting edge is also preferred by Desault, Cline, and Cruikshanks; but, they have enlarged the director, and flattened the part, which was previously concave. Aware of the danger of wounding the pudic artery by the horizontal direction of the gorget, they direct the handle of the staff to be inclined towards the patient's right groin, and the gorget to be pushed along it, inclined in such a manner, that its obtuse edge may be directed towards the rectum, and its cutting edge placed at a sufficient distance from the tuberosity and ramus of the ischium to avoid wounding the artery. Scarpa contends, however, that it is difficult to give a proper degree of obliquity to the staff, and that such inclination of the instrument must be incommodious, arbitrary, and unstable, in comparison with that position of it, in which the handle of the staff is held in a line perpendicular to the body of the patient, and its concavity placed against the arch of the pubes; on which stability of the instrument (says Scarpa) the safety and precision of the lateral operation depend. According to this eminent professor, the defects of Hawkins's original gorget arise from the excessive breadth of the director, particularly at the point; the want of sufficient elevation of the cutting edge, above the level of the groove of the staff, and the uncertain inclination of the edge to the axis of the urethra and prostate gland. The cervix of the urethra, in a man between thirty and forty years of age, is only three lines in diameter at the apex of the prostate gland, four lines in its centre, and five near the orifice of the bladder. The apex of the prostate gland is rather more than two lines in thickness, the body or centre four, and the base six and sometimes eight, which surrounds the orifice of the bladder. In an adult of middle stature, from eighteen to twenty years of age, the thickness of the base of the prostate gland is about two lines less, compared with that of a man of forty, and of a large size. The precise line in which the lateral incision of the prostate gland should be made in an adult, (says Scarpa) is found to be inclined to the longitudinal axis of the cervix of the urethra, and of the gland itself, at an angle of 69°. Now, from these data, drawn from the structure of the parts, Scarpa makes the director of his gorget only four lines broad, and two deep; the breadth decreasing at the beak. The cutting edge of the instrument is straight near its point, but gradually rises, and becomes convex above the level of the staff, so that its greatest convexity is seven lines broad. Lastly; the inclination of the cutting edge to the longitudinal axis of the director, is exactly at an angle of 69°; that is to say, the same as the left side of the prostate gland to the longitudinal axis of the neck of the urethra. (See *Scarpa's Memoir on Hawkins's Gorget; transl. by Mr. Briggs*, *p.* 12, 17.)

For more than twenty years, the instrument-makers in London have been in the habit of selling a gorget, which Mr. Abernethy invented, and which in the particularity of its cutting edge turning up at an angle of 45° bears much analogy to the instrument lately recommended by Scarpa. The cutting edge is straight, and that useless and dangerous part of a gorget, sometimes called the shoulder, is removed. Admitting that the principles of the lateral operation, as inculcated by Scarpa, are correct, and of which I shall presently speak, it appears to me, that Mr. Abernethy's gorget is far preferable to that very recently proposed by Scarpa. Its edge is not so immoderately turned up, and it will enter with more ease, and less risk of slipping from the staff, because it has not any projecting shoulder, which, while the staff is firmly held with the beak of the gorget in it, can have no other effect but that of obstructing the passage of the last instrument.

Gorgets, which cut on both sides, have also been sometimes employed in England, and as a larger opening can be obtained by them, even without trespassing the limits of the incision, fixed by Scarpa. that is to say, without cutting any part of the body of the bladder, they appear to promise utility, especially when the stone is suspected to be large. However, they are less used now, than they were some years ago, when Sir Astley Cooper employed them in Guy's Hospital; but I am unacquainted with the particular reasons of this change.

Some criticisms on Scarpa's method of operating, and a few remarks on the size and direction of the lateral incision, will be found in a subsequent section of the present article.

Sir A. Cooper, as I think with considerable reason, recommends putting the patient on vegetable diet, for a little while previously to the operation. He disapproves of operating when the kidneys are diseased, the bladder ulcerated, disease in the chest, asthma, or any irregularity of the circulation prevails. He has found the operation generally more successful in the poor and labouring classes, than in the rich and luxurious. Old age is not considered by him as an objection to the operation, which he even believes most successful in persons, from 61 to 63 years of age. If the patient is loaded with fat, he says, the chance of peritoneal inflammation is always great. According to his experience, convulsions having a fatal result, are frequent after operations on children, particularly when much blood has been lost. (See *Lancet*, *Vol.* 2, *p.* 316, *&c.*) When a stone of considerable magnitude is accompanied with an enlarged prostate gland, the patient (he says,) rarely recovers from the operation. (*Vol. cit. p.* 345.)

As inflammation of the bladder and peritonæum is the principal danger of this operation, and, under an equal degree of injury and violence, is most likely to happen in a plethoric subject, it has been a question, whether venesection should not be practised a day or two before the patient is operated upon, supposing that his age and weakness form no prohibition. The chief reason, which prevents the common observance of this practice, is, that a great deal of blood is sometimes lost in the operation itself. A vegetable diet, for a week or two, before the operation, seems to be a better plan. When, however, the loss of blood in the operation has been inconsiderable, the patient is young and strong, and particularly when the operation has been tedious, and the bladder has suffered a good deal, I am disposed to think very favourably of the rule of bleeding the patient as soon as he is put to bed, and recovered from the first depressing effects of the operation. An opening medicine should be given the day before the patient is cut, and a clyster injected a couple of hours before the time fixed upon for the operation, in order to empty the rectum, and thus diminish the chance of its being wounded.

It is generally considered advantageous to let the bladder be somewhat distended, and the patient is therefore directed to retain his urine a certain time before he is cut. Formerly, a jugum penis was sometimes used for confining the urine in the bladder; but, since my entrance into the profession, I have never heard of this contrivance being employed. The presence of urine in the bladder, it is conceived, may lessen the chance of the fundus of that organ being injured by the gorget; but, as the beak of this instrument should always be in the groove of the staff, I am not sure, that the reason for the practice is good. The plan is disapproved of by Sir A. Cooper, who says, that, when the urine collected gushes out, the bladder contracts, and embraces the stone so closely, that it is difficult to get hold of the foreign body with the forceps. (See *Lancet*, *Vol.* 2, *p.* 347.)

Before the operation, the following instruments should all be arranged ready on a table: a staff of as large a diameter as will easily admit of introduction, and the groove of which is very deep, and closed at the extremity. A sharp gorget, with a beak nicely and accurately adapted to the deep groove of the preceding instrument, so as to glide easily and securely. A large scalpel for making the first incisions. Forceps of various sizes and forms, for extracting the stone. A blunt-pointed curved bistoury for enlarging the wound in the prostate, if the incision of the gorget be not sufficiently large, as the parts should never be lacerated. A pair of Le Cat's forceps with teeth for breaking the stone, if too large to come through any wound reasonably dilated. A syringe for washing out clots of blood, or particles of the stone: a practice however, not considered necessary by Sir A. Cooper (*Lancet*, *Vol.* 2, *p.* 347); a scoop for the removal of small calculi or fragments. Two strong garters, or bands, with which the patient's hands and feet are tied together.

The curvature of the staff is a matter of considerable importance; because the direction of the incision through the prostate gland and neck of the bladder is partly determined by it. The French surgeons, convinced of the advantage of introducing the gorget in the direction of the axis of the bladder, always use a staff, which is much more curved than what English surgeons employ. (See *Roux*, *Voyage fait à Londres en* 1814, *ou Parallèle de la Chir. Angloise*, *&c. p.* 319.) But, I am inclined to believe with Scarpa, that, upon the whole, it is best to let the curvature of the staff correspond exactly to that of the axis of the neck of the urethra and prostate gland. (*Memoir on Hawkins's Gorget*, *&c. p.* 17.)

After introducing the staff, and feeling that the stone is certainly in the bladder, the patient is to be secured in the same position, as was described in the account of Cheselden's latest method of operating.

The assistant holding up the scrotum, with his left hand, is with his right to hold the staff, inclining its handle towards the right groin, so as to make the grooved convexity of the instrument turn towards the left side of the perinæum. Some operators, also, like the assistant to depress the handle of the staff towards the patient's abdomen, in order to make its convexity project in the perinæum, while others condemn this plan, asserting, that it withdraws the instrument from the bladder. (*Allan*, *&c.*)

Professor Scarpa disapproves of inclining the handle of the staff towards the patient's right groin, (*p.* 15,) and he expressly recommends this instrument to be held firmly against the arch of the pubes, in a line perpendicular to the body of the patient, so that the convex part of the director may be placed towards the rectum, and take the exact course of the axis of the neck of the urethra and prostate gland. (*P.* 20.) This position of the staff is the firmest and most commodious to the surgeon, and Scarpa maintains that on such stability of the instrument the safety and precision of the lateral operation depend.—(*P.* 15.)

Sir A. Cooper directs the operator to hold the staff perpendicularly, and to let it rest on the stone, as he has seen many instances, in which the gorget has not entered the bladder, owing to the staff not having itself passed into it, but rested against the prostate gland. (See *Lancet, Vol.* 2, *p.* 319.)

The first incision should always commence below the bulb of the urethra, over the membranous part of this canal, at the place, where the operator means to make his first cut into the groove of the staff, and the cut should extend at least three inches, obliquely downward, to the left of the raphe of the perinæum, at an equal distance from the tuberosity of the ischium and the anus. The first cut should descend rather beyond the level of the centre of the anus; for, it is a general rule in surgery to make free external incisions, by which the surgeon is enabled to conduct the remaining steps of his operation with greater facility, and no where is it so necessary, as where a stone is to be extracted. (*Allan.*) That excellent surgical writer, Callisen, lays it down as a rule to be observed in the lateral operation, *that the incision ought not to extend to such parts as can make no impediment to the extraction of the stone; and, therefore,* (says he,) *the bulb, and that part of the urethra, which is surrounded by the corpus spongiosum, should never be cut.* Only those parts ought to be divided, which firmly resist the safe introduction of instruments into the bladder, and the extraction of the stone. Hence, the integuments must be opened by an ample incision, and the membranous part of the urethra, transversus perinæi muscle, levator ani, and prostate gland, be properly divided. (*Callisen, Systema Chirurgiæ Hodiernæ, Pars* 2, *p.* 655.) Like Scarpa, however, he is fearful of making a free cut through the neck of the bladder, and, in lieu of doing so, prefers a slow and cautious dilatation of the parts. When the external cut through the integuments, fat, and accelerator urinæ muscle has been executed, the next object is to divide the transversus perinæi muscle, which stands, like a bar, across the triangular hollow, out of which alone the stone can be easily extracted. A part of the membranous portion of the urethra, adjoining the prostate gland, is next to be laid open; but, an extensive cut through it, as far forward as the bulb, is quite unnecessary, because it will not at all facilitate the passage of the stone outward.

Having placed the beak of the gorget in the groove of the staff, the operator takes firm hold of the latter instrument with his left hand, raises its handle from the abdomen, so that it may form nearly a right angle with the body, and stands up. Before attempting, to push the gorget into the bladder, however, he should slide it backwards and forwards, with a wriggling motion, that he may first be sure of its beak being in the groove of the staff. The bringing forward of the handle of the latter instrument, so as to elevate its point, before introducing the gorget into the bladder, is also considered of great importance; for, it is by this means, that the gorget is introduced along the groove of the staff in the axis of the bladder, the only direction, unattended with risk, of wounding the rectum. In fact, the gorget should be introduced nearly in a direction, corresponding to a line drawn from the os coccygis to the umbilicus. It is obvious, however, that the degree, in which the handle of the staff should be depressed, must depend very much upon the curvature of the instrument.

The utmost attention to the rule last noticed is especially necessary, when a staff with a groove not closed at the end is employed. The neglect of it in this case might make the operator cut the bladder with the gorget in several places, as according to Mr. B. Bell has actually happened. But, since the gorget, when introduced as nearly as possible in the axis of the bladder, may transfix and otherwise injure this organ, if introduced either too far, or at all beyond the extremity of the staff, I am decidedly of opinion, that every surgeon, who chooses to perform the lateral operation with a gorget, should employ a staff, the groove of which is closed at the extremity, as is invariably done in France, and is expressly enjoined by Professor Scarpa. (See *Sabatier's Médecine Opératoire, T.* 3, *p.* 233, *Edit.* 2; *and Scarpa's Memoir on Hawkins's Gorget, p.* 18, *&c.*) There can also be no doubt of the prudence of endeavouring to have only a fixed and limited length of the staff in the bladder. Scarpa specifies an inch and a half as the proper distance to which the end of the staff should enter the bladder. However, as it is known, that this distinguished Professor is an advocate for a very limited incision, and that consequently, he would not require the staff to extend further than an inch and a half into the bladder, I infer, that operators, who prefer making a freer opening, must use a staff, that reaches into this viscus rather further. Much, however, will depend upon the kind of gorget employed, particularly its breadth, and, if it is to rest against the stone, as advised by Sir A. Cooper, of course the extent to which it passes, will be determined by the situation of the calculus.

As soon as the gorget is introduced, the staff is to be withdrawn. Some operators next pass the forceps, along the concave surface of the gorget, into the bladder; while others recommend the cutting gorget to be withdrawn immediately it has completed the wound; for then the bladder contracts, and its fundus is liable to be cut. The gorget should be withdrawn in the same line in which it entered, pressing it towards the right side, in order to prevent its making a second wound. If, however, the operator should prefer passing the forceps into the bladder, along the gorget, the latter instrument must be kept quite motionless, lest its sharp edge do mischief; and, at all events, as soon as the forceps is in the bladder, the cutting gorget is to be withdrawn.

Some operators withdraw the cutting gorget, and introduce a blunt one for the guidance of the forceps; a step certainly unnecessary, as the latter instrument will easily pass, when the incision into the bladder is ample and direct, as it ought always to be.

The operator has next to grasp the stone with the blades of the forceps; for which purpose he is not to expand the instrument, as soon as it has arrived in the bladder; but he should first make use of the instrument as a kind of probe, for ascertaining the exact situation of the stone. If this body should be lodged at the lower part of the bladder, just behind its neck, the operator is to open the forceps immediately over the stone, and after depressing the blades a little, is gently to shut them, so as to grasp it. Certainly, it is much more scientific to use the forceps at first, merely for ascertaining the position of the stone; for, when this is known, the surgeon is much more able to grasp the extraneous body in a skilful manner, than if he were to open the blades of the instrument immediately, without knowing where they ought next to be placed, or when shut. No man of experience can doubt, that the injury, which the bladder frequently suffers, from rough, reiterated, awkward movements of the forceps, is not an uncommon cause of such inflammation of this viscus, as extends to the peritonæum, and occasions death.

If the surgeon cannot readily take hold of the stone with the forceps, he should introduce his fore and middle fingers into the rectum, and raise up the extraneous body, when it may generally be easily grasped. The stone should be held with sufficient firmness to keep it from slipping away from the blades, but not so forcibly as to incur the risk of its breaking.

Sometimes the extraction of the stone is attended with difficulty, owing to the operator having chanced to grasp it in a transverse position, in which circumstance, it is better to try to change its direction, or let it go altogether, and take hold of it in another manner. When the stone is so large, that it cannot be extracted from the wound, without violence and laceration, the surgeon may either break the stone by means of a strong pair of forceps, with teeth constructed for the purpose; or he may enlarge the wound with a probe-pointed crooked bistoury, introduced under the guidance of the fore-finger of the left hand. The latter plan is generally the best of the two; for, breaking the stone is an exceedingly unpleasant circumstance, as it creates serious danger of calculous fragments remaining behind.

However, as nothing can justify the exertion of force in pulling out a stone, if the operator should be afraid of making the wound more ample, (it being already large and direct) he must break the stone, as above described. As many of the fragments are then to be extracted with the common lithotomy forceps, as can be taken away in this method, after which the surgeon should introduce his finger, in order to feel whether any pieces of the stone still remain behind. Perhaps, some of these may be most conveniently taken out with the scoop; but, if they are very small, it is best to inject lukewarm water with moderate force into the wound, for the purpose of washing them out.

The surgeon, however, cannot be too strongly impressed with the absolute necessity of using the greatest care not to remove the patient from the operating table, while any calculus, or fragment, remains in the bladder. For, the distressing pain of the disorder has been known to recur upon the healing of the wound, and a second operation become necessary. It is a melancholy truth, however, that a fresh calculus may form again in the short space of a few months. I have seen several patients who have been cut for the stone, more than once; and Richerand mentions the case of a surgical instrument-maker, resident at the gate of La Charité, in Paris, who has undergone the operation three times in the course of a year and a half, although, after each operation, several eminent surgeons carefully examined the bladder, and could not detect a calculus. (See *Nosogr. Chir. T.* 3, *p.* 549, *Edit.* 4.)

The stone should always be attentively examined immediately it is extracted; because its appearance conveys some information, though not positive, concerning the existence of others. If the stone is smooth on one surface, the smoothness is generally found to arise from the friction of other stones still in the bladder; but, when it is uniformly rough, it is a presumptive sign, that there is no other one remaining behind. In every instance, however, the surgeon should gently examine the cavity of the bladder with his fore-finger; for, it would be an inexcusable neglect to put the patient to bed, with another stone in his bladder.

After the operation, a simple pledget should be laid on the wound, supported by a T bandage; the patient should lie in bed on his back, with his thighs closed; a piece of oil-cloth, and some folded napkins, should be laid under him for the reception of the urine, and, an opiate administered. However, with respect to the application of a pledget and bandage, I confess that my own ideas lead me to regard them, as Sir A. Cooper and many other excellent surgeons do, as rather disadvantageous: indeed, I believe, the best plan is to leave the wound quite open, so that the urine may have a free outlet, strict attention being paid to keeping the parts clean.

An occasional embarrassment to lithotomists is the circumstance of stones in the bladder not being always free and detached: some are embraced very tightly by the coats of this viscus; others are partially engaged in the ureters; they are sometimes fixed in the neck of the bladder; and are not unfrequently found lodged in sacculi accidentally formed. These cysts are of different sizes: some are small, and exist in a considerable number; some are deeper, with an orifice smaller than their base They appear to be formed by a prolongation of the internal coat of the bladder. Other sacculi are occasionally found, which seem to be composed of all the tunics of the bladder, and they are sometimes of such magnitude, that the bladder appears, as if it were divided into two, or more cavities of nearly equal size. Stones, found in these sacculi, sometimes present depressions and irregularities, in which fungi of the bladder have been received. When this happens, a portion of such fungous productions is often extracted with the stone; a circumstance that has deceived some practitioners, and led them to suppose, that the calculi actually adhered to the coat of the bladder. (See *Desault's Parisian Chirurgical Journ. Vol.* 2, *p.* 386, 387.)

The extraction of encysted stones requires different modes of proceeding from those, which have been related. Littre conceived, that they might be removed in two ways. When they made only an inconsiderable projection into the bladder, he recommended the introduction of a probe, with which the membrane, covering the calculus, was to be rubbed, a finger being put into the rectum, in order to keep it down, and facilitate the action of the probe in opening the cyst. When the calculi were very prominent, Littre recommended taking hold of them with a pair of forceps, and contusing and breaking the membranous pouch, with the points and asperities upon the inside of the blades of the instrument. He conceived that suppuration would then destroy the internal parietes of the cyst, and that the stone would fall into the bladder, and admit of being easily extracted. As Sabatier observes, it is plain, that this theory, which is founded on the idea entertained by Littre of the manner in which stones become encysted, is totally inadmissible in practice.

Garengeot ventured to pass a bistoury into the bladder for the purpose of disengaging a calculus lodged in a particular cyst at the fundus of this organ, behind the pubes. The knife had some tape twisted round the greatest part of its length, and was introduced under the guidance of the left index finger, which was passed in as far as it could reach. The patient was not more than ten, or eleven years old, and consequently of a size, which favoured the operation. The stone was loosened and taken out, and the child recovered. However, as Sabatier remarks, there are many instances, in which this mode of proceeding cannot be imitated; for, if the calculus should be in a sort of cul-de-sac, as often happens, the entrance of which is narrower than its bottom, and the stone be of considerable size, the incision cannot be made large enough, without risk of cutting through the whole thickness of the bladder, and producing certain death by the effusion of urine in the abdomen.

Other practitioners fancied, that the calculus might be taken hold of with the forceps, and turned about in different directions so as to lacerate its connexions, or even that it might be forcibly extracted, without any serious ill consequences. Houstet mentions, (see *Mém. de l'Acad. de Chir. T.* 2, *p.* 307, *&c. Edit.* 12*mo.*) that Peyronie adopted this method on a patient, thirty-one years of age. The calculus did not resist long, and its surface was found covered with fleshy substances, which formed the adhesions to the bladder. The operation was painful, followed by considerable hemorrhage, tension of the belly, hiccough, cold extremities, and death.

There are some examples, however, in which this bold practice had better success. In 1730, Le Dran extracted from a woman an enormous stone, adherent to that part of the bladder, which lies upon the rectum. The irritation of the inequalities of the stone had produced ulceration of the bladder, and fungous growths, which insinuated themselves into the substance of the extraneous body. The adhesions readily yielded, and the excrescences came away with the calculus. Ten days afterwards, some thick membranous sloughs were voided. This calculus is engraved in Le Dran's Treatise on the Operations.

Le Dran afterwards extracted similar stones, which adhered by a less extensive surface; and he relates an operation done by Maréchal, who, in 1715, extracted with a pair of forceps, a stone shaped like a calabash, and having its narrow part surrounded by a fungus. In one case, the position of the calculus led Le Dran to suspect, that it was fixed in the extremity of the ureter; he shook it occasionally with a pair of forceps; and, lastly, it fell into the bladder, whence it was extracted without difficulty. It resembled a cucumber in shape, and its large extremity had been lodged in the ureter, from which it could only be gradually removed. Sabatier believes, that a case of this description, which must be very uncommon, is the only one, in which there is any prospect of removing an encysted stone with success. In other examples, he conceives, that it is more prudent to leave the stone, and let the wound heal, than expose the patient to an almost certain death by repeated attempts to extract it. (*Médecine Opératoire, T.* 3, *p.* 190, 194, *Edit.* 2.) Desault employed a sort of concealed knife, called a *coupe-bride*, for opening the cavity, or cyst; and he has recorded one example, in which he thus successfully extracted from a woman, aged sixty-two, a stone, lodged at the insertion of the ureter into the bladder. The bistoury, used by Garengeot, Desault did not consider a safe instrument, as the stones are round and the knife may slip, and pierce the bladder; an objection to which, he says, the *coupe-bride* is not liable. No injury can be received from its point, as the blade is concealed, nor can any part be divided, except what the surgeon intends. If the incision should not be completed at first, the blade may be withdrawn, the semicircular notch of the instrument pushed more forward, and the incision prosecuted to any extent. This instrument was invented for the express purpose of dividing membranous bands in the rectum; but, it was afterwards employed with the greatest success for the excision of diseased tonsils, and fungous tumors situated in cavities. The blade is so contrived, that when it passes through the semicircular notch, it firmly fixes the parts which are to be divided: a thing, that cannot be done either with the scissars, or bistoury, as the moveable parts recede, and render the section difficult. (See *Parisian Chirurgical Journal, Vol.* 1, *p.* 33, *&c.*)

Sir A. Cooper in his lectures, mentions, that when the stone is partly in the cyst, and partly in the bladder, it may sometimes be removed without opening the latter organ. In the case of a child, he passed his finger into the rectum, and felt the stone, confined in a bag above it. On raising the calculus, it struck firmly against the sound. While the finger was in the rectum, the knife was carried through the perinæum above the bowel, the cyst opened, and the stone taken out, without any further opening of the bladder itself. (See *Lancet, Vol.* 2, *p.* 346.)

A stone perfectly encysted would not be expected to produce symptoms equal in severity to those, which arise from an extraneous body actually in the cavity of the bladder, and generally they do not have this effect; yet, in Houstet's interesting dissertation, several cases are recorded, which prove, that encysted stones do sometimes cause the same distressing symptoms, which proceed from the presence of a loose calculus in the bladder. Hence, the patients were sounded, and in consequence of the sacs, or pouches, in which the stones lay, not being entirely closed, the calculi were distinctly struck by the instrument, and lithotomy attempted. It deserves particular remark, also, that, in a large proportion of these cases, the pouches, or cysts, were not single, but numerous, occupying different parts of the bladder. In some dissections, referred to by Houstet, cysts of this kind were found, not containing any stones whatever; a circumstance, that would rather lead one to suspect, that, in general, the formation of these sacs precedes that of the calculi commonly found in them. (See *Observations sur les Pièrres Encystées et Adhérentes à la Vessie par*

M. Houstet, in Mém. de l'Acad. de Chir. T. 2, p. 268, Edit. in 12mo.

OF SOME PARTICULAR METHODS AND INSTRUMENTS.

M. Foubert, a very eminent surgeon at Paris, devised and practised a plan of his own, which however, has not been considered by others, as worthy of being imitated. The patient having retained his urine, so as to distend his bladder, an assistant, with a convenient bolster, presses the abdomen a little below the navel, in such a manner, that by pushing the bladder forwards, he may make that part of it protuberant, which lies between the neck and the ureter. The operator at the same time, introduces the fore-finger of his left hand up the rectum, and drawing it down towards the right buttock, pushes in a trocar on the left side of the perinæum, near the great tuberosity of the ischium, and about an inch above the anus. Then the trocar is to be carried on parallel to the rectum, exactly between the erector penis and accelerator urinæ muscles, so as to enter the bladder on one side of its neck. As soon as the bladder is wounded, the operator withdraws his fore-finger from the anus.

In the upper part of the cannula of the trocar, there is a groove, the use of which is to allow some urine to escape, immediately the instrument enters the bladder, so that the trocar may not be pushed in any further; but, its principal use is for guiding the incision. As soon as the urine began to flow, Foubert, retracting the trocar a little, without drawing it quite out of the cannula, introduced the point of a slender knife into the groove in the cannula; and by the guidance of this groove he ran it onwards into the bladder, and was aware of the knife having actually entered this viscus, by the urine flowing still more freely. Then raising the knife from the groove. he made his incision, about an inch and a half in length, through the neck of the bladder, by moving the knife from that point, at which it had entered, upwards towards the pubes. And, finally, by moving the handle more largely, than the point of the knife, he opened the outer part of the wound to whatever extent the size of the stone seemed to require, and then, withdrawing the knife, he introduced a blunt gorget to guide the forceps.

An effort was made by Thomas to improve this method; but he failed, and it was never much adopted. The inability of many bladders to bear distention, is an insuperable objection; for, without this, the trocar is liable to pass between the bladder and rectum, and even through the bladder into the pelvis. (*Mémoires de l'Acad. de Chir.* 663, *Vol.* 1. *Le Dran's Parallèle. Sharp's Critical Enquiry. J. Bell's Principles, Vol.* 2.)

In the year 1748, Frère Côme's method of performing the lateral operation began to attract considerable notice. The operation was done with a particular instrument, called the *lithotome caché*, by means of which the prostate gland and neck of the bladder were divided, from within outwards. The *lithotome caché* is entitled to much attention, because it is still generally used in several parts of the Continent, and sometimes in this country, especially, by the surgeons of the Westminster Hospital. "In France (says M. Roux) if there is any mode of operating more common than others, and preferred by the majority of practitioners, it is that in which the instrument, named the *lithotome caché*, is employed." (See *Parallèle de la Chirurgie Angloise, &c. p.* 318.) Frère Côme does not ascribe the invention of this instrument to himself; but acknowledges, that it resembles the knife for operating upon herniæ, said to have been devised by a French surgeon of the name of Bienaise. It consists of a handle and the blade part. The latter is slightly curved, about as thick as a quill, furnished with a beak, and excavated so as to form a sheath for a knife of its own length. By means of a kind of lever, the knife can be made to pass out of the sheath, and the distance, to which the blade projects, also admits of being regulated with precision. For this purpose, the handle is divided into six sides, numbered 6, 7, 9, 11, 13, and 15, and which, according as they are more or less elevated, allow the lever to be depressed in different degrees, and the knife to move out of its sheath in the same proportion. Thus, the surgeon can at his option make an incision through the prostate gland and neck of the bladder of six different lengths.

When the lithotome caché is to be used, the patient must be placed in the same posture, as in every other mode of practising the lateral operation; and after a staff has been introduced, an oblique incision is to be made from the raphe of the perinæum, to a point situated rather more towards the anus, than the innermost part of the tuberosity of the ischium. The bulb of the urethra should not be cut, and not too much of the membranous part of the urethra. The fat and transverse muscles having been divided, and the urethra opened, exactly as in the common operation, the scalpel is to be put down, and the beak of the lithotome introduced into the groove of the staff. Of course, the surgeon, previously to the operation, will have settled the distance, to which the blade of the instrument is to pass out of the sheath, and which must necessarily depend upon the age of the subject, and the presumed size of the calculus. When the beak of the lithotome has been inserted in the groove of the staff, the surgeon is to take hold of the handle of the latter instrument with his left hand, and bring it a little towards himself, at the same time pushing the lithotome into the bladder, with the handle depressed as much as possible. The staff is now to be withdrawn, and the surgeon is to try to feel the stone with the sheath of the other instrument, in order to be able to judge of the size of the calculus, and whether the distance, to which the blade of the knife is intended to move out of the sheath, is such as is likely to make an opening of due, but not unnecessary magnitude. Things being properly determined. the lithotome is to be held in a position calculated to make a division of the parts *which is parallel to the cut in the integuments*, and, by means of the lever, the cutting blade of the instrument is then to be disengaged from its sheath. The surgeon is next to draw the opened lithotome towards himself, in a perfectly horizontal manner, so as to make the requisite division of the prostate gland and orifice of the bladder.

As Sabatier observes, Frère Côme's method undoubtedly possesses all the advantages of the lateral operation, besides being more easy than Cheselden's plan, and most of the other modes, subsequently proposed, for cutting the neck of the bladder with perfect smoothness, and to a sufficient extent to allow the calculus to be removed, without any laceration of the parts.—(*Médecine Opératoire, T.* 3, *p.* 199.)

There have been several objections urged against the use of the lithotome caché.

1. It is said, that the size of the incision is not always proportioned to the distance, to which the knife moves out of the sheath, and that the instrument, when opened to No. 13 or 15, sometimes makes a smaller incision, than when opened only to No. 5 or 7. This uncertainty is said to depend upon the greater or less contraction of the bladder in different subjects.

For my own part, I confess, that I am not inclined to put much credit in the accuracy of this last explanation, and suspect the difference sometimes observed must depend upon the operator not taking care to draw out the instrument in a horizontal direction, a thing which may always be easily done.

2. Frère Côme himself made his incision too high, so that an extravasation of urine in the scrotum followed some of his operations; but the above method of operating is free from any objection of this kind.

3. Some surgical writers have exaggerated the danger of cutting the body of the bladder too extensively with the lithotome, and thus producing internal hemorrhage. However, this cannot happen, unless the surgeon raise the handle of the instrument improperly at the moment of withdrawing it, and, as Sabatier himself allows, it is rather the fault of the operator than of the operation.

4. The arteria pudica profunda and the rectum, which some authors conceive to be endangered, must always be in absolute safety, if the edge of the knife of the lithotome be turned in the direction above recommended.

I think that for a surgeon, who understands the right principles of lithotomy, this is one of the best ways of performing the operation.

When I was at Paris in 1815, I saw Dr. Souberbielle operate very skilfully with the lithotome caché. A stone of considerable size was extracted from a gentleman, who was, I should think, not less than 70. No apprehensions were entertained of ill success, as I understood that this operator hardly ever lost a patient.

M. Roux, when he visited England, seems not to have been informed, that at the Westminster Hospital, the lithotome caché has been commonly employed for many years past. It has also been sometimes used at Guy's Hospital by Sir A. Cooper. When M. Roux likewise finds fault with the bad construction of this instrument, as made in London, I suspect, that he cannot have seen those which are made and sold by Mr. Evans. (See *Voyage fait à Londres, ou Parallèle de la Chirurgie Angloise, &c. p.* 318.)

Le Cat, a surgeon of Rouen, in Normandy, devised a mode of lithotomy, which would be too absurd to be described, were it less renowned. He thought the neck of the bladder might be dilated, like the wound, and his operation was deformed with all the cruelty of the Marian method, and every error attendant on the infant state of the lateral operation. He first introduced a long wide staff; he cut forward with a common scalpel, through the skin and fat, till he could distinguish the bulb, the naked urethra, and the prostate gland. Secondly, with another knife, the urethrotome, having a groove on one side, he opened the urethra, just before the prostate, and, fixing the urethrotome in the groove of the staff, and holding it steady, rose from the kneeling posture, in which he performed the outward incision. Thirdly, holding the urethrotome in the left hand, he passed another knife, the cystotome, along the groove of the urethrotome, and the beak of the cystotome being lodged in the groove of the urethrotome, it was pushed forwards, through the substance of the prostate gland into the bladder. Fourthly, drawing the cystotome a little backwards, he gave the staff to an assistant to be held steadily, and lifting a blunt gorget in the right hand, he placed the beak of it in the groove of the cystotome, and pushed it onwards, till it glided from the groove of the cystotome, along the groove of the staff into the bladder. Then, true to the principles of the apparatus major, and, never forgetting his own peculiar theory, *little incision, and much dilatation*, he forced his fingers along the gorget, dilated the neck of the bladder, and so made way for the forceps. (*J. Bell's Principles, Vol.* 2.)

In 1741, Le Dran described an operation, the introduction of which has been claimed by several since his time. A staff being introduced, and two assistants keeping open the patient's knees, while a third stands on one side of him on a chair, (Le Dran says,) "I then raise up the scrotum, and directing the last assistant to support it with both hands, so as to avoid bruising it, by pressing it either against the staff, or the os pubis, I place his two fore-fingers on each side of the part, where the incision is to be made; one of the fingers being laid exactly along that branch of the ischium, which rises towards the pubes, and the other pressed upon the raphe, that the skin may be kept fixed and tight. While I thus place the fingers of the assistant, who supports the scrotum, I still keep hold of the handle of the staff, and direct it so as to form a right angle with the patient's body; at the same time, taking care, that the end of it is in the bladder. This position is the more essential, as all the other instruments are to be conducted along the groove of this. If the handle of the staff were kept inclined towards the belly, the end of it would come out of the bladder, and the gorget, missing its guide, would slip between that and the rectum.

"The staff being rightly placed, I take the knife from the assistant, who holds the instruments, and put it into my mouth; then pressing the beak of the staff against the rectum, I feel the curvature of it through the perinæum. The incision ought to terminate, an inch and a half, below where we feel the bottom of the curvature. If we do not carry this incision sufficiently low, it may happen not to be of a size to allow the extraction of a large stone, and might lay us under the necessity of extending it further afterwards, for the skin will not lacerate here, nor easily give way for the passage of the stone. I therefore begin the incision from the lower part of the os pubis, continuing it down to the place, that I before directed for its termination; after which I pass the point of the knife into the groove of the staff, and cutting from below upwards, without taking the point out of the groove, I open the anterior part of the urethra, as far as the incision, that is in the skin.

"The beak of the staff, which was pressed upon the rectum, must now be raised and pressed against the os pubis. At the same time, I turn the handle towards the right groin, that the groove, which is at the beak of the staff, may face the space, between the anus and the tuberculum ischii on the left side. Then carrying the point of the knife down the groove, I slide it along the beak, turning the edge, that it may face the space, between the anus and tuberosity of the ischium. By this incision, I exactly divide the bulb of the urethra, and by doing this on its side, we are sure to avoid wounding the rectum, which, for want of this precaution, has been often cut. This first incision being made, I again pass the point of the knife into the curvature of the staff to the part, where it bears against the perinæum, and direct it to be held there by the assistant, who supports the scrotum. This done, I take a large director, the end of which is made with a beak, like that of a gorget, and conveying this beak, upon the blade of the knife, into the groove of the staff, I draw the knife out. I then slide the beak of this director, along the groove of the staff, into the bladder, and I withdraw the staff by turning the handle towards the patient's belly. The following circumstances will sufficiently satisfy us, that the director is introduced into the bladder; first, if it strikes against the end of the staff, which is closed; secondly, if the urine runs along the groove. I next feel for the stone with this director, and, having found it, endeavour to distinguish its size and surface, in order to make choice of a proper pair of forceps; that is, one of a stronger or weaker make, or of a large or small size, agreeably to that of the stone; after which I turn the groove, towards the space, between the anus and tuberosity of the ischium, and, resting it there, convey a bistoury along the groove, the blade of which is half an inch broad, and about three quarters of an inch long. I continue the incision, made by the knife in the urethra, and entirely divide the prostate gland laterally, as also the orifice of the bladder; and, I am very certain, that the introducing the use of these two instruments, which are not employed by other lithotomists, does not prolong the operation a quarter of a minute, but rather shortens the time, both by facilitating the dilatation, that is afterwards to be made with the finger, and by rendering the extraction of the stone more easy. The bistoury being withdrawn, the groove of the director serves to guide the gorget into the bladder. I then introduce my fore-finger along the gorget, (which is now easily done, as the urethra and prostate, being divided, do not oppose its entrance,) and with it I dilate the passage for the stone, in proportion to the size, of which I discover it to be. This dilatation being made, I withdraw my finger, and use the proper forceps." (*Le Dran's Operations, Edit.* 5, 1784, *London.*)

Pajola, of Venice, was the pupil of Le Cat, and his method resembles that of his master. He is stated to have cut for the stone 550 patients with success; which deserves notice, because his operation has for its principles, dilatation, and no division of any part of the bladder. He makes an incision into the groove of the staff, with a lancet-pointed, double-edged knife, called an urethrotome, the blade of which has upon its centre a groove, that is continued to its very point, and serves to guide the beak of another instrument, called the cystotome, into the groove of the staff. As the professed intention of the cystotome is only to cut the prostate gland, its name is ridiculous. It consists of a handle, and very slender blade, which is not connected with the handle, but with its sheath, by means of a little joint, close to the beak of the instrument. When the cystotome is opened as far as possible, the end of the blade, furthest from the beak, is twelve lines from the sheath. In this position, it is held by a transverse piece of steel, which admits of being pushed more or less out at the option of the surgeon, and can be fixed by means of a screw. Pajola, like Scarpa, considers cutting the neck of the bladder dangerous, and he merely divides the prostate, after which he introduces a blunt gorget, and along this a species of forceps for dilating the neck of the bladder in all directions. (*X. F. Rudtorffer über die Operation des Blasensteins nach Pajola's Methode.*) As Langenbeck observes, great as the success of this lithotomist has been, his method of operating has little to recommend it; and every thing must be ascribed to his individual skill, and intimate knowledge of the parts. Langenbeck even prefers Le Cat's method, in which there is no need of such a multiplicity of instruments. The blunt gorget and dilator are perfectly unnecessary, as the finger would do the purpose of both.

In some former editions of this Dictionary, I omitted to notice what has been termed by the French, "*Operation à deux temps*," and which was first mentioned by Franco. If, by this plan, it be intended, that the incision should be made at one period, and the extraction of the stone not attempted till a subsequent period, I cannot too strongly reprobate the practice. But, if I am to understand, that the postponement of the completion of the operation is only to be adopted, as a matter of necessity, when the patient cannot bear the longer continuance of the unsuccessful efforts to extract the stone, of course, I can only say, that every endeavour should be used to avoid this very disagreeable dilemma, by making in the first instance an adequate opening, and (if this cannot be done) by breaking the calculus, and carefully removing all the fragments. Some further considerations against delaying the completion of the operation will be found in the 2d vol. of the First Lines of Surgery.

The danger of the beak of the gorget slipping out of the groove of the staff, is one of the chief objections urged against the employment of the first of these instruments. In order to obviate this inconvenience, Sir Charles Blicke had the groove of the staff, and the beak of the gorget, so constructed that they locked into each other, and continued fixed till near the extremity of the staff. The contrivance, though plausible and ingenious, is not much used: the point of contact of the beak and body of the instrument is necessarily so small, that it is liable to break. It is allowed, however, that this objection might be removed; but another one is still urged, viz. the beak and groove catching on each other, so as to resist the efforts made to introduce the gorget into the bladder. Every operator knows, that much of the safety of the lateral operation, as performed at present, depends on the ease with which the beak of the gorget slides along the groove of the staff. Le Cat, in 1747, is said to have devised a similar instrument.

Some operators have a good deal of trouble in dissecting into the groove of the staff. Sir James Earle invented an instrument to render this part of the operation more easy. It consists of a short staff, with an open groove, connected by a hinge, with the handle of another staff, of the usual size, shape, curvature, and length, which may be called the *long staff*. The hinge, by means of a pin, is capable of being disjointed at pleasure. The short staff is sufficiently curved to go over the penis and scrotum, and long enough to reach to that part of the long staff which is just below the beginning of its curvature. The end of the short staff, made somewhat like a pen, with the sides sharpened and finely pointed, is adapted to shut into the groove of the long staff, and its cutting edges are defended from being injured by a proper receptacle, which is prepared for it in the groove of the long staff. When the instrument is shut, the groove of the short staff leads into that of the long one, so as to form one connected and continued groove. The short staff is rendered steady by the segment of an arch projecting from the long one through it.

The long staff, separated from the short one, is first introduced in the usual manner, and, the stone having been felt, the short staff is to be put on the other at the hinge. The incision is then to be made in the usual manner, through the skin and cellular membrane, and a second incision through the muscles, so as nearly to lay bare the urethra. The operator then being perfectly convinced that the extremity of the long staff is sufficiently within the bladder, must bring the end of the short staff down, and press it against the urethra, which it will readily pierce, and pass into the cavity prepared for it in the groove of the long staff. The two pieces being now firmly held together by the operator's left hand, nothing remains to be done, except applying the beak of the gorget to the groove of the short staff, and pushing it on till it is received in the groove of the long one; and if this latter be made with a contracted groove, it will just enter where the contraction begins, and thus must be safely conducted into the bladder. (*Earle on the Stone; Appendix; Edit.* 2, 1796.) Deschamps describes an instrument, invented by Jardaa, surgeon of Montpelier, which bears a resemblance to Earle's double staff, but was more complicated, being designed to support the scrotum, and also press the rectum out of the way.

The late Mr. Dease, of Dublin, and Mr. Muir, of Glasgow, considering that the gorget was more apt to slip from the staff in consequence of the latter being curved, and that its beak never slips from the groove of the staff in operating on women, proposed, like Le Dran, to convert the male into the female urethra. They introduce, as usual, a curved grooved staff, into the bladder, make the common incisions, and open the membranous part of the urethra; but, instead of introducing a gorget on the curved staff, they conduct along the groove a straight director, or staff, into the bladder, and immediately withdraw the other. The gorget is then introduced. In this manner the operation may be very well performed with a narrow bistoury, as was advised by Mr. A. Burns. Mr. Key, who adheres to the valuable principles of Cheselden, but uses a knife, instead of a gorget, is also an advocate for a director, which is straight, except towards its termination, a part never concerned in guiding the knife, and which is introduced like a common staff. (*On the Section of the Prostate Gland, p.* 23.)

LITHOTOMY, AS PERFORMED WITH A KNIFE, INSTEAD OF A CUTTING GORGET, BY SEVERAL OF THE MODERNS.

We have already described, how Frère Jacques and Cheselden used to operate with a knife, without any cutting gorget, in the early state of the lateral operation. The success, which attended the excellent practice of the latter surgeon, certainly far exceeds what attends the present employment of the gorget, for, out of 52 patients, whom he cut successively for the stone, he only lost two; and out of 213, of all ages, constitutions, &c. only 20. These facts are strongly in favour of abandoning the use of the gorget, and doing its office with a knife.

The objections to the gorget are numerous and well founded. In the hands of many skilful operators, its beak has slipped out of the groove of the staff, and the instrument has been driven either between the rectum and the bladder, into the intestine instead of the latter viscus, or else between the bladder and pubes. "If I were to be asked (says Sir A. Cooper) how many times I have known the gorget slip, and pass between the bladder and rectum, I should say, at least a dozen times, and in each case, the most lamentable and fatal consequences ensued; for, the operator now lays hold of the stone and bladder together; the forceps slip; the stone, enclosed in the bladder, is again laid hold of; and, thus, he continues to pull, bruise, and injure the bladder, till the patient is at length carried back to his bed with the stone unextracted, violent inflammation supervenes from the injury done to the bladder, and, in a few days, the patient is no more." (See *Lancet, Vol.* 2, *p.* 238.) Sir James Earle remarks: "I have more than once known a gorget, though passed in the right direction, pushed on so far, and with such violence, as to go through the opposite side of the bladder." Bromfield, even when operating with a blunt gorget, perforated the bladder and peritonæum, so that the abdominal viscera came out of the wound. (*P.* 270.) I now know of at least three instances, in which the gorget, slipping from the staff, completely severed the urethra from the bladder; the stone was not taken out; and the patients died.

We will suppose, however, that the preceding dangers of the gorget are surmounted, as they certainly may be, by particular dexterity, seconded by the confidence of experience. The gorget is introduced, but whatever kind of one has been used, the wound is never sufficiently large for the easy passage of any stone, except such as are below the ordinary size. Camper has noticed this fact: "Hawkensius solo conductore, cujus margo dexter in aciem assurgit, idem præstat: *omnes plagam dilatant, ut calculum extrahant: dilacerentur igitur semper vesicæ ostium et prostata.*" (*P.* 114.) Dease says: "In all the trials that I have made with the gorget on the dead subject, I have never found the opening into the bladder sufficiently large for the extraction of a stone of a middling size, without a considerable laceration of the parts. I have frequently taken the largest-sized gorget, and could not find, in the adult subject, I ever entirely divided the prostate gland, if it was any way large; and in the operations that were performed here on the living subject, if the stone was large, the extraction was painfully tedious, and effected with great difficulty, and, in some cases, not at all."

I shall dismiss this part of the subject with referring the reader to the spirited and correct remarks on the objections to the gorget in Mr. John Bell's Principles, Vol. 2, Part 2.

The latter author recommends the external incision, in a large man, to commence about an inch behind the scrotum, and to be carried downwards three inches and a half, midway between the anus and tuberosity of the ischium. The fingers of the left hand, which at first kept the skin tense, are now applied to other purposes. The fore-finger now guides the knife, and the operator proceeds to dissect through fat and cellular substance, and muscular and ligamentous fibres, till the wound is free and open, till all sense of stricture is gone; for it is only by feeling opposition and stricture that we recognize the transverse muscle. When this hollow is fairly laid open, the external incision, *which relates merely to the free extraction of the stone, is completed.* If it were the surgeon's design to operate only with the knife, he would now push his fingers deeply into the wound, and, by the help of the fore-finger, dissect from the urethra along the body of the gland, till he distinguished its thickness and solidity, and reached its back part. Then, plunging his knife, through the posterior portion of the gland, and settling it in the groove of the staff, he would draw it firmly and steadily towards him, at the same time pressing it into the groove of this instrument, and then the free discharge of the urine, assuring him that the prostate and neck of the bladder were divided, he would lay aside his knife, pass the left fore-finger into the bladder, withdraw the staff, and introduce the forceps. (*John Bell, p.* 197.)

Mr. C. Bell describes the following method of operating with a knife, instead of a gorget. A staff grooved on the right side, a scalpel with a straight back, and the common lithotomy forceps, are the indispensable instruments. The staff is kept in the centre, and well home into the bladder. The surgeon making his incision under the arch of the pubes, and by the side of the anus, carries it deeper towards the face of the prostate gland: cutting near to the staff, but yet not cutting into it, and avoiding the rectum by pressing it down with the finger. Now carrying the knife along the staff, the prostate gland is felt. The point of the knife is run somewhat obliquely into the urethra, and into the lateral groove of the staff, just before the prostate gland. It is run on, until the urine flows. The fore-finger follows the knife, and it is slipped along the back of it, until it is in the bladder. Having carried the fore-finger into the bladder, it is kept there and the knife is withdrawn. Then the forceps, directed by the finger, are introduced. (*Operative Surgery, Vol.* 1. *p.* 361.)

Mr. Allan Burns, of Glasgow, recommends the following method: "The plan (says he) introduced by Cheselden, and revived by Mr. J. Bell, I would assume, as the basis of the operation; but still, along with their mode, I would blend that of Mr. Dease, by which, I imagine, we may overcome some of the disadvantages attendant on each considered individually.

"For more than twelve months, I have been in the habit of showing such an operation, which is as simple in its performance as the one in general use, is attended with less danger to the patient, permits of an incision varying in size, according to the wish of the operator, and completely prevents injury of the rectum, or pudic artery. To perform this operation, I introduce into the urethra a common curved staff, then make the usual incision into the perinæum, divide fully and freely the levator ani, so as to expose the whole extent of the membranous part of the urethra, the complete extent of the prostate gland, and a portion of the side of the neck of the bladder. When this part of the operation is finished, I open the membranous part of the urethra, and introduce through the slit a straight or female staff, with which I feel the stone, and then withdraw the curved staff. This done, I grasp the handle of the staff firmly in my left hand, and with the right lay hold of the knife. Having ascertained that the two instruments are in fair contact, I rest the one hand upon the other, pressing them together, and then by a steady extraction, I pull out the knife and staff together, which is preferable to drawing the knife along the staff; it prevents the risk of the one slipping from the other; it guards the bulb of the urethra, and every other part from injury; for, between them and the cutting instrument, the staff is interposed;" &c. "When introducing the knife, the side of the blade must be laid flat along the fore-finger of the right hand, which is to project a little beyond the point. In this state the finger and knife are to enter the wound, opposite the tuber ischii; but, in proportion as they pass along, they are to be inclined forward, till at last, with the point of the finger, the staff is to be felt through the coats of the bladder, a little beyond the prostate, and rather higher than the orifice of the urethra. Here the knife is to be pushed, with the finger, through the bladder, and when the point is fairly fixed in the groove of the staff, the operation is to be finished by the steady extraction of both instruments." (See *Edinb. Surg. Journal, No.* 13.)

The knife of Cheselden does not require so much violence to divide the parts as the gorget does; cannot slip in some instances before, in others behind, the bladder; and it will make a wound sufficiently ample for the easy extraction of the stone, without the least laceration. The possibility of its wounding the rectum, Dr. Thomson thinks, might be obviated by employing it as follows: "After having made the external incisions, and divided the membranous part of the urethra, in the way that it is usually done for the introduction of the beak of the gorget, a straight-grooved staff is to be introduced into the groove of the curved staff, and pushed along it into the bladder. The curved staff is then to be withdrawn, and the surgeon, laying hold of the handle of the straight staff with his left hand, and turning the groove upwards and a little outwards, presses the back of it downwards towards the right tuber ischii, and holds it steadily in that position. The point of a straight-backed scalpel being now introduced into the groove of the staff, with its cutting edge inclined upwards and a little outwards, is to be pushed gently forwards into the bladder. The size of the scalpel need only be such as will make a wound in the prostate gland and neck of the bladder, sufficiently large to admit the fore-finger of the left hand. The scalpel being removed, this finger is to be introduced into the bladder, through the wound which has been made, and the staff may then be withdrawn. With the finger the surgeon endeavours to ascertain the size and situation of the stone. If, after this examination, he judges the incision in the neck of the bladder to be too small for the easy extraction of the stone, he next introduces into the bladder a straight probe-pointed bistoury, with its side close to the fore-part of his finger, and its cutting edge upwards. By turning this edge towards the left side, and by keeping the point of his finger always beyond the point of the bistoury, he may safely divide, in the direction of the first incision, as much of the prostate gland, and neck of the bladder, as he shall deem necessary." (See *Obs. on Lithotomy, &c. with a Proposal for a new Manner of Cutting for the Stone; Edinb.* 1808.)

Mr. Allan, who is a strenuous advocate for using the knife instead of the gorget, directs us, after laying bare the urethra, and bringing the staff so as to form a right angle with the patient's body, to feel that the instrument is fairly lodged in the bladder. The operator is to use the fore-finger of his left hand as a director in feeling for the groove in the staff, and in distinguishing the prostate gland; and, with this finger, he is to depress the rectum, and direct the deeper part of his dissection. "Feeling the gland, with the point of the fore-finger of the left hand, and the groove of the staff in the upper part of the wound, the assistant is desired to steady his hand, and the operator, holding his knife as he does a writing pen, his fingers an inch and a half from the point, turns up its edge towards the staff, and strikes its point through the membranous part of the urethra into its groove, half an inch before the prostate gland. He now turns the back of the knife to the staff, slides it a little backwards and forwards in the groove, that he may be sure he has fairly entered; then shifts the fore-finger, with which he guides the incision, places it under the knife, and carries always before the point of it, to prevent the rectum being wounded; he then lateralizes the knife, enters the substance of the prostate, is conscious of running the scalpel through its solid and fleshy substance, and judges, by the finger, of the extent of the incision which he now makes. The urine flows out; he slips his finger into the opening, withdraws the scalpel, and gives it to an assistant, who hands him the forceps, which he passes into the bladder, using the fore-finger of his left hand, which is still within the wound, as a conductor. The forceps instantly encounter the staff, which serves to conduct them safely into the bladder, while the finger guides them through the wound; &c." (*Allan on Lithotomy, p.* 48, *Edinb.* 1808.)

I leave the reader to judge, which of the foregoing modes of operating with a common knife, claims the preference. Perhaps Cheselden's manner, which is also Mr. John Bell's, is as deserving of recommendation as any. When it is adopted, a largish scalpel, with a long handle, will be found more convenient, than a common one, on account of the depth of the parts requiring division, especially in adults and fat subjects.

I would also beg the attention of surgeons to the modification in the manner of performing Cheselden's operation, proposed by Mr. Key, and executed with a staff of nearly a straight form, and a scalpel that has a slightly convex back near its point, in order that it may run with more facility in the groove of the staff. (*On the Section of the Prostate Gland, p.* 26.)

The methods of operating with a knife, as practised by Klein, and Langenbeck, I shall not here repeat, as they were described in the last edition of the First Lines of Surgery, accompanied with many valuable practical observations made by these judicious and skilful surgeons.

That the performance of lithotomy with a knife, when the operator has the assistance of a proper staff, cannot be difficult, may be inferred from there being no particular difficulty in the method, even when no staff at all is employed. In the spring of the year 1814, when at Oudenbosch in Holland, I was requested by Serjeant Ryan, of the 1st Foreign Veteran Battalion, to see his little boy, about four years old, who was troubled with symptoms, which made me immediately suspect, that there was a stone in the bladder. As I had no sound, I introduced into this viscus a small silver catheter, which distinctly struck against a calculus. Without taking the instrument out again, I determined to perform lithotomy with a common scalpel. Indeed, no other mode could be adopted, as we had neither staff, gorget, nor lithotomy instruments of any kind. After making the external part of the incision in the common way, I found, that the catheter afforded me no guidance. I therefore withdrew it, and dissected deeply by the side of the prostate gland, till the fore-finger of my left hand passed rather beyond it. The scalpel was then plunged into the bladder, behind this gland, under the guidance of my left fore-finger, and with the edge turned towards the urethra. The necessary division of the prostate and neck of the bladder was then made by cutting inwards and upwards in the direction of the rest of the wound. With a small pair of ordinary dressing forceps, a calculus, rather larger than the end of the thumb, was easily extracted. This operation was done at the Military Hospital, in the presence of Dr. Shanks, of the 56th regiment, and several other medical officers. Not a single bad symptom ensued, although the army unexpectedly moved into the field three days afterwards, and the child travelled about for some time in a baggage cart, in an exposed and neglected state. The wound was consequently rather longer in healing than usual; but, this was the only ill effect. The little boy in the end completely recovered.

Of late years, many surgeons have chosen to perform lithotomy with several kinds of beaked scalpels. The practice, indeed, is still gaining ground. Mr. Thomas Blizard's knife is one of the best. Its blade is long, straight, and narrow, and, like the gorget, is furnished with a beak, by means of which it admits of being conducted along the groove of the staff into the bladder, after the external incisions have been made. The staff is then withdrawn, and the operator has now the power of making the incision through the prostate and neck of the bladder downwards and outwards to any extent, which the parts will allow, or the case require. This is one of the principal advantages, which beaked long narrow knives have over gorgets, which, after their introduction, cannot be further used for the enlargement of the wound. The narrow knife will also cut more safely downwards and outwards, than any gorget; nor is it subject to the serious danger of slipping away from the staff, and going we know not where; because the moment its beak and extremity have entered the bladder, the staff is no longer necessary, as the proper extent of the blade will then readily pass in without the aid of any conductor at all. I need hardly observe, also, that, in this method, we have nothing like the perilous, and violent, thrust of the gorget, which, in the event of a little unsteadiness in the operator's hand, or of any fault either in the position of the staff, or the direction of the gorget, will do irremediable and fatal mischief.

Sir A. Cooper admits, that the operation may be done very well with a knife in children; but he prefers a gorget, or the *bistoire caché* for old persons, on account of the prostate gland and bladder being frequently so rigid in them, that the scalpel does not easily make an impression upon those parts. Also, for adults, he has relinquished the use of the knife, in consequence of the unfitness of it to do what is necessary in a deep perinæum. (See *Lancet*, *Vol.* 2, *p.* 340.)

A FEW GENERAL REMARKS ON THE BEST MODE OF MAKING THE INCISION IN THE LATERAL OPERATION: AND SOME REFLECTIONS ON THE PRINCIPLES INCULCATED BY PROFESSOR SCARPA.

Perhaps, of all the great operations in surgery, lithotomy is that, in which great awkwardness, mortifying failures, and dangerous blunders, are most frequently observed. Many a surgeon, who contrives to cut off limbs, extirpate large tumors, and even tie aneurismal arteries, with *éclat*, cannot get through the business of taking a stone out of the bladder in a decent, much less, a masterly style. This fact is so familiarly known in the profession, and its truth so often exemplified, that I may well be excused the unpleasant task of relating in proof of it all the disasters, which have come to my own personal knowledge. But, I must take the liberty of remarking, that, in this branch of surgery, a great number of individuals do not profit by these instructive lessons of experience. The more they see of lithotomy, the more they are convinced of its dangers; yet, too often, instead of studying the causes of ill success, they merely derive from the examples before them, a suspicion of the unskilfulness of the operator, or some discouraging conjectures about the difficulties of the operation.

The establishment of certain principles to be observed in lithotomy, appears the most probable way of diminishing the frequency of the accidents and failures of this common operation. If these principles are not violated, it is of less consequence what instrument is employed, for the surgeon may do nearly the same thing with an ordinary dissecting knife, a concealed bistoury, a beaked scalpel, or a well made gorget.

After the very opposite principles, and different methods of cutting for the stone, which are explained in the preceding columns, as preferred by different surgeons, I think it may be useful to offer a few general observations on the proper direction and size of the incision. These points, which are of the highest practical consequence, in regulating the principles, which ought to be observed in lithotomy, are far from being settled, as must be plain to every body who recollects that Desault, Mr. John Bell, Klein, and Langenbeck, have recommended a free opening; Scarpa, Callisen, and others, a small one; that Mr. Abernethy and Scarpa employ gorgets, which cut upwards and outwards, at angles of 45° and 69° from the axis of the urethra; and that the gorgets of Cruickshank, B. Bell, Desault, Mr. Cline, and most other surgeons, are constructed for cutting either directly outwards, or outwards and downwards.

It appears to me, that the incision, through the whole of the parts cut in lithotomy, should always be made in a straight, regular, direct manner, from the surface of the skin in the perinæum to the termination of the wound in the urethra and bladder. In an adult subject, the external wound should commence about an inch above the anus. The impropriety of beginning it higher up has been duly insisted upon by Sharp, Bertrandi, Callisen, and every good writer on the operation. "Il ne faut couper l'urétre que le moins qu'on peut, parcequ'on obtient par ce moyen une meilleure voie pour pénétrer dans la vessie sous l'angle du pubis. C'est avec raison que Sharp dit que l'incision de l'urétre faite au-dessus de cet angle est si peu utile pour l'extraction de la pierre, qu'on n'en retireroit pas plus d'avantage en le coupant presque dans toute sa longueur." (*Bertrandi, Traité des Opérations, p.* 127.) And Callisen lays it down as a maxim: "Ut eæ partes haud sectione attingantur, quæ pro calculi egressu nihil faciunt; adeoque bulbus urethræ, et hujus pars corpore spongioso circumdata intacta relinquatur." (*Systema Chirurgiæ Hodiernæ; Pars Posterior; p.* 655.)

Extraordinary as it may seem, it is not the less true, that cutting too much of the urethra is one of the most common faults still committed by modern surgeons. The incision in the integuments is to be large, that is to say, at least, three inches in length in an adult subject, because a free opening in the skin is not only exempt from danger, but attended with many advantages, especially, those of facilitating the other steps of the operation, and preventing any future lodgment and effusion of urine. The external wound ought to be directed towards a point, situated a very little towards the anus from the innermost part of the tuberosity of the ischium. From the line, thus made, the incision should be carried inward and upward, through all the parts between it and the side of the prostate gland. Another line, extending from the inferior angle of the wound to the termination of the cut in the bladder, forms the precise limits, to which the depth of the incisions should reach, and no further.

The great principle of making the axis of the wound as straight and direct as possible, should always be kept in view, whether the surgeon employ a common scalpel, which cuts into the bladder, from without, inwards, or other instruments, which divide the prostate gland, and neck of the bladder, from within outwards, like the bistoire caché, beaked knives, and every kind of cutting gorget. In the latter circumstance, the only difference consists in cutting, from the bladder and urethra, downwards and outwards *towards a point, situated a little way more inwardly than the tuberosity of the ischium*, instead of carrying the incision from this point, upwards and inwards, through the side of the prostate gland and the orifice of the bladder. The following may be enumerated as important advantages of attending to the foregoing principle:

1. The wound is made in that direction, which affords the greatest room for the extraction of large stones; and the axis of the incision being also as nearly straight as possible, the introduction of forceps, and the passage of the calculus outward, are materially facilitated.

That these are important advantages, I think every surgeon will allow, who knows how much the pain and danger of lithotomy depend upon the injury, which the parts suffer from the force sometimes used in the extraction of the stone, and the repeated introduction of the forceps. Cheselden, one of the most successful lithotomists England ever produced, made the incision in the direction here recommended, sometimes inward and upward; sometimes outward and downward. (See *Key on the Section of the Prostate Gland*, *p.* 27.) The following remarks of another excellent surgeon merit particular attention:—"J'ai vu plusieurs fois dans les Hôpitaux de Paris, que les chirurgiens, coupant trop en haut vers l'angle du pubis, sentoient une grande résistance au périné, quand ils vouloient retirer le calcul avec les tenettes; on voyoit le périné se tuméfier par la pression qu'y faisoit la pièrre; en ce cas, quelques operateurs plus sages abandonnoient la pièrre, introduisoient de nouveau le gorgeret, et en tournant en dessous la cannelure de celui-ci, prolongeoient l'incision obliquement vers la tuberosité de l'os ischion; et enfin, à la faveur de cette plus grande ouverture, retiroient la pièrre sans causer de déchiremens." (*Bertrandi, Traité des Operations, p.* 133.) Larger stones may likewise be thus extracted, without being broken, than in any other mode of making the lateral incision, as must be obvious to every practitioner, who recollects the very limited room, afforded at the upper part of the triangular space, between the arch of the pubes, the ramus of the ischium, and the neck of the bladder. This consideration cannot fail to have great weight with all surgeons, who feel duly convinced, how unsatisfactory a method it is to break a calculus, in order to get it out of the bladder. The measures necessary for the removal of all the fragments protract the completion of the operation, and seriously increase its danger; while the continuance of a single part of the stone behind may cause a renewal of all the grievances, for the cure of which the patient submitted to the operation. By these remarks, however, I am far from meaning to say, that large calculi should not be broken: on the contrary, my only wish is, that the necessity for the practice may be avoided, as much as possible, by making a free incision into the bladder, and even enlarging the opening, if necessary, as far as can be done with safety. In short, instead of breaking the stone, I prefer the practice of Mr. Martineau, of Norwich, perhaps the most successful lithotomist now living in this country, as *out of* 84 *patients, whom he has cut, only two have died;* a statement highly favourable to operating with a knife, and making an adequate opening. "Should the stone be large, or there be any difficulty in the extraction, rather than use much force, while the forceps have a firm hold of the stone (says Mr. Martineau), I give the handles to an assistant, who is to draw them outwards and upwards, while the part forming the stricture is cut; which is easily done, as the broad part of the blade becomes a director to the knife; and rather than lacerate, I have often repeated this enlargement of the inner wound two or three times." (See *Med. Chir. Trans. Vol.* 11, *p.* 411.) The great advantage of the knife over the gorget, and even the necessity of employing it to adapt the size of the opening in the bladder to the magnitude of the stone, or its fragments, are most convincingly exemplified in several cases recently put upon record. Thus Klein, with the aid of a common scalpel, extracted a calculus, which weighed twelve ounces, thirty grains; and the patient recovered. (*Pract. Ansichten Bedeutendsten Operationen, H.* 1.) In 1818, Mr. Mayo, of Winchester, operated with a knife, and extracted a calculus, which broke in the forceps, weighing fourteen ounces two drachms, avoirdupois, and the patient recovered. (See *Med. Chir. Trans. Vol.* 11, *p.* 54, *&c.*) Mr. W. B. Dickenson, of Macclesfield, also succeeded with Mr. Gibson's knife, in taking out of the bladder a calculus, the fragments of which weighed eight and a half ounces, and the patient was saved. (*Vol. cit. p.* 61.) And in the same volume may be seen other instances, in which immense calculi were removed from the bladder with various results, but particularly one which weighed sixteen ounces, and which Sir A. Cooper could not succeed in breaking: he was therefore obliged to enlarge the wound, first made with the gorget "to the sacro-sciatic ligament," when with the aid of a hook applied to the forepart of the stone behind the pubes, and the simultaneous assistance of the forceps, he succeeded with considerable difficulty in removing this immense mass. The patient lived, however, only four hours after the operation. (See *Med. Chir. Trans. Vol.* 11, *p.* 73.)

2. The arteria pudica profunda can never be injured, because the surgeon does not let the knife, or gorget, approach nearer to the ischium, than a point which is situated a little way from the tuberosity of that bone towards the anus; and consequently the edge of the instrument cannot come into contact with the inside of the tuberosity and ramus of the ischium where the great pudic artery is situated.

3. The rectum will not be wounded, because the direction of the axis of the incision, either downwards and outwards to the above-mentioned point, or from that point inwards and upwards, sufficiently removes the edge of the knife, or gorget, from the intestine. But, the rectum will be in still greater safety, if it be pressed downward with the fore finger of the left hand in the wound, and the prudent custom of emptying it, by means of a clyster, a short time before the operation, be not omitted; for, no lithotomist should ever forget, that, when this bowel is considerably distended with feces, it rises up a little way on each side of the prostate gland.

4. As the seminal duct penetrates the lower part of the substance of the prostate gland, in order to reach the urethra, and the knife, or other instrument, employed, divides the side of that gland obliquely inward and upward, or outward and downward, the duct will not be in danger of being cut.

The judicious Callisen is well aware of the advantages of making a smooth, even, direct incision into the bladder*; but, like Professor Scarpa, he is averse to making a free cut through the neck of that viscus. Indeed, as we shall presently notice, Scarpa does not sanction cutting any portion of the bladder at all.

Every practitioner, who will take the trouble to look over the history of the lateral operation, will find that the greater number of lithotomists, who have particularly distinguished themselves by their unparalleled success, as Frère Jacques, Cheselden, Côme, Mr. Martineau, Dr. Souberbielle, &c. made a free incision into the bladder. This fact alone is enough to raise doubts of the goodness of the advice delivered upon this subject by Callisen and Scarpa; especially, as neither they, nor any other modern surgeon (with the exception, perhaps, of Pajola, whose individual skill is said by Langenbeck to make amends for the disadvantages of this method,) can boast of having cut patients for the stone with a degree of success at all equal to that of the above-mentioned operators. The extraordinary success which characterised Cheselden's practice we have already detailed. (See *p*. 697.) The accounts, which we have, of the successful operations done by Frère Jacques, and Côme, are equally remarkable.

Mr. Martineau, as I have noticed, has lost but two patients out of 84, on whom he has operated, and this without making any selection, as he never rejected any one who was brought for operation. His patients were always kept a week in the house before operating; and this precaution, with a regulated diet, and perhaps a dose or two of opening medicine, was the only preparatory treatment. (*Med. Chir. Trans. Vol.* 11, *p.* 409.)

During my stay at Paris, in 1815, I saw Dr. Souberbielle extract a stone of considerable size, on the plan of his well known ancestor. The incision was ample and direct, so that the calculus was taken out with perfect ease. Now, as the operations of this professed lithotomist are very numerous, and he enjoys the reputation of scarcely ever losing a patient, are we not justified in inferring, that the advocates for a small opening are promulgating the worst advice which can be offered to the practitioner? My own observations certainly tend to such a conclusion, as will be presently explained. The tract recently published by Scarpa (*Memoir on the Cutting Gorget of Hawkins, &c. trans. by Briggs*), has for its main objects the recommenuation of a modification of Hawkins's gorget, and the inculcation of the propriety of making a small limited incision in the prostate gland, without cutting any part of the bladder. As sufficient room cannot thus be obtained for the extraction of even a stone of moderate size, he is an advocate for the gradual dilatation of the urethra and orifice of the bladder. He observes, that the lateral operation, though executed with the greatest precision, does not exempt the surgeon from dilating in a certain degree the orifice of the bladder, and cervix of the urethra, the dilatation of those parts, however moderate, being always necessary even where the calculus is of middling size. He states, that, in the adult, the orifice of the bladder dilates almost spontaneously to the diameter of five lines; and he adds, that the lateral incision, within proper limits, divides the body and base of the prostate gland to the depth of four, or, at most, five lines, forming with the five, to which the orifice of the bladder naturally yields, an aperture of ten lines. But, says Scarpa, in an adult, a stone of ordinary size and oval figure is sixteen lines in the small diameter, to which must be added the thickness of the blades of the forceps: consequently, even after the incision has been made with the most scrupulous exactness, the stone, though of moderate size, cannot pass out of the bladder, unless the dilatation of the base of the gland and orifice of the bladder be carried to the extent of nearly eight lines, beyond the size of the aperture made with the knife. But, says Scarpa, if, in order to avoid distending the parts to the extent of eight lines, the base of the prostate gland, together with the orifice of the bladder, and a part of its fundus, be divided to a depth equivalent to it, *the event would necessarily be an effusion of urine into the cellular membrane, between the rectum and bladder, and consequently suppuration, gangrene, fistulæ, and other serious evils.* (*Pages* 4, 5.)

According to Scarpa, the apex of the prostate gland forms the greatest resistance to the introduction of the forceps and the extraction of the stone, and, therefore, ought to be completely divided; (*p.* 7,) but, he contends, that two, and sometimes three, lines of the substance of the base of the gland, should be left undivided; which, he asserts, is a matter of great importance, because the untouched portion, around the orifice of the bladder, prevents the effusion of urine, and the formation of gangrene, or fistulæ, between that part and the rectum. (*P.* 22.)

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* Vulnus sit æquale, haud angulatum, conicæ figuræ, apice vesicam respiciente, externa plaga ampla, et quatuor pollicum longitudine, unde effluxus sanguinis, puris, lotii, arenæ, facilitatur. See Systema Chirurgiæ Hodiernæ; Pars Posterior, p. 656. Hafniæ, 1800.

After this statement of one of the great principles, which Scarpa wishes to be observed in the performance of the lateral operation, a question, or two, naturally arise. Are we then to conclude, that the plan of making a free and direct incision into the bladder ought to be abandoned? Must we forget, that it is this method, which has answered so well in the hands of Cheselden and the several renowned lithotomists already enumerated? And must we believe, that the advice, delivered upon this point by Bertrandi, Desault, Mr. John Bell, and all the best modern surgeons in this country, is founded only upon a capricious partiality to the free use of cutting instruments?

Earnestly as I respect the names of a Callisen, and a Scarpa, their authority cannot influence me further, than I find it coincide with the dictates of experience,—the great arbitrator of every disputed point in practice.

We have seen, that an apprehension of effusion of urine, gangrene, fistulæ, &c. is the only reason assigned by Scarpa for his aversion to making a complete division of the side of the prostate gland, and orifice of the bladder. But, I would inquire, do we find extravasation of the urine, between the rectum and bladder, and gangrene, and fistulæ, so frequent after lithotomy in England, as to render it probable, that these ill consequences can ever proceed from our usual mode of dividing completely, not only the side of the prostate gland, but also the adjoining part of the bladder? Are such bad effects so often experienced in this country, as to constitute a material source of uneasiness in the mind of a surgeon about to undertake lithotomy? Do they form a substantial reason for abandoning the maxim of always endeavouring, as far as circumstances will allow, to make an incision of sufficient size for the easy removal of the calculus? And, would not Scarpa's method of stretching and dilating the wound, in order to get the stone out of the bladder, often dangerously prolong the operation; lead to much mischief from the repeated use of the forceps; cause serious contusion and lacerations of the parts; and, for all these reasons, render inflammation of the bladder and peritoneum very likely to follow?

I have seen the lateral operation performed an immense number of times, either with various kinds of gorgets, beaked knives, the lithotome caché, or common scalpels. In all these examples, the avowed intention of the surgeon was to make a free opening into the bladder. I do not mean, however, to say, that this was always actually accomplished, since the bad construction of the instruments employed, and other causes, sometimes frustrated the wise design of the operator. But, what was the consequence? Generally speaking, those surgeons who made only a small incision into the bladder, and kept their patients a long while upon the operating table, ere they succeeded in getting out the stone, by the repeated and forcible use of the forceps, had the mortification to see very few of their patients recover; a large proportion of them being carried off by peritonitis, on the third, or fourth day, after the operation.

On the contrary, when the incision was ample and direct, so that the calculus could be easily and gently removed, the patients were almost always saved.

During the first six or seven years of the long time, during which I enjoyed frequent opportunities of seeing lithotomy performed in St. Bartholomew's Hospital, gorgets were invariably used, most of which made an insufficient opening. The consequence was, that many of the patients were detained a long while upon the operating table, before the stone could be extracted, and some considerable numbers were lost by peritonitis. Of late years, however, in the same institution, common scalpels and beaked knives have been often used; a freer opening has been generally made; and the proportion of deaths from peritonitis is strikingly lessened.

The following observation, made by Mr. Martineau, is also worthy of particular attention:—"In the first years of my practice," says he, "I was not very successful; and often witnessing many untoward circumstances in myself and others, which appeared to arise from the use of the cutting gorget, I determined to lay that instrument aside, and employ the knife only, and the *blunt* gorget as a conductor for the forceps." (*Med. Chir. Trans. p.* 405.)

Now, when we remember that this gentleman has lost only two out of eighty-four patients, on whom he has operated, his remarks are of great importance; and his cases, and the other facts, which I have specified, strongly impress my mind with the truth of all that I have urged, respecting the advantages of making the opening large, and in the best direction for the easy passage of the stone outward.

In Mr. Martineau's manner of operating, it is true, he does not make the external wound parallel to that in the bladder, as I venture to recommend, but directs it nearly in a line with the raphe; a circumstance which may, perhaps, account for his continuing the use of the blunt gorget as a conductor for the forceps. Neither is his internal incision carried downwards and outwards, as Bertrandi, Desault, and many other judicious surgeons consider most advantageous. But these defects (if I may presume to call them so) are rendered of less consequence by the rule, which Mr. Martineau observes, of *making his first incision long and deep*, and avoiding all stretching and laceration of the parts. Like Langenbeck (see *First Lines of Surgery, Vol.* 2), he uses a staff, the groove of which is much wider and deeper than usual, and therefore more easily felt. This instrument his assistant holds, in the way preferred by Scarpa, nearly in an upright straight direction. "After the first incision (says Mr. Martineau) I look if the staff is not altered in its situation, and then feeling for the groove, I introduce the point of the knife into it, *as low down as I can, and cut the membranous part of the urethra, continuing my knife through the prostate into the bladder; when, instead of enlarging the wound downwards, and endangering the rectum, I turn the edge of the blade towards the ischium, and make a lateral enlargement of the wound in withdrawing the knife.*" (See *Med. Chir. Trans. Vol.* 11, *p.* 409.) This description is particularly interesting, as coming from a gentleman, who has had so much experience and success; and its value would have been increased, had the direction, in which the edge of the knife was turned in the division of the prostate gland, been exactly specified.

With respect to the degree of importance, which ought to be attached to the fear of effusion of urine, between the bladder and rectum, gangrene, fistulæ, &c., I can only say, that they are inconveniences which are not commonly observed after lithotomy in this country. In two or three instances only, I have known the urine come through the wound longer than usual, and these cases ended well. As for the extravasation of urine and sloughing, I shall merely remark, that although there cannot be a doubt of their occasional occurrence, they have not taken place after any of the numerous operations, with the results of which I have been acquainted.

All these facts and considerations, therefore, incline me to doubt whether the apprehension of the effusion of urine, fistulæ, &c. be sufficiently serious and well-founded to make it advisable for surgeons to relinquish the plan of making a complete division of the side of the prostate gland, and neck of the bladder, in the operation of lithotomy. Nor is it at all clear to my mind, that effusion of urine and sloughing are likely to be the effect of practising a free opening. Indeed, whenever they do happen, I believe they proceed from a totally different cause, viz. from the incision in the skin being too small and too high up, and from the axis of the internal part of the incision not corresponding with that of the external wound. Hence the urine does not readily find its way outward, and some of it passes into the neighbouring cellular membrane.

In confirmation of the foregoing remarks, I beg leave to cite the sentiments of one of the greatest and most experienced of modern surgeons. Speaking of the defects of Hawkins's gorget, Desault observes, "La méthode de l'enforcer horizontalement dans la vessie sur la catheter tenu à angle droit avec le corps, a deux grands désavantages: d'un côté, celui de pénétrer par l'endroit le plus rétréci du pubis, et par conséquent de ne faire que difficilement une ouverture suffisante; d'un autre côté, celui de ne pas établir de parallèlisme entre l'incision extérieure des tégumens qui est oblique et celle du col de la vessie et de la prostate, qui se trouve alors horizontale. Delà la possibilité des infiltrations par les obstacles qui les urines trouveront à s'écouler."

No doubt also some of the worst, and most dangerous, urinary extravasations after lithotomy, have proceeded from another cause, pointed out by the same excellent surgeon. "Imprudemment porté dans la vessie, le gorgeret peut aller, par le stylet beaucoup trop long qui le termine, heurter, déchirer, perforer même la membrane de la vessie, et donner lieu à des infiltrations, d'autant plus dangereuses que le lieu d'où elles partent est plus inaccessible. Cet accident est surtout à craindre, lorsque, comme les Anglais, on se sert de cathéter sans cul-de-sac." (See *Œuvres Chir. de Desault par Bichat, T. 2, p.* 460, 461.)

LITHOTOMY THROUGH THE RECTUM.

This method may be said to have been first suggested in a work published at Bâle, in the 16th century, by an author who assumed the name of Vegetius:—"Jubet per vulnus recti intestini, et vesicæ aculeo lapidem ejicere," says Haller, in speaking of this writer. (*Bibl. Chir. Vol.* I, *p.* 102.) But the proposal never received much attention until the year 1816, when M. Sanson, in France, gave an account of this manner of operating, and urged several considerations in favour of the practice. In that country, however, the operation has been performed only by Sanson and Dupuytren, and, though the first trial made by the latter proved successful, the other French surgeons do not appear to have imitated him. Dupuytren himself has also now given up the practice. Almost as soon as this method was heard of on the other side of the Alps, it was put to the test of experience by Barbantini, in a case where every other plan of operating appeared hardly practicable. "The connexion of the urethra with the rectum, prostate gland, and posterior part of the bladder, (says M. Sanson), made me easily perceive, that by dividing the sphincter ani and some of the rectum near the root of the penis, I should expose, not only the apex of the prostate gland, but a more or less considerable portion of this body, and that I should then be able to penetrate into the cavity of the bladder, either at the neck through the prostate, or at its posterior part." It was the latter method, which M. Sanson first tried upon the dead subject. The body was placed in the position usually chosen for the common ways of operating, and a staff was introduced, and held perpendicularly by an assistant. A bistoury, with its blade kept flat on the left fore-finger, was now introduced into the rectum, and the edge being turned upwards, M. Sanson, with one stroke, in the direction of the raphe, cut the sphincter ani, and the lower part of the rectum. The bottom of the prostate gland being thus exposed, the finger was next passed beyond its solid substance, where the staff was readily perceptible through the thin parietes of the rectum and bladder. While the latter instrument was steadily maintained in its original position, M. Sanson here introduced the knife into the bladder, and, following the groove of the staff, made an incision about an inch in length. At this instant, the flow of urine from the wound indicated that the bladder had had an opening made in it. On examination, the parts divided were found to be the sphincter, the lower part of the rectum, the back part of the prostate, and the adjacent portion of the bladder. Another mode, contemplated by M. Sanson, was, after dividing the sphincter ani, to cut the termination of the membranous part of the urethra along the groove of the staff held perpendicularly, and by the same guidance to extend the incision in the median line through the prostate gland, and neck of the bladder.

In Barbantini's case, the calculus was so large, that it made a considerable prominence in the rectum, where it was felt extending across from one tuberosity of the ischium to the other. On account of its size, its extraction by the lateral operation was considered impracticable, and, as it was not thought advisable or easy to break such a mass, and Barbantini regarded the high operation as more difficult and uncertain in its results, than the common method, it was determined to operate through the rectum. The attempt was delayed some days, by the impossibility of introducing the staff effectually, which was stopped at its entrance into the bladder by the calculus. But, as a grooved instrument was judged to be an essential guide, Barbantini caused a long director to be constructed, which he thought might be passed more conveniently than the staff, into the first incision. He also provided himself with long forceps, the blades of which were very broad, and admitted of being put separately over the stone. A staff having been introduced, the operation was done after M. Sanson's manner, except that a wooden gorget was introduced for the protection of the rectum, and the prostate gland was left undivided at the forepart of the wound. When the bladder had been opened at the lower part of the rectum, as far as the groove of the staff served as a guide, the latter instrument was withdrawn, and the long director introduced into the incision, which, under its guidance, was then enlarged to the necessary extent. With some difficulty the stone was then extracted, and found to weigh nine ounces and a half. For about eighteen days the urine passed away by the anus, only a few drops occasionally issuing from the urethra. As this circumstance gave Barbantini some uneasiness, he introduced his finger into the bladder, the inner surface of which, near the wound, he found covered with encysted calculous matter, which was very adherent. At length, however, it was gradually removed, with a portion of new-formed membrane, by attempts repeated with the finger several days in succession. A catheter was then introduced, through which, at first, almost the whole of the urine flowed. But, the tube being afterwards obstructed with mucus, it became necessary frequently to clear it by injecting tepid water. The cure now seemed to proceed with rapidity. When the feces were hard, none of them passed into the bladder; but, when they were liquid, a part of them were voided with the urine through the tube, though without any inconvenience. At the end of fifty days, scarcely any urine passed out of the wound; the patient, therefore, went into the country, where, in the course of another month, the cure was complete.

About a year ago, I saw an example, in which a calculus had made its way through the prostatic portion of the urethra, and formed, with the swelling of the soft parts, a considerable prominence within the rectum. If the patient had been under my care, I should certainly have made an incision directly on the tumor just within the sphincter, by which means the calculus might have been removed with great ease, and less risk than dividing the prostate. However, the latter method was followed, and the case had a very favourable termination. In this instance, as the sound, in its passage, only occasionally touched a small point of the calculus, which approached the urethra, and this just at the instant before its entrance into the cavity of the bladder, the exact nature of the case was for some time a matter of doubt to several skilful surgeons who were consulted.

Respecting the merits of lithotomy through the rectum, I think the practice well deserving the consideration of the profession, where the calculus is known beforehand to be of unusual size. It must be less painful, I apprehend, than the high operation, and, perhaps, more easy of execution. Even Scarpa, who decidedly condemns the recto-vesical operation, as it is termed, acknowledges, that a large calculus may indeed be thus extracted more speedily, and with less risk of injury to important parts, than by the high operation; but, says he, in addition to the consideration, that, in such cases, every mode of operating is contraindicated by the morbid state of the bladder, it is to be recollected, that, after the recto-vesical method, there is always left an open passage for the feces from the rectum into the bladder, and for the urine from the bladder into the rectum. Of three individuals, within his knowledge, who have been operated upon in this manner for very large stones, two died soon afterwards of sloughing of the bladder, and the third led for some time a miserable existence, discharging fecal urine, and urine mixed with excrement. Instructed by these disasters, some Italian surgeons, not declared advocates for the new method, very laudably endeavoured to obviate them in future; and having ascertained that, for the extraction of a stone of moderate size, such as can be conveniently taken out by the perinæum, it is not at all necessary to open the fundus of the bladder, they adopted Sanson's method, viz. that of cutting the sphincter ani from below upwards, and then to lay open vertically, from above downwards, the membranous part of the urethra and the prostate gland, so as to let the knife meet the first wound in the sphincter. "In fact (says Scarpa,) they really attained the object, namely, that of hindering the feces from entering the bladder after the extraction of the stone. This was, no doubt, of great importance in their operation, yet, as it seems to me, not a consideration that ought to make the recto-vesical preferable to the lateral operation, whenever the stone can be taken out through the perinæum. First, because the vertical section of the membranous part of the urethra, and the prostate gland, cannot be executed, without separating the left seminal duct, and sometimes the right one, from the vas deferens and vesicula seminalis of the same side: Secondly, because the wound is still exposed to the contact of the feces." (*Sul Toglio Retto-Vesicale, p.* 4.) In reply to Vacca's observations, he urges also against the recto-vesical operation; when the wound must be made extensive enough for the removal of a large calculus, the risk there is of wounding the fold of the peritonæum, which, if the bladder is thickened and contracted, descends lower than is generally supposed. (*P.* 36.) This accident really happened in one case, which was dissected by Geri of Turin. (*Repert. Med. Chir. de Torino, No.* 18.)

Even when the stone is of extraordinary magnitude, it may be doubted whether the recto-vesical method ought to be preferred either to the high or the lateral operation. by which last, stones of larger size, than that extracted by Barbantini, have been successfully taken out by Sir A. Cooper, Mr. Mayo of Winchester, Dr. Klein, of Stuttgard, and others. The most serious consideration is, whether a large incision, forming a communication between the bladder and rectum, will generally heal up, as well, or even more favourably, than in Barbantini's case. A smaller wound in the same part, it appears, may be soon cured; for, in the instance reported by Sanson, the boy was quite well on the twentieth day. On this point, it must be confessed, modern reports are becoming extremely unfavourable. Of seven patients, operated upon with division of the fundus of the bladder (says Professor Vacca,) four were left with a recto-vesical fistula, and the fifth was in danger of one. In four cases operated upon, Professor Geri, knew of three such terminations. Besides these facts, observes Scarpa, of which I could increase the number by others within my knowledge, it is to be taken into the account, that in some individuals, the fecal and urinary fistula, after seeming to be closed for some time, has opened again. (*Sul Taglio Retto-Vesicale, p.* 40.) In the School of Practical Surgery at Turin, out of five operated upon through the rectum, three died, although eleven other patients, cut in the lateral way, all recovered in a short time. Only one had rather severe symptoms, which were ascribed to a wound of the rectum. Dupuytren, who tried the recto-vesical operation as performed by Vacca, lost all his patients; and, on being asked one day, if he would still try the plan, made no answer, but by shaking his head. Riberi also saw two children cut by Sanson at Paris; one died a few days afterwards of peritonitis; and the other was given up, before his departure from that city. (*Ragguaglio di tredici Cistotomie; Torino*, 1822; *and Scarpa sul Taglio retto-vesicale, p.* 55.) *Sanson, Des Moyens de Parvenir à la Vessie par le Rectum*, 4*to. Paris*, 1817; *N. Barbantini, Obs. relative à l'extraction d'un calcul urinaire très volumineux, operée au moyen de la taille vesico-rectale*, 8*vo. Lucques*, 1819; *Journ. Complém. du Dict. des Sciences Méd. T.* 6, *p.* 79, 8*vo. Paris*, 1820; *Dict. des Sciences Méd. T.* 28, *p.* 422, *&c. A. Scarpa sul Taglio Recto-vesicale*, 4*to. Pavia*, 1823. Also *Memorie del Prof. Vacca relativa al Taglio Retto-vesicale.*

LITHOTOMY IN WOMEN.

Women suffer less from the stone than men, and far less frequently stand in need of lithotomy. It is not, however, that their urine will not so readily produce the concretions, which are termed urinary calculi. The reason is altogether owing to the shortness, largeness, and very dilatable nature of the female urethra; circumstances which in general render the expulsion of the stone with the urine almost a matter of certainty. The records of surgery present us with numerous instances, where calculi of vast size have been spontaneously voided through the meatus urinarius, either suddenly without pain, or after more or less time and suffering. Heister mentions several well authenticated examples. Middleton has also related a case, where a stone, weighing four ounces, was expelled in a fit of coughing, after lodging in the passage a week. Colot speaks of another instance, where a stone, about as large as a goose's egg, after lying in the meatus urinarius seven or eight days, and causing a retention of urine, was voided in a paroxysm of pain. A remarkable case is related by Dr. Molinieux in the early part of the Philosophical Transactions: a woman voided a stone, the circumference of which measured the longest way seven inches and six tenths, and round about, where it was thickest, five inches and three-quarters; its weight near two ounces and a half troy. And Dr. Yelloly has related an interesting example, in which a calculus, weighing three ounces, three and a half drachms troy, and lodged in the meatus urinarius, was easily taken out with the fingers. (See *Med. Chir. Trans. Vol.* 6, *p.* 577.) Dr. Yelloly also refers to several very remarkable instances, described in the Phil. Trans. vols. 12, 15, 17, 20, 34, 42, and 55, proving what large stones will pass out of the female urethra, either spontaneously, or with the aid of dilatation and manual assistance. Were any doubts now left of this fact, they would be immediately removed by other histories, especially those contained in the papers published by Sir A. Cooper. (See *Med. Chir. Trans. Vols.* 8 *and* 12.)

Sometimes, after the passage of large calculi, the patient has been afflicted with an incontinence of urine; but, in general, this grievance lasts only a short time.

The occasional spontaneous discharge of very large calculi, through the meatus urinarius, led Frederic de Leauson to deliver the advice not to interfere with them, as he thought they would all present themselves sooner or later at the orifice of that passage, and admit of being taken away with the fingers. (See *Traité Nouveau pour aisément parvenir à la Vraie Curation de plusieurs belles Operations, &c. Génève*, 1674.)

When surgeons began to consider what very large calculi were sometimes spontaneously voided, and the large size, and dilatable nature of the female urethra, they suspected, that it would be a good practice to dilate this passage by mechanical contrivances, until it would allow the stone to be extracted, and thus all occasion for cutting instruments might be superseded. With this view, Tolet first proposed suddenly dilating the passage with two steel instruments, called a male and female conductor, between which the fingers, or forceps, were passed for the removal of the calculus. (*Traité de la Lithotomie, Paris*, 1681.) But as it was afterwards rightly judged, that the dilatation would produce less suffering and injury, if more gradually effected, Douglas suggested the practice of dilating the meatus urinarius with sponge or dried gentian root.

Mr. Bromfield published the case of a young girl, in whom he effected the necessary dilatation by introducing into the meatus urinarius the appendicula cœci of a small animal in a collapsed state, and then filling it with water, by means of a syringe; thus furnishing a hint for the construction of instruments on the principle of Mr. Arnott's dilator. The piece of gut, thus distended, was drawn out, in proportion as the cervix vesicæ opened, and, in a few hours, the dilatation was so far accomplished, that the calculus had room to pass out. (See *Chir. Obs. and Cases, Vol.* 2, *p.* 276.)

Mr. Thomas met with a case, in which, after dilating the meatus urinarius with a sponge tent, he succeeded in extracting an earpicker which lay across the neck of the bladder. The passage was so much enlarged, that the left fore-finger was most easily introduced, and (says this gentleman) "I believe had the case required it, both thumb and finger would have passed into the bladder without the smallest difficulty." After adverting to this, and other facts, proving the ease, with which the female urethra can be dilated, Mr. Thomas remarks: "If these relations can be credited, and there is no reason why they should not, I can hardly conceive any case, in a young and healthy female subject, and where the bladder is free from disease, where a very large stone may not be extracted, without the use of any other instrument than the forceps, the urethra having first been sufficiently dilated by means of the sponge tents. For this purpose, the blades of the forceps need not be so thick and strong, as those commonly employed." (See *Med. Chir. Trans. Vol.* 1, *p.* 123—129.) Many facts of a similar kind are on record, and one, in which a large needle-case was extracted is referred to in a modern periodical work. (See *Quarterly Journ. of Foreign Med. Vol.* 2. *p.* 331.)

Some surgeons have extracted stones from the female bladder in the following manner: the patient having been placed in the position commonly adopted in the lateral operation, a straight staff, with a blunt end, is introduced into the bladder, through the meatus urinarius. The surgeon then passes along the groove of the instrument the beak of a blunt gorget, which instrument becoming wider towards the handle, effects a part of the necessary dilatation. The staff being withdrawn, and the handle of the gorget taken hold of with the left hand, the right forefinger with the nail turned downwards, is now introduced slowly along the concavity of the instrument. When the urethra and neck of the bladder have thus been sufficiently dilated, the finger is withdrawn, and a small pair of forceps passed into the bladder. The gorget is now removed, and the stone taken hold of, and extracted. (*Sabatier, Médecine Opératoire, T.* 2, *p.* 103.)

This plan, however, has been objected to on account of the dilatation being too suddenly effected; and the practice of gradually expanding the meatus urinarius with sponge tent preferred. The retention of urine, during the continuance of the sponge, certainly causes great irritation, and if this method be followed, therefore, I consider Mr. C. Hutchison's suggestion of placing a catheter in its centre, as mentioned by Sir A. Cooper, worthy of attention. (See *Med. Chir. Trans. Vol.* 8, *p.* 433.)

Sir A. Cooper, who is an advocate for the practice of removing calculi from the female bladder by dilating the meatus urinarius, now employs for this purpose "an instrument constructed upon the principle of the speculum ani and speculum oris," and which has the advantage of permitting the urine to escape, whilst it dilates the passage sufficiently for the entrance of the forceps, and the removal of a stone of considerable dimensions. He believes that "if the stone be small, the dilatation should be accomplished in a few minutes; but, that, if it be large, it will be better to dilate but little, from day to day, until the greatest degree of extension is accomplished; carefully avoiding contusion, which is much to be dreaded." (See *Med. Chir. Trans. Vol.* 12, *p.* 240.)

Notwithstanding these favourable accounts of the practice of dilating the female urethra, for the purpose of removing calculi from the bladder, there are very good surgeons who deem an incision the best practice. It is certain, that some patients have found the method insufferably tedious and painful. But the strongest objection is the incontinence of urine, which occasionally follows a great distention of the urethra and neck of the bladder. Klein, one of the most experienced operative surgeons in Germany, states, that he has tried both plans, and that the use of the knife is much less frequently followed by incontinence of urine. And Scarpa declares that when the calculus is large and not soft and fragile, the method of extracting it by dilatation is almost always followed by incontinence of urine. (*Sul Taglio Retto-Vesicale, p.* 49.) On the other hand, Mr. Thomas believes, that this unpleasant symptom is quite as often a consequence of the operation of lithotomy, as now usually performed, (*Med. Chir. Trans. Vol.* 1, *p.* 127;) and Sir A. Cooper expressly states, that the greatest advantage of his mode of extracting calculi with a dilating instrument, is the preservation of the power of retaining the urine. (See *Med. Chir. Trans. Vol.* 12, *p.* 240.) Of the propriety of removing calculi, under a certain size, and also pieces of broken catheter, &c., in this manner, no doubt can be entertained; but, if the foreign body were very large, I should consider an incision the safest and least painful practice.

In females, lithotomy is much more easy of execution, and less dangerous, than in male subjects. It may be done in various ways; but the surgeons of the present time constantly follow the mode of making the requisite opening by dividing the urethra and neck of the bladder. Louis employed for this purpose a knife, which cut on each side, and was contained in a sheath; Le Blanc, a concealed bistoury, which had only one cutting edge; Le Cat, his gorgeret-cystitome; Frère Côme, his lithotome caché; and Fleurant, a double-bladed lithotome caché. Of these instruments, the best, I think, is that of Frère Côme. But, at present, every surgeon knows, that the operation may be done, as conveniently as possible, with a common director and a knife that has a long, narrow, straight blade. A straight staff, or director, is introduced through the meatus urinarius; the groove is turned obliquely downwards and outwards, in a direction parallel to the ramus of the left os pubis; and the knife is thus conducted into the bladder, and makes the necessary incision through the whole extent of the passage, and neck of the bladder.

Louis and Fleurant, as I have said, were the inventors of particular bistouries for dividing both sides of the female urethra at once. The instrument of the former effected this purpose, in passing from without inwards; that of the latter, in passing from within outwards. Fleurant's bistoury bears some resemblance in principle to Frère Côme's lithotome caché, or to the cutting forceps with which Franco divided the neck of the bladder. The reason, assigned as a recommendation of these bistouries, is, that they serve to make a freer opening for the passage of large stones, than can be safely made by cutting only in one direction. When the calculus is large, it is certainly difficult to procure a free opening, without cutting the vagina, in front of which passage there is but little space under the pubes for the removal of the stone. Hence, Dubois invented a new method, which consists in dividing the meatus urinarius directly upwards towards the symphysis of the pubes, dilating the wound, and keeping the vagina out of the way by means of a blunt gorget, and then taking out the calculus with the forceps. This plan is acknowledged to be very painful, yet generally successful, and not followed by any serious symptoms or incontinence of urine. (See *Dict. des Sciences, Méd. T.* 28, *p.* 436.) Lisfranc also carries the incision upwards, and a little to one side of the symphysis of the pubes, because this mode of operating is found to be less frequently followed by retention of urine. When the opening thus made is not large enough, he makes another cut obliquely downwards and outwards. When the stone is known to be very large, Sabatier and some other modern surgeons prefer the apparatus altus.

A case may present itself, in which the posterior part of the bladder, drawn downwards by the weight of the stone, may displace a portion of the vagina, and make it protrude at the vulva in the form of a swelling. Here, there would be no doubt of the propriety of cutting into the tumor, and taking out the foreign body contained in it. Rousset performed such an operation, and Fabricius Hildanus, in a case, where the stone had partly made its way into the vagina, enlarged the opening, and successfully extracted the foreign body.

Mery proposed to cut into the posterior part of the bladder, through the vagina, after introducing a common curved staff; but the apprehension of urinary fistulæ made him abandon the project.

Extraordinary circumstances may always render a deviation from the common modes of operating not only justifiable, but absolutely necessary. Thus, Tolet met with a case, where a woman had a prolapsus of the uterus, with which the bladder was also displaced. In the latter viscus, several calculi were felt: an incision was made into it, and the stones extracted; after which operation, the displaced parts were reduced, and a speedy cure followed. (*Sabatier, Médecine Opératoire, T.* 2, *p.* 107.)

The incontinence of urine, consequent to lithotomy in women, is by no means an unfrequent occurrence. Mr. Hey cut two female patients for the stone, both of whom were afterwards unable to retain their urine, and were not quite well when discharged from the Leeds Infirmary. These cases led Mr. Hey in a third example to endeavour to prevent the evil, by introducing into the vagina a cylindrical linen tent, two inches long and one broad, with a view of bringing the edges of the incision together, without obstructing the passage of urine through the urethra. The plan answered, if it be allowable to make such an inference from a single trial. (See *Hey's Practical Obs. in Surgery, p.* 560, *Ed.* 1810.)

TREATMENT AFTER THE OPERATION.

If the internal pudendal artery should be wounded, and bleed profusely, the best plan is, if possible, first to take out the stone, and then introduce into the wound a piece of firm sponge, with a large cannula passed through its centre. The expanding property of the sponge, on its becoming wet, will make the necessary degree of compression of the vessel, which lies too deeply to be tied. Linen wet with cold water should at the same time be applied to the perinæum and hypogastric region.

I cannot say, that it has fallen to my lot to see any cases (out of the great number which I have seen), in which death could be imputed to hemorrhage, notwithstanding the bleeding has often been so profuse, and from so deep a source, just after the operation, as to create suspicion, that it proceeded from the internal pudendal artery. Such hemorrhage generally stopped before the patient was put to bed.

The majority of patients who die after lithotomy, perish of peritoneal inflammation. Hence, on the least occurrence of tenderness over the abdomen, copious venesection should be put in practice. At the same time, eight or ten leeches should be applied to the hypogastric region. The belly should be fomented, and the bowels kept open with the oleum ricini. The feebleness of the pulse should not deter the practitioner from using the lancet; this symptom is only fallacious; and generally attendant on all inflammation within the abdomen. It is a curious fact, that Mr. Martineau, who has lost only two out of 84 patients, whom he has operated upon for the stone, should *never* have found it requisite to bleed; but it appears to me, that it is a much better argument in favour of the superior safety of operating with the knife and making a free opening, than reason for discouraging venesection, when inflammation of the peritonæum has come on, which, however, may not be this gentleman's meaning, as he says, "I believe, it will be found in adults, that death follows oftener from exhaustion, after a tedious operation, or from despondency, &c. than from acute disease;" (*Med. Chir. Trans. Vol.* 11, *p.* 412,) a sentiment, which, I am sure, this gentleman would not have entertained, had he been present with me at the opening of the many unfortunate cases, which used formerly to occur in the practice with badly made gorgets in St. Bartholomew's Hospital. Together with the above measures, the warm bath, a blister on the lower part of the abdomen, and emollient glysters, are highly proper. I have seen several old subjects die of the irritation of a diseased thickened bladder, continuing after the stone was extracted. They had not the acute symptoms, the inflammatory fever, the general tenderness and tension of the abdomen, as in cases of peritonitis; but they referred their uneasiness to the lower part of the pelvis; and instead of dying in the course of two or three days, as those usually do who perish of peritoneal inflammation, they, for the most part, lingered for two or three weeks after the operation. In these cases, opiate glysters, and blistering the hypogastric region, are the best measures. In some instances of this kind, abscesses form about the neck of the bladder.

Whoever wishes to acquire a perfect knowledge of the history of lithotomy, should consult the following works: *Celsus de Re Medicá, lib.* 7, *cap.* 26. *Remarques sur la Chirurgie de Chauliac, par M. Simon de Mingelouzeaux, tom.* 2; *Bourdeaux*, 1663. *La Legende du Gascon, par Drelincourt; Paris*, 1665. *Van Horne's Opuscula. Marianus de Lapide Vesicæ par Incisionem extrahendo*; 1552. *G. Fabr. Hildanus, Lithotomia Vesicæ*, 8*vo. Lond.* 1640.

M. S. Barolitanus, De Lapide Renum: Ejusdem de Lapide Vesicæ per Incisionem extrahendo, 4to. *Paris,* 1540. *Le Dran, Parallèle des Différentes Manières de tirer la Pièrre hors de la Vessie,* 2 *Vols.* 8*vo.* 1730. *Sharp's Operations. Sharp's Critical Enquiry. Le Dran's Operations, Edit.* 5; *London,* 1781. *Franco's Traité des Hernies,* 1561. *Rosetus de Partu Cæsario. Traité de la Lithotomie, par F. Tolet, Paris,* 5*ieme Ed.* 1708. *Heister's Surgery, Part* 2. *Lithotomia Douglassiana,* 1723. *J. Douglas, History of the Lateral Operation,* 4to. *Lond.* 1726. *Fr. M. Colot, Traité de l'Opération de la Taille, &c.* 12*mo. Paris,* 1727. *Morand, Traité de la Taille au haut appareil,* 12*mo. Paris,* 1728. *J. Mery, Observations sur la Manière de Tailler, &c. pratiquée par Frère Jacques,* 12*mo. Paris,* 1700. *Cours d'Opérations de Chirurgie par Dionis. Traité des Opérations par Garengeot, T.* 2. *Morand Opuscules de Chirurgie. Bertrandi Traité des Opérations. J. G. Ilsemann, De Lithotomiæ Celsianæ Præstantia; Helmst.* 1745. *Le Cat, Recueil de Pièces sur l'Opération de la Taille, Part* 1; *Rouen,* 1749. *Cosme, Recueil de Pièces Anatomiques importantes sur l'Opération de la Taille; Paris,* 1751, —1753. *J. Douglas, Postscript to Hist. of the Lateral Operation;* 1726. *J. Douglas, Appendix to Hist. of the Lateral Operation;* 1731. *A short Historical account of Cutting for the Stone, by W. Cheselden, in his own last Edition of his Anatomy. Falconet in Thes. Chirurg. Halleri; thes.* 103, *T.* 4, *p.* 196. *Traité Historique et Dogmatique de l'Opération de la Taille, par J. F. L. Deschamps,* 4 *Tom.* 8*vo. Paris,* 1796. *This last work is a very complete and full account of the subject, up to the time of its publication, and well merits careful perusal. Richerand's Nosogr. Chir. T.* 3, *p.* 538, *&c. Ed.* 4. *John Bell's Principles of Surgery, Vol.* 2, *Part* 1. *A. Burns, in Edinb. Med. and Surg. Journal, January,* 1808. *C. Bell's Operative Surgery, Vol.* 1, 1807. *Sabatier, de la Médecine Opératoire. Tom.* 3, *Edit.* 2, 1810. *Dr. John Thomson's Observations on Lithotomy; Edinb.* 1808. *Also an Appendix to a proposal for a new manner of cutting for the Stone,* 8*vo. Edinb.* 1810. *Allan's Treatise on Lithotomy; Edinb.* 1808. *Earle's Practical Observations on Operations for the Stone;* 2*d Ed. with an appendix containing a description of an instrument calculated to improve that operation,* 8*vo. Lond.* 1803. *Wm. Dease, Obs. on the different methods for the radical cure of the Hydrocele, &c. To which is added a comparative view of the different methods of cutting for the Stone, &c.* 8*vo. Lond.* 1798. *Œuvres Chir. de Desault, par Bichat; T.* 2. *Wm. Simmons, Cases and Obs. on Lithotomy,* 8*vo. Manchester,* 1808. *C. B. Trye, Essay on some of the Stages of the Operation of cutting for the Stone,* 8*vo. Lond.* 1811. *Roux, Voyage fait à Londres en* 1814, *ou Parallèle de la Chirurgie Angloise avec la Chirurgie Francoise, p.* 315, *&c. Paris,* 1818. *Schreger, Chirurgische Versuche, B.* 2, *von Steinschnitten an Weibern, p.* 135, *&c.* 8*vo. Nürnberg,* 1818. *C. J. M. Langenbeck, über eine einfache und sichere methode des Steinschnittes,* 4*to. Wurzburg,* 1802. *This work contains an excellent anatomical engraving of the parts in the perinæum. F. X. Rudtorffer, Abhandlung über die Operation des Blasensteines nach Pajola's Methode,* 4*to. Leipz.* 1808. *A. Scarpa, A Memoir on the Cutting Gorget of Hawkins, &c. Transl. by J. H. Wishart,* 8*vo. Edinb.* 1816. *H. Mayo, W. Dickenson, H. Earle, and P. M. Martineau in Med. Chir. Trans. Vol.* 11. *Klein, Pract. Ansichten bedeutendsten Operationen,* 4*to. Stutgart,* 1816. *J. S. Carpue, Hist. of the High Operation, and An Account of the various Methods of Lithotomy,* 8*vo. Lond.* 1819. *Sir E. Home on Strictures, &c. Vol.* 3, 8*vo. Lond.* 1821. *A. Scarpa, Mem. sul Taglio Ipogastrico, in Imp. R. Instituto di Scienze ed Arti di Milano, Vol.* 1: *Also Osserv. sul Taglio-Retto-Vesicale,* 4*to. Pavia,* 1823. *W. W. Sleigh, Essay on an Improved Method of Cutting for Urinary Calculi; or the posterior Operation of Lithotomy,* 8*vo. Lond.* 1824. *The opening to be made through the rectum, without cutting the sphincter ani and prostate gland. Against this proposal, the difficulty of healing the wound, experienced by the Italian surgeons in their earlier methods of the recto-vesical operation, and the danger of wounding the cul-de-sac of the peritoneum, must be strong objections, as explained by Scarpa. C. Aston Key, A Short Treatise on the Section of the Prostate Gland in Lithotomy,* 4*to. London,* 1824. For a minute description and delineations of the parts concerned in the operation, see *Camper's Demonstrationes Anatomico-pathologicæ, lib.* 2. Also *L. F. Von Froriep über die Lage der Eingeweide an Becken, nebst einer Darstellung derselben,* 4*to. Weimar,* 1815.

LOTIO ALUMINIS.—℞. Aluminis purif. ℥ss. Aquæ distillatæ ℔ j. Misce.—Sometimes used as an astringent injection; sometimes as an application to inflamed parts.

LOTIO AMMONIÆ ACETATÆ.—℞. Liq. ammon. acetatæ; Spirit. vin. rectif.; Aquæ distillatæ; sing. ʒiv. Misce.—Properties discutient.

LOTIO AMMONIÆ MURIATÆ.—℞. Ammon. muriatæ ℥j. Spirit. rorismarini ℔j.—Has the same virtues as the preceding. Justamond recommended it in the early state of the milk-breast.

LOTIO AMMONIÆ MURIATÆ CUM ACETO.—℞. Ammon. Mur. ℥ss. Aceti, Spirit. vinos. rectif. sing. ℔j. Misce. This is one of the most efficacious discutient lotions. It is, perhaps, the best application for promoting the absorption of extravasated blood, in cases of ecchymosis, contusions, sprains, &c.

LOTIO AMMONIÆ OPIATA.—℞. Spiritus ammon. comp. ʒiiiss. Aquæ distillatæ ℥iv. Tinct. Opii ℥ss. Misce.—Applied by Kirkland to some suspicious swellings in the breast, soda and bark being also given internally.

LOTIO CALCIS COMPOSITA.—℞. Liq. calcis ℔j. Hydrargyri submuriatis ʒj. Misce.—Ring-worms, tetters, and some other cutaneous affections, are benefited by this application.

LOTIO GALLÆ.—℞. Gallarum contusarum ʒij. Aquæ ferventis ℔j. To be macerated one hour, and strained. This astringent lotion is sometimes used with a view of removing the relaxed state of the parts, in cases of prolapsus ani, prolapsus uteri, &c.

LOTIO HYDRARGYRI AMYGDALINA.—℞. Amygdalarum amararum ℥ij. Aquæ distill. ℔ij. Hydrarg. oxymuriatis ℈j. Rub down the almonds with the water, which is to be gradually poured on them; strain the liquor, and then add the oxymuriate of mercury. This will cure several cutaneous affections.

LOTIO HYDRARGYRI OXYMURIATIS.—℞. Hydrargyri oxymuriatis gr. ijss. Arabici gummi ℥ss. Aquæ distillatæ ℔j. Misce.—This is the injection of corrosive sublimate in use at St. Bartholomew's Hospital.

LOTIO HYDRARGYRI OXYMURIATIS COMPOSITA.—℞. Hydrarg. oxymur. gr. x. Aq. distillat. bullientis ℥iss. Tinct. canthar. ℥ss. Misce.—This was ordered by Dr. H. Smith, to be applied every night to scrophulous swellings.

LOTIO HELLEBORI ALBI.—R. Decocti hellebori albi ℔j. Potassæ sulphureti ℥ss. Misce.—This is occasionally employed as an application for curing tinea capitis, and some other cutaneous diseases.

LOTIO PLUMBI ACETATIS.—℞. Liq. plumbi acet. ʒij. Aq. distill. ℔ij. Spirit. vinos. tenuioris ʒij. The first and last ingredients are to be mixed before the water is added. The common whitewash; an application universally known.

LOTIO POTASSÆ SULPHURETI.—℞. Potassæ sulph. ʒij. Aquæ distill. ℔j. Misce.—Used in cases of porrigo, psoriasis, lepra, &c.

LOTIO OPII.—℞. Opii purif. ʒjss. Aquæ distillatæ ℔j. Misce.—A very excellent application to irritable painful ulcers of every description. It is best to dilute it, especially at first.

LOTIO PICIS.—℞. Picis liquidæ ℥iv. Calcis ℥vj. Aquæ ferventis ℔iij.—To be boiled till half the water is evaporated. The rest is then to be poured off for use. This application is sometimes employed for the cure of tinea capitis; it is also of singular service in removing an extensive scorbutic redness, frequently seen on the legs, accompanying old ulcers.

LOTIO ZINCI SULPHATIS.—℞. Zinci sulphatis ʒj. Aq. ferventis ℔j. Misce. Sometimes used in lieu of the lotio plumbi acet. It forms a good astringent application for a variety of cases. When diluted with two additional pints of water, it forms a common injection for gonorrhœa.

LUES VENEREA. See VENEREAL DISEASE.

LUMBAR ABSCESS. *Psoas Abscess.* By these terms are understood chronic collections of matter, which form in the cellular substance of the loins, behind the peritonæum, and descend in the course of the psoas muscle. Patients, in the incipient stage of the disease, cannot walk so well as usual: they feel a degree of uneasiness about the lumbar region; but in general, there has been no acute pain, even though the abscess has acquired such a size as to form a large tumor, protruding externally. In short, the psoas abscess is the best instance, which can possibly be adduced, in order to illustrate the nature of those collections of matter, which are called chronic, and which form in an insidious manner, without serious pain, or any other attendant of acute inflammation.

The abscess sometimes forms a swelling above Poupart's ligament; sometimes below it; and frequently the matter glides under the fascia of the thigh. Occasionally, it makes its way through the sacro-ischiatic foramen, and assumes rather the appearance of a fistula in ano. When the matter gravitates into the thigh, beneath the fascia, Mr. Hunter would have termed it a disease *in*, not *of*, the part. The uneasiness in the loins, and the impulse communicated to the tumor by coughing, evince, that the disease arises in the lumbar region; but, it must be confessed, that we can hardly ever know the existence of the disorder, before the tumor, by presenting itself externally, leads us to such information. The lumbar abscess is sometimes connected with diseased vertebræ, which may either be a cause, or an effect, of the collection of matter.—The disease, however, is frequently unattended with this complication.

The disease of the spine, we may infer, is not of the same nature as that treated of by Pott, as there is usually no paralysis. When the bodies of patients with lumbar abscesses are opened, it is found, that the matter is completely enclosed in a cyst, which, in many cases, is of course very extensive. If the contents of such abscesses were not circumscribed by a membranous boundary in this manner, we should find that they would spread among the cells of the cellular substance, just like the water in anasarca. The cysts are both secreting and absorbing surfaces, as is proved by the great quantity of matter, which soon collects again after the abscess has been emptied, and by the occasional disappearance of large palpable collections of matter of this kind, either spontaneously, or in consequence of means which are known to operate by exciting the action of the absorbents. In short, the cyst becomes the suppurating surface, and suppuration is now well ascertained to be a process, similar to glandular secretion. While the abscess remains unopened, its contents are always undergoing a change; fresh matter is continually forming, and a portion of what was previously in the cyst is undergoing the necessary removal by the absorbents. This is not peculiar to lumbar abscesses; it is common to all, both chronic and acute, buboes and suppurations in general. It is true, that, in acute abscesses, there often has not been time for the formation of so distinct a membrane as the cyst of a large chronic abscess; but their matter is equally circumscribed by the cavities of the cellular substance being filled with a dense coagulating lymph; and though it generally soon makes its way to the surface, it also is occasionally absorbed.

The best modern surgeons make it a common maxim to open very few acute abscesses; for the matter naturally tends with great celerity to the surface of the body, where ulceration allows it to escape spontaneously; after which, the case generally goes on better, than if it had been opened by art. But, in chronic abscesses, the matter has not that strong tendency to make its way outward; its quantity is continually increasing; the cyst is, of course, incessantly growing larger and larger; in short, the matter, from one ounce, ften gradually increases to the quantity of a gallon. When the disease is at length opened, or bursts by ulceration, the surface of the cyst, irritated by the change, inflames; and its great extent, in this circumstance, is enough to account for the terrible constitutional disorder, and fatal consequences, which too frequently soon follow the evacuation of the contents of such an abscess. Hence, in cases of chronic suppurations of every kind, and not merely in lumbar abscesses, it is the surgeon's duty to observe the opposite rule to that applicable to acute cases; and he is called upon to open the collection of matter, as soon as he is aware of its existence, and its situation will allow it to be done.

Certainly, it would be highly advantageous to have some means of ascertaining whether the vertebræ are also diseased; for, as in this instance, the morbid bones would keep up suppuration, until their affection had ceased, and there would be no reasonable hope of curing the abscess sooner, it might be better to avoid puncturing it under such circumstances. The propriety of this conduct seems the more obvious, as issues, which are the means most likely to stop and remove the disease of the spine, are also such as afford most chance of bringing about the absorption of the abscess itself. However, if the collection cannot be prevented from discharging itself, and ulceration is at hand, it is best to meet the danger, make an opening with the lancet, in a place at some distance from where the pointing threatens, and afterwards heal it, in the way which will be presently detailed.

Though we have praised the prudence of opening all chronic abscesses while small, the deep situation of the lumbar one, and the degree of doubt, always involving its early state, unfortunately prevent us from taking this beneficial step in the present case. But still the principle is equally praiseworthy, and should urge us to open the tumor as soon as the fluctuation of the matter is distinct, and the nature of the case is evident. For this purpose Mr. Abernethy employs an abscess lancet, which will make an opening large enough for the discharge of those flaky substances so frequently found blended with the matter of lumbar abscesses, and by some conceived to be an emblem of the disease being scrophulous. Such flakes seem to consist of a part of the coagulating matter of the blood, and are very commonly secreted by the peculiar cysts of scrophulous abscesses. The puncture must also be of a certain size, in order to allow the clots of blood, occasionally mixed with the matter, to escape. Mr. Abernethy considers the opening of a lumbar abscess a very delicate operation. Former surgeons used to make large openings in these cases; let out the contents; and leave the wound open: the usual consequences of which were, great irritation and inflammation of the cyst: immense disturbance of the constitution: putrefaction of the contents of the abscess, in consequence of the entrance of air into its cavity; and, too often, death. While such practice prevailed, very few, afflicted with lumbar abscesses, were fortunate enough to escape. The same alarming effects resulted from allowing the abscess to attain its utmost magnitude, and then burst by ulceration. If then a more happy train of events depend upon the manner, in which lumbar abscesses are punctured, the operation is certainly a matter of great delicacy.

Until the collection is opened, or bursts, the patient's health is usually little, or not at all impaired; indeed, we see in the faces of many persons with such abscesses, what is usually understood by the picture of health. Hence, how likely our professional conduct is to be arraigned, when great changes for the worse, and even death occur very soon after we have let out the matter, seemingly, and truly, in consequence of the operation. Every plan, therefore, which is most likely to prevent these alarming effects, is entitled to infinite praise; and such, I conceive, is the practice recommended by Mr. Abernethy.

This gentleman's method is to let out the matter, and heal the wound immediately afterwards by the first intention. He justly condemns all introductions of probes, and other instruments, which only irritate the edges of the puncture, and render them unlikely to grow together again. The wound is to be carefully closed with sticking plaster, and it will almost always heal.

These proceedings do not put a stop to the secretion of matter within the cavity of the abscess. Of course, a fresh accumulation takes place; but, it is obvious, that the matter, as fast as it is produced, will gravitate to the lowest part of the cyst, and, consequently, the upper part will remain for a certain time undistended, and have an opportunity of contracting.

When a certain quantity of matter has again accumulated, and presents itself in the groin, or elsewhere, which may be in about a fortnight after the first puncture, the abscess is to be punctured again, in the same manner as before, and the wound healed in the same way. The quantity of matter will now be found much less, than what was at first discharged. Thus the abscess is to be repeatedly punctured at intervals, and the wounds as regularly healed by the first intention, by which method, irritation and inflammation of the cyst will not be induced, the cavity of the matter will never be allowed to become distended, and it will be rendered smaller and smaller, till the cure is complete.

In a few instances, the surgeon may, perhaps, be unable to persevere in healing the repeated punctures which it may be necessary to make; but, after succeeding once or twice, the cyst will probably have had sufficient opportunity to contract so much, that its surface will not now be of alarming extent. It is also a fact, that the cyst loses its irritability, becomes more indolent, and less apt to inflame, after the contents have been once or twice evacuated, in the above way. Its disposition to absorb becomes also stronger.

The knowledge of the fact, that the cysts of all abscesses are absorbing surfaces, should lead us never to neglect other means, which Mr. Abernethy suggests, as likely to promote the dispersion of the abscess, by quickening the action of the absorbents. Blisters kept open with savine cerate, issues, electricity, occasional vomits of the sulphate of zinc, are the means most conducive to this object. When the vertebræ are diseased, issues are doubly indicated.

In the latter complication, the case is always dangerous. If an opening be made in the abscess, the cyst is at first more likely to be irritated, than when the bones are not diseased, and the affection of the spine is rendered much less likely to undergo any improvement, in consequence of the mere formation of an outward communication. The same bad effect attends necrosis; in which case, the absorption of the dead bone is always retarded by the presence of unhealed fistulæ and sores, which lead down to the disease.

Mr. Crowther succeeded in dispersing some large lumbar abscesses without opening them. Large blisters, applied to the integuments covering the swelling, and kept open with the savine cerate, effected the cure. When this gentleman punctured such collections of matter, he used a small trocar, which he introduced at the same place as often as necessary. He observes, that the aperture so made does not ulcerate, and allows no matter to escape after being dressed. I cannot, however, discover any reason for his preferring the trocar to the abscess lancet, except that the cannula enables the surgeon to push back with a probe any flakes of lymph, &c. which may obstruct its inner orifice. But, this is scarcely a reason, when Mr. Abernethy informs us, that the opening, made with an abscess lancet, is large enough to allow such flakes to be discharged; and when they stop up the aperture, a probe might also be employed to push them back. A wound made with a cutting instrument will, *cæteris paribus*, always unite more certainly by the first intention, than one made with such an instrument as a trocar. Mr. Crowther may always have succeeded in healing the aperture; but, I do not believe, that other practitioners would experience equal success. Were the tumor not very prominent, from the quantity of matter being small, suddenly plunging in a trocar might even endanger parts, which should, on no account, be injured.

Some writers recommend opening lumbar abscesses with a seton. The matter being made to form as prominent a swelling as possible, by pressing the abdomen, and putting the patient in a position, which will make the contents of the abscess gravitate towards the part where the seton is to be introduced, a transverse cut is first to be made in the integuments down to the fascia. A flat trocar is next to be introduced within the incision, which should only be just large enough to allow the instrument to pass freely up under the skin, for at least three quarters of an inch; when the hand is to be raised, and the trocar pushed obliquely and gently upwards, till the cannula is within the lower part of the sac. The trocar must now be withdrawn, and the matter allowed to flow out gently, stopping it every now and then for some minutes. The assistant must now withdraw his hand, to take away the pressure, and the thumb of his left hand upon the opening of the cannula, holding it between his fore and middle fingers. It must then be pushed upward, nearly to the top of the tumor, where its end may be distinctly felt with the fore-finger of the right hand. As soon as it can be plainly felt, it must be held steadily in the same position, and the trocar is to be introduced into it again, and pushed through the skin, at the place where it is felt, and the cannula along with it. The trocar being next withdrawn, a probe with a skein of fine soft silk, dipped in oil, must be passed through the cannula, which being now taken away, leaves the seton in its place. A pledget of mild ointment is then to be applied over the two openings, the more completely to exclude the air. A fresh piece of the silk is to be drawn into the abscess, and that which was in before cut off, as often as necessary. (See *Latta's System of Surgery, Vol.* 3, *p.* 307.)

Mr. Crowther states, that Deckers, who wrote in 1696, discharged a large abscess, in a gradual manner, with a trocar, the cannula of which was not withdrawn, but was stopped up with a cork, and the latter let out at intervals. B. Bell also advises the cannula not to be taken out.

I cannot quit this subject without mentioning a remarkable case of lumbar abscess, which I once saw in Christ's Hospital, under the care of the late Mr. Ramsden. The tumor extended from the ilium and sacrum below, as high up as the ribs. The diameter of the swelling, from behind forward, might be about six or eight inches. It was attended with so strong a pulsation, corresponding with that of the arteries, that several eminent surgeons in this city considered the case as an aneurism of the aorta. After some weeks, as the tumor increased in size, the throbbing of the whole swelling gradually became fainter and fainter, and, at length, could not be felt at all. The tumor was nearly on the point of bursting. Mr. Ramsden suspected, that it was an abscess, and determined to make a small puncture in it. The experiment verified the accuracy of his opinion; a large quantity of pus was evacuated at intervals; but, the boy's health suffering, he went to his friends at Newbury, and I did not afterwards hear the event. I have never seen any popliteal aneurism, whose pulsations could be more plainly seen and strongly felt, than those of the abscess we have just been describing. A singular case is related by Mr. Wilmot of a psoas abscess, the matter of which was at length absorbed, and its cavity filled with air, attended with a considerable increase in the size of the tumor, a conical elongated shape, and elastic feel, instead of a fluctuation, previously quite evident, and the subsidence of all the hectical symptoms. A complete dispersion of the swelling was effected by a bandage and compress wet with a strong decoction of oak bark and alum. (See *Trans. of the King's and Queen's College of Physicians in Ireland, Vol.* 2, *p.* 26, *&c.* 8*vo. Dublin*, 1818. *F. Schoenmezel, Obs. de Musculis Psoa et Iliaco suppuratis, Frank. Del. Op. V. R. Beckwith de Morbo Psoadico. Edinb.* 1784. *Abernethy's Surgical and Physiological Essays, Parts* 1 *and* 2. *Crowther's Observations on White-Swelling, &c.* 1808. *Latta's System of Surgery, Vol.* 3. *Callisen's Systema Chirurgiæ Hodiernæ, Vol.* 1, *p.* 370. *Pearson's Principles of Surgery, p.* 102, *Edit.* 2. *Richter's Anfangsgrunde der Wundarzneykunst, B.* 5, 113, *Göttingen*, 1801.)

LUNAR CAUSTIC. (See *Argentum Nitratum.*)

LUPUS. (See *Noli me tangere.*)

LUXATION. (See *Dislocation.*)

M.

MAMMA, REMOVAL OF. The operation of cutting away a diseased breast, is done nearly in the same manner as the removal of tumors in general, and is indicated whenever the part is affected with an incurable disease, which must admit, however, of being entirely removed with the knife. When the breast is affected with scirrhus, or ulcerated cancer, the imprudence of tampering with the disease cannot be too severely censured. Were the disorder unattended with a continual tendency to increase, some time might properly be dedicated to the trial of the internal remedies, and external applications, which have acquired any character for doing good in these unpromising cases. But, unfortunately, by endeavouring to cure the disease by medicine, we only afford time for it to increase in magnitude, and, at length, attain a condition, in which even the knife cannot be employed so as to take away the whole of the diseased parts. When the case is marked by the characteristic features of scirrhus, noticed in the article *Cancer*, the sooner the tumor is cut out, the better. There are also some malignant kinds of sarcoma, to which the female breast is subject, (as will be explained in the article *Tumor*,) which cannot be removed at too early a period after their nature is suspected, or known. Indeed, though there is not equal urgency for the operation when the tumor is only an indolent, simple, fatty, hydatid, or scarcomatous disease, yet as all these tumors are continually growing larger, and little success attends the attempt to disperse them, the practitioner should never devote much time to the trial of unavailing medicines and applications, and let the swelling attain a size, which would require a formidable operation for its excision. Besides, many simple, fleshy, indolent tumors, are accompanied with a certain degree of hazard of changing into very malignant forms of disease.

With respect to what Sir A. Cooper calls the *hydatid*, or *encysted swelling of the breast*, he describes two forms of it; one containing a fluid like serum, in cells; the other being a globular hydatid, such as is found in the liver and other parts. In the beginning, the disease has a solid feel, and cannot then be discriminated from chronic inflammation of the breast. The part is painful only just before the period of the menses. After a time, a part of the swelling feels as if it contained fluid, while the rest continues firm. The skin is quite free from discoloration, except immediately before it begins to ulcerate. The constitution suffers no particular disturbance, except when ulceration commences, and then it is only slight. Sir A. Cooper has never seen an instance of this disease being cured by a natural process; it remains for months and years; the cysts breaking one after another, and the breast wasting, till little of it remains. He has seen more cases of this complaint between the ages of 15 and 25, than at other periods of life; but he has also sometimes met with it in older subjects, and one case in an individual more than 60. The disease sometimes acquires an extraordinary magnitude. It never requires to be removed on account of any malignancy in its character; but the operation is done to relieve the patient from its inconvenience, and to satisfy her mind. When the cyst has been single, Sir A. Cooper has sometimes let out the fluid with a lancet, and the adhesive and suppurative inflammation, thus excited, has terminated in a cure. (See *Lancet, Vol.* 2, *p.* 368—370.)

Besides this hydatid swelling of the breast, and scirrhus and fungus hæmatodes, (see *Cancer* and *Fungus*,) Sir A. Cooper notices in his lectures the case named *simple chronic tumor of the breast*. It is generally met with in very young persons, of healthy appearance; is exceedingly moveable, more diffused in the surrounding substance, than scirrhus, and has a lobulated feel, like that of a fatty swelling. He affirms, that it is a disease, which never becomes cancerous, though it may attain a large size, and be attended with pain at the period of menstruation. Its ordinary size is from that of a filbert to that of a billiard-ball. It does not admit of being dispersed by medicine, but can easily be taken away by incision. (See *Vol. cit. p.* 413.)

The same excellent surgeon has also described another form of disease, which he calls the irritable tumor of the breast. It occurs in persons aged from 15 to 25, a period of life scarcely liable to cancer; the part is so extremely sensible, that the patient starts on its being touched, and, although it is commonly painful, yet, just before the time of the menses, the agony from it is almost incredible, the pain extending from the breast to the arm down to the fingers' ends, and even sometimes affecting the sight. The removal of the breast, on account of this affection, is alleged by Sir A. Cooper to be completely unnecessary, and the treatment recommended by him, consists in endeavouring to restore menstruation. He prescribes with this view an ounce and a half of the tinct. ferri comp., or from two to five grains of the ferrum ammoniatum, to be taken two or three times a day. Of the utility of leeches, in this kind of case, he entertains doubts. (See *Vol. cit. p.* 405.)

It cannot be denied, that there are many swellings and indurations of the breast, which it would be highly injudicious and unnecessary to extirpate, because they generally admit of being discussed. Such are many tumors, which are called *scrophulous*, from their affecting patients of this peculiar constitution, cases in which the trial of iodine internally and externally, may very properly be made. (See *Iodine.*) Such are nearly all those indurations, which remain after a sudden and general inflammatory enlargement of the mamma; such are most other tumors, which acquire their full size in a few days, attended with pain, redness, &c.; and, of this kind, also, are the hardnesses in the breast, occasioned by the mammary abscess.

In the removal of all malignant or cancerous tumors, their nature makes it necessary to observe one important caution in the operation, viz. not to rest satisfied with cutting away the tumors just at their circumference; but to take away also a considerable portion of the substance, in which they lie, and with which they are surrounded. In cutting out a cancerous breast, if the operator were to be content with merely dissecting out the disease, just where his eyes and fingers might equally lead him to suppose its boundary to be situated, there would still be left behind white diseased bands, which radiate from the tumor into the surrounding fat, and which would inevitably occasion a relapse. In a vast proportion of the cases also, in which cancer of the breast unfortunately recurs after the operation, it is found, that the skin is the part, in which the disease makes its reappearance. Hence the great prudence of taking away a good deal of it in every case suspected to be a truly scirrhous or cancerous disease. This may also be done so as not to prevent the important objects of uniting the wound by the first intention, and covering the whole of its surface with sound integuments. So frequently does cancer recur in the nipple, whenever it does recur any where, that many of the best modern operators always make a point of removing this part in every instance, in which it is judged expedient to take away any portion of the skin at all. The surgeon, indeed, would be inexcusable, were he to neglect to take away such portion of the integuments covering scirrhous tumours as is evidently affected, appearing to be discoloured, puckered, and closely-attached to the diseased lump beneath. Nor should any gland in the axilla, at all diseased, nor any fibres of the pectoral muscle, in the same state, be ever left behind. There is no doubt, that nothing has stamped operations for cancers with disrepute, so much as the neglect to make a free removal of the skin, and parts surrounding every side of the tumor. Hence, the disease has frequently appeared to recur, when, in fact, it has never been thoroughly extirpated; the disease, though perhaps a local affection, has been deemed a constitutional one; and the operation frequently rejected as ineffectual and useless.

But, strongly as I have urged the prudence, the necessity, of making a free removal of the skin covering, and of the parts surrounding, every cancerous or malignant tumor, the same plan may certainly be regarded as unnecessary, and, therefore, unscientific, in most operations, for the removal of simple, fatty, fleshy, or encysted tumors, to which the breast, and almost every other part, is liable. However, even in the latter cases, when the swelling is very large, it is better to take away a portion of skin; for, otherwise, after the excision of the tumor, there would be a redundance of integuments, the cavity of which would only serve for the lodgment of matter. The loose superfluous skin also would lie in folds, and not apply itself evenly to the parts beneath, so as to unite favourably by the first intention; nor could the line of the cicatrix itself be arranged with such nice evenness as it might be, were a part of the redundant skin taken away at the time of operating.

The best method of removing a diseased breast is as follows: The patient is usually placed in a sitting posture, well supported by pillows and assistants; but the operator will find it equally convenient, if not more so, to remove the tumor while his patient is in a recumbent position; and this posture is best whenever the operation is likely to be long, or much blood to be lost, which circumstances are very apt to bring on fainting. I remember, that Mr. Abernethy, in his lectures, used to recommend the latter plan; which, however, without the sanction of any great name, or authority, possesses such obvious advantages, as will always entitle it to approbation.

The arms should be confined back, by placing a stick between them and the body, by which means, the fibres of the great pectoral muscle will be kept on the stretch, a state most favourable for the dissection of the tumor off its surface. The stick also prevents the patient from moving her arm about, and interrupting the progress of operation.

When the tumor is not large, and only a simple sarcoma, free from malignancy, it will be quite unnecessary to remove any of the skin, and of course, this need only be divided by one incision, of a length proportionate to the tumor. The cut must be made with a common dissecting knife; and as the division of the parts is chiefly accomplished with the part of the edge towards the point, the instrument will be found to do its office best when the extremity of the edge is made of a convex shape, and this part of the blade is turned a little back, in the way in which dissecting knives are now often constructed. The direction of the incision through the skin should be made according to the greatest diameter of the tumor to be removed, by which means it will be most easily dissected out.

The direction of the incision is various with different practitioners; some making it perpendicular, others transverse. In general, the shape of the tumor must determine which is the best. In France, it has been said, that when the incision follows the second direction, it heals more expeditiously, because the skin is more extensible from above downward, than laterally, particularly towards the sternum, and consequently allows the sides of the wound the more readily to be placed in contact; and that the action of the pectoral muscle tends to separate the edges of the wound when it is perpendicular. On the other hand, it is allowed, that the wound, made in the latter manner, is the most favourable for the escape of the discharge, if suppuration should occur. (See *Œuvres de Desault par Bichat, p.* 312, *T.* 2.)

The cut through the skin should always be somewhat longer than the tumor; and as it is, perhaps, the most painful part of the operation, and one attended with no danger whatever, it should be executed with the utmost celerity, pain being more or less dreaded, according to its duration, as well as its degree. The fear, however, of giving pain, has probably led many operators to err, in not making their first incision through the integuments large enough, the consequence of which has often been, that there was not sufficient room for the dissection of the tumor with facility; the patient has been kept nearly an hour in the operating room, instead of five minutes, and the surgeon censured by the spectators, as awkward and tedious. It is clear, also, that, besides the great deal more blood lost, from this error, than would otherwise happen, the vessels being commonly not tied till all the cutting is finished, the avoidance of pain, that fear, which led to the blunder, is not effected, and the patient suffers much more, and for a much longer time, in consequence of the embarrassment and obstacles in the way of the whole operation.

When the disease is of a scirrhous or malignant nature, the skin covering the tumor should, at all events, be in part removed. As I have said before, all that portion which is discoloured, puckered, tuberculated, or otherwise altered, should be taken away. Some must also be removed, in order to prevent a redundance, in all cases in which the tumor is large. We have said too, that in cases of scirrhus and cancer of the breast, the nipple is considered a dangerous part to be left behind. For the purpose of removing the necessary portion of skin, the surgeon must obviously pursue a different mode from that above described; and, instead of one straight incision, he is to make two semicircular cuts, one immediately after the other, and which are to meet at their extremities. The size of these wounds must be determined by that of the disease to be removed, and by the quantity of skin, which it is deemed prudent to take away; for the part, which is included in the two semicircular cuts, is that which is not to be separated from the upper surface of the swelling, but taken away with it. The shape of the two cuts together may approach that either of a circle or oval, as the figure of the tumor itself may indicate, as most convenient. The direction of the incisions is to be regulated by the same consideration.

In the above ways, the first division of the integuments is to be made in removing tumors of every description, covered with skin. The same principles and practice should prevail in all these operations; and whether the swelling be the mamma, or any other diseased mass, whether situated on the chest, the back, the head, or extremities, the same considerations should always guide the operator's hand.

The incision, or incisions, in the skin having been made, the next object is to detach every side of the tumor from its connexions, and the separation of its base will then be the last and only thing remaining to be done. When the tumor is a scirrhous, or other malignant disease, the operator must not dissect close to the swelling, but make his incisions on each side, at a prudent distance from it, so as to be sure to remove, with the diseased mass, every atom of morbid mischief in its vicinity. But when the tumor is only a mere fatty, or other mass, perfectly free from malignancy, the cellular bands and vessels forming its connexions, may be divided close to its circumference. It is astonishing with what ease fatty tumors are removed, after the necessary division is made in the skin; they may almost be turned out, with the fingers, without any cutting at all. When they have been inflamed, however, they are then more adherent to the surrounding parts.

Thus we see, that the first stage of operation of removing a tumor, is the division of the skin; the second, the separation of the swelling from the surrounding parts on every side; the third and last stage is the division of the parts to which its under surface, or base, is attached. The latter object should be accomplished by cutting regularly from above downward, till every part is divided.

It is a common thing to see many operators constantly embarrassed and confused, whenever they have to remove a large tumor, on account of their having no particular method in their proceedings. They first cut a few fibres on one side; then on another: and, turning the mass of disease now to this side, now to that, without any fixed design, they both prolong the operation very tediously, and present to the bystanders a complete specimen of surgical awkwardness. On the contrary, when the practitioner divides the cutting part of the operation into the three methodical stages, above recommended, in each of which there is a distinct object to be fulfilled, he proceeds with a confidence of knowing what he is about, and soon effects what is to be done, with equal expedition and adroitness.

Having taken out the tumor, the operator is immediately to tie such large vessels as may be pouring out their blood; indeed, when the removal of the swelling will necessarily occupy more than three or four minutes, it is better to tie all the large arteries as soon as they are divided, and then proceed with their dissection. This was the celebrated Desault's plan, and it is highly deserving of imitation in this country, not only because many subjects cannot afford to lose much blood, but also because the profuse effusion of this fluid keeps the operator from seeing what parts he is dividing.

The largest arteries being tied, the surgeon should not be immediately solicitous about tying every bleeding point which may be observed. Instead of this, let him employ a little while in examining every part of the surface of the wound, in order to ascertain that no portion of the swelling, no hardened lump, nor diseased fibres remain behind. Even if any part of the surface of the pectoral muscle should present a morbid feel, or appearance, it must, on every account, be cut away. Also, if any of the axillary glands are diseased, the operator should now proceed to remove them. After the time spent in such measures, many of the small vessels, which bled just after the excision of the swelling, will now have stopped, the necessity for several ligatures will be done away, and, of course, the patient saved a great deal of pain, and more of the wound be likely to heal by the first intention.

Some information may be derived, respecting whether any of the tumor is left behind, by examining its surfaces, when taken out, and observing whether any part of them is cut off; for, if it is, it may always be found in the corresponding part of the wound.

The axillary glands may invariably be taken out, without the least risk, if the plan pursued by Desault in France, and the late Sir Charles Blicke, and other eminent surgeons in this country, be adopted. The method alluded to, is, after dividing the skin covering the gland, and freeing the indurated part from its lateral connexions, to tie its root, or base, by which it is connected with the parts on the side towards the cavity of the axilla. Then the indurated gland itself may be safely cut off, just above the ligature. Were the gland cut off in the first instance, the artery which supplies it with blood would be exceedingly difficult to tie, on account of its deep situation; and by reason of its shortness and vicinity to the heart, it would bleed almost like a wound of the thoracic artery itself. In this way, there is also not the least hazard of injuring the latter vessel.

It would be a great improvement in the mode of operating for the removal of these glands, if surgeons were always to make the patient lie down, with the arm placed in such a position as would let the light fall into the axilla. How much the steps of the operation would be facilitated in this way, I need not attempt to explain.

The above directions will enable a surgeon to remove tumors in general. They apply also in a great measure to *encysted tumors*; but, a few particular rules how to operate in the latter cases, will be found in the article *Tumors*. One half of each ligature is always to be cut off before dressing the wound. The edges of the incision are to be brought together with strips of adhesive plaster; and, before this can be done with ease, the stick confining the arm back must be removed, and the os brachii brought forward, so as to relax the pectoral muscle, and integuments of the breast. No sutures should ever be employed, as they are useless, painful, and irritating. The wound being closed with sticking plaster, and a pledget of simple cerate, a compress of folded linen, or flannel, may be put over the dressings; these are to be secured with a broad piece of linen, which is to encircle the chest, be fastened with pins, or stitches, and kept from slipping down by two tapes, one of which is to go from behind forward, over each shoulder, and be stitched to the upper part of the bandage, both in front and behind. The arm on the same side as that, on which the operation has been done, should be kept perfectly motionless in a sling; for, every motion of the limb must evidently disturb the wound, by putting the great pectoral muscle into action, or rendering its fibres sometimes tense, sometimes relaxed. It is scarcely necessary to say, that, after so considerable an operation as the removal of a large breast, or any other tumor of magnitude, the patient should be given about thirty drops of the tinctura opii. A smaller dose always creates restlessness, head-ach, and fever, after operations, instead of having the desired effect.

Here it becomes me to state, that as I could not find, in any surgical book, with which I am acquainted, what I conceived to be a proper description of the mode of removing a diseased breast, and tumors in general, the foregoing remarks are given chiefly on my own authority. Whether they are just, or not, must be decided by the profession.

The removal of a diseased breast rarely proves fatal of itself, unless the parts cut away extend to a considerable depth, and occupy a very large space, or the patient is much reduced before the operation. However, I have known one or two patients in St. Bartholomew's Hospital die, without any very apparent cause, very soon after its operation; and Schmucker has recorded an instance, in which the operation was followed by tetanus. (*Wahrnehmungen, B. 2, p.* 80.)

With respect to the average success, following the removal of cancerous diseases, this is a topic, which has been noticed in the article *Cancer*. The statement lately made by Baron Boyer is exceedingly unfavourable; for, in one hundred cases, in which he has removed the diseased parts, only four or five of the patients continued radically cured. (*Traité des Mal. Chir. T.* 7, *p.* 257, *8vo. Paris*, 1821.)

The principal writers on the removal of the mamma are, Garengeot, Dionis, Le Dran, Bertrandi, Sharp, and Sabatier, in their respective treatises on the operations. B. Bell, Latta, &c. have also treated on the subject in their Systems of Surgery; and there is a memoir *Sur l'Operation du Cancer au Sein*, in *Les Œuvres de Desault par Bichat, T.* 2.

MAMMARY ABSCESS. *Milk abscess.* With regard to inflammations of the mamma, as my friend, Mr. James, has observed, there is "either simple phlegmon, or mammary abscess, which, as it depends upon a peculiarity of state and function, ought to stand alone. Mr. Hey also describes a deep-seated abscess, to which this gland is liable, of rather a chronic character, and is the same, perhaps, as that which Dr. Kirkland has described as the encysted. Dr. K. describes also two others, under the titles of chronic and encysted." Certain cases, most frequently occurring in unmarried females, and having very little tendency to suppuration, Mr. James suspects, are the result of inflammation of the glandular part of the breast from disorder in the digestive organs, uterine system, or both. (*On Inflammation, p.* 171.)

Women who suckle are particularly subject to inflammation and suppuration in the breast. The part enlarges, becomes tense, heavy, and painful. The integuments of the breast sometimes assume a uniform redness; sometimes they are only red in particular places. The inflammation may affect the mammary gland itself, or be confined to the skin and surrounding cellular substance. In the latter case, the inflamed part is equally tense; but, when the glandular structure of the breast is also affected, the enlargement is irregular, and seems to consist of one or more large tumors, situated in the substance of the part. The pain often extends to the axillary glands. The secretion of the milk is not always suppressed, when the inflammation is confined to the integuments, and suppuration is said to come on more quickly, than in the affections of the mammary gland itself. When the symptoms of inflammation continue to increase for four or five days, suppuration may be expected; unless the progress of the inflammation be slow, and its degree moderate, in which circumstances, resolution may often be obtained, even as late as a fortnight after the first attack. Inflammations of the breast are almost always attended with sympathetic inflammatory fever. (See *Fevers.*)

Women are most liable to mammary abscesses within the first three months after parturition; but they are also very much exposed to the disorder as long as they continue to suckle.

The most common causes of mammary abscess, as enumerated by writers in general, are, repressing the secretion of milk at an early period, mental disturbance, fright, &c.; exposure to cold, moving the arms too much while the breasts are very large and distended, bruises, and other external injuries. The causes are not always obvious.

The matter is sometimes contained in one cyst, or cavity; sometimes in several; but the abscess generally breaks near the nipple.

As all inflammations of the mamma are attended with considerable induration, these cases should be carefully distinguished from other swellings of a more incurable kind. It is said, that scrophulous tumors of the mamma, which have existed a long while, often disappear after the occurrence of a milk abscess. Women who have never been pregnant are sometimes affected with suppuration in the breast, supposed by Mr. James, of Exeter, to be connected with uterine, or gastric disorder. Even men are said to be liable to similar complaints.

In the early period of the affection, resolution should be attempted. The following are the principal means for this purpose :—topical bloodletting, saline purges, low diet, keeping the inflamed breast from hanging down, gentle friction of the breast, with a soft sponge, wet with some warm emollient liquor; having the milk tenderly sucked out at proper intervals; saturnine applications, or lotions, containing the muriate of ammonia.

When matter cannot be prevented from forming, an emollient poultice is the best application, and the abscess should in general be allowed to break of itself, unless of a somewhat chronic nature, in which case, it should be opened in a depending part with a lancet. Sinuses sometimes form, in consequence of abscesses in the breast, and will not heal till freely opened with a director and curved bistoury. When the cavity of the abscess begins to fill up with granulations, the poultice may be left off, and superficial dressings applied.

The indurations, often remaining in the breast, in consequence of acute inflammation and abscesses, generally yield to frictions with camphorated mercurial ointment, the application of a piece of soap plaster, and the exhibition of calomel, cicuta, and other alteratives.

Sometimes, when the swelling is opened, a considerable quantity of milk is discharged: in this case, Sir A. Cooper recommends a sponge tent to be introduced into the puncture, by which means the adhesive inflammation and obliteration of the cavity will be produced. (See *Lancet, Vol.* 2, *p.* 406.)

Mr. Hey describes a very deep-seated abscess of the breast, not of frequent occurrence, and not confined to pregnant nor suckling women. Its situation renders all superficial applications ineffectual. The inflammatory stage is tedious; and when the matter has made its way outward, the discharge continues, and there is no tendency to healing. Sometimes the matter lodges behind the mamma, as well as in the substance of the gland, and breaks out in different places, the intermediate parts of the breast feeling as if affected with a scirrhous hardness. Numerous sinuses run in different directions, and, when opened, a soft purple fungus appears within them. The disease goes on in this state, for a long while, keeping up hectic symptoms.

Mr. Hey's practice is to trace the course of all the numerous sinuses, and lay them open, and, unless this be done, with respect to every one of them, the cure cannot be accomplished. If he finds any two sinuses running in such directions, that when fully opened, they leave a small part of the mamma in a pendulous state, he removes such part entirely. As the sinuses are filled with fungus, their continuations present no visible cavity, and can only be detected by the greater softness of parts of the wound, where, on breaking down the fungus, the orifice of the collateral sinus may be found. Mr. Hey has found, that, even in the most unfavourable subjects, the wounds heal quickly, and the natural shape of the breast is preserved.

Pearson's Principles, chap. 3. *Hey's Practical Observations, p.* 504. *Kirkland has also treated of several kinds of abscesses of the breast in his Inquiry into the present State of Medical Surgery, Vol.* 2, *p.* 161. *Callisen, Systema Chirurgiæ Hodiernæ, Vol.* 1, *p.* 332. *Gibbons, De Mulierum Mammis et Morbis quibus obnoxiæ sunt, 8vo. Edinb.* 1775. *J. Clubbe, Treatise on the Inflammation of the Breasts peculiar to Lying-in Women, &c. 8vo. Ipswich,* 1799. *M. Underwood,* Treatise *upon Ulcers, &c., and on the Mammary Abscess, &c. 8vo. Lond.* 1783. *J. H. James, on the Principles of Inflammation, p.* 171, *8vo. Lond.* 1821. *Boyer, Traité des Mal. Chir. T.* 7, *p.* 211, *&c. 8vo. Paris,* 1821. *Richter's Anfangsgr. der Wundarzn. B.* 4, *c.* 16.

MELICERIS. (from μελι, honey, and κηρος, wax.) A tumor of the encysted kind, filled with a substance resembling wax, or honey, in consistence. (See *Tumors, Encysted.*)

MENINGOPHYLAX. (from μηνιγξ, a membrane, and φυλασσω, to guard.) An instrument, used by the ancients for guarding the dura mater and brain from injury, in their mode of trepanning. It seems to have been something like the lenticular, only its blade was completely round, without an edge. It ended in a lentiform cup, like the latter. (*Encyclopedie Méthodique, Partie Chirurgicale.*) Pott gives an engraving of a meningophylax, which resembles a common elevator. (See *Vol.* 1 *of his Works.*)

MERCURY. (*Quicksilver, Mercurius, Hydrargyrus.*) The medicinal virtues of this mineral were almost totally unknown to the ancients, who considered it as a poison. It was first employed for purposes of medicine by the Arabians, who made use of it in the form of ointments for the cure of certain diseases of the skin and the killing of vermin. In modern times, mercury is one of the most important articles of the materia medica; and perhaps, though recent investigations will not strictly allow it to be regarded as a specific for the venereal disease, which may be cured by other means, or sometimes even spontaneously, while mercury, so far from being always a certain cure, is sometimes highly detrimental, yet notwithstanding these facts, mercury still retains the character of being generally the most expeditious means of relief. The possibility of curing the venereal disease without mercury, by no means establishes the propriety of abandoning this remedy, any more than its unfitness for certain states of the same disease ought to be a reason for not availing ourselves of its superior utility in others.

Mercury, taken into the stomach in its metallic state, has no action on the body, except what arises from its weight or bulk. It is not poisonous, as was vulgarly supposed, but perfectly inert. But, in its various states of combination, it produces certain sensible effects. It is a powerful and general stimulant, quickening the circulation, and increasing all the secretions and excretions. According to circumstances, the habit of the patient, the temperature in which he is kept, the nature of the preparation, and the quantity in which it is exhibited, its effects are, indeed, various. Sometimes, it more particularly increases one secretion; sometimes another; but its most characteristic effect is the increased flow of saliva, which it generally excites, if given in sufficient quantity. (*Edinb. Dispensatory.*)

From the writings of Theodoric, it appears, that mercury was employed in the practice of medicine and surgery as early as the 13th century. But, its use in venereal cases was first mentioned in a tract by Almenar, published in 1516. (See *Thompson's Dispensatory, p.* 205, *Edit.* 2.)

It has been said, that the efficacy of mercury in curing the venereal disease was an accidental discovery; but it seems more probable, that the good effects, which it produced in cutaneous diseases, first led to the trial of it in venereal cases, which, being frequently attended with eruptions, ulcers, &c., seemed to present an analogy to the affections, in which mercury had already been found successful.

In the times, immediately following the supposed origin of the venereal disease, practitioners only ventured to employ this remedy with timorous caution, so that, of several of their formulæ, mercury scarcely composed a fourteenth part, and either on this account, or some difference in the disease itself at that period from what is now remarked, few cures were effected. On the other hand, the empirics, who noticed the little efficacy of these small doses, ran into the opposite extreme, and exhibited mercury in quantities so large, and with so little care, that most of their patients were suddenly attacked with violent salivations, frequently attended with very dangerous, and even fatal symptoms; or such as after making them lose their teeth, left them pale, emaciated, exhausted, and subject, for the rest of their lives, to tremblings, or other more or less dangerous affections. From these two very opposite modes of practice, there originated such uncertainty, respecting what could be expected from mercury, and such fears of the consequences, which might result from its employment, that every plan was eagerly adopted, which offered the least chance of cure, without having recourse to this mineral.

A medicine, however, so powerful, and whose salutary effects had been watched by attentive practitioners amidst all its inconveniences, could not sink into oblivion. After efforts had been made to discover an equally efficacious substitute for it, and it had been seen, how inferior other means were, on which the highest praises had been lavished, the attempts to extend its utility were renewed. A medium was pursued, between the too timid methods of those physicians, who had first administered it, and the inconsiderate boldness of empirics. Thus the causes, from which both parties failed, were avoided; the character of the medicine was revived in a more durable way, and from this period, its reputation has always been maintained.

The renowned Paracelsus first taught practitioners, that mercury might be given internally with safety; for, before he set the example, it had only been externally employed, in three manners. The first was in the form of an ointment or linament; the second, as a plaster; and the third, as a fumigation.

The basis of the ointment, or linament, was quicksilver, which was blended, by means of trituration, with hog's lard, goose's fat, &c. and composed scarcely one-sixth or one-eighth of the whole; a proportion, however, much greater, than what had been at first employed. But from a fear, that the mineral might prove hurtful to the nerves, by the cold property, which they fancied it to possess, and that it might occasion numbness, tremblings, or palsies, they combined with it a multitude of ingredients of a warm, aromatic nature, or supposed to possess such; for example, oil of camomile, sesame-seeds, aniseeds, the roots of zedoary, the florentine iris, and a thousand other substances, which were incorporated with the ointment. The members, joints, and the whole of the body, except the head, belly, and chest, were rubbed with this composition; and the frictions were repeated, at suitable intervals, until obvious signs of salivation appeared.

The ingredients of the plasters resembled those of the ointments; only they contained less fat, for which was substituted a sufficient quantity of wax, to give them a proper consistence. This composition was applied to the skin, and the whole body was covered with it, excepting the parts, on which it was not usual to put ointment. The plasters were kept on, till salivation began.

The fumigations were made with quicksilver, triturated with turpentine, or saliva, or else with cinnabar. These substances were mixed with fatty, or resinous ones, such as myrrh, nutmeg, &c., and, all the ingredients being reduced to powder, were made into a paste, with a sufficient quantity of turpentine, or gum tragacanth. The patient was then placed in a box made on purpose, or under a little kind of tent, out of which the head was generally allowed to protrude. A chafing-dish, containing burning coals, was placed near his feet, and, every now and then, bits of mercurial paste were thrown into the vessel. The patient was left exposed to the fumes, which arose, until he broke out into a profuse perspiration, which they took great pains to keep up and increase, by putting him into a warm bed, loading him with bedding, for about two hours, after which he was rubbed quite dry, and given some food. This plan was persisted in every day, till a salivation was produced, which was kept up as long as necessary. The method of fumigation is described by Astruc, and particular preparations, and apparatuses for the purpose, have been since recommended by Lalonette in France, and, more recently, by Abernethy in England.

Of the three methods, which have just been described, only the first is at present much in use, and even this is considerably altered. It was found, not only, that mercurial plasters caused heat, redness, itching, and disagreeable eruptions, but, that the method was exceedingly slow and uncertain. Hence, plasters are now only used as topical discutient applications.

Fumigations, considered as the only means of cure, fell also into discredit, because, although they formed a method of applying mercury in a very active manner, they were, as anciently managed, liable to several objections. In this way, it was next to impossible to regulate the quantity of mercury used, which varied according to the greater, or lesser activity of the fire, the position of the patient, and other circumstances. The effect of the vapour on the organs of respiration also frequently proved very oppressive; and mercury, applied in the way of fumigation, more frequently occasioned tremblings, palsies, &c. than in any other manner. In Mr. Abernethy's mode, however, fumigation is, under certain circumstances, not only an eligible, but, the very best, way of affecting the constitution.

Frictions with ointment have always been regarded as the most efficacious. They have undergone considerable change, and by being rendered more simple, have been greatly perfected. All the warm aromatic substances have been retrenched from the ointment, not only as useless, but as irritating and inflaming to the skin. In modern times, the proportion of mercury to the fat has also been very much increased.

GENERAL REMARKS ON THE ADMINISTRATION OF MERCURY, ITS OCCASIONAL CONSEQUENCES, &c.

With regard to the preparations of the medicine, and the modes of applying it, we are to consider two things; first, the preparation and mode attended with the least trouble, or inconvenience, to the patient; and secondly, the preparation, and mode of administering it, that most readily conveys the necessary quantity into the constitution. Mercury is carried into the constitution in the same way as other substances, either by being absorbed from the surface of the body, or that of the alimentary canal. It cannot, however, in all cases, be taken into the constitution in both ways; for, sometimes the absorbents of the skin will not readily receive it, at least, no effect is produced, either on the disease, or constitution, from this mode of application. In this circumstance, mercury must be given by the mouth, although the plan may be very improper in other respects, and often inconvenient. On the other hand, the internal absorbents sometimes will not take up the medicine, or, at least, no effect is produced on the disease, or the constitution.

In such cases, all the different preparations of the medicine should be tried; for sometimes one succeeds, when another will not. In some cases, mercury seems to have no effect, either applied outwardly, or taken into the stomach. Many surfaces seem to absorb mercury better than others: such are probably all internal surfaces and sores. Thirty grains of calomel, rubbed in on the skin, have not more effect, than three, or four, taken by the mouth. Dressing small ulcers with red precipitate sometimes causes a salivation. (See *Hunter on the Venereal Disease*, *p.* 335, 336.)

Besides the practicableness of getting the medicine into the constitution in either way, it is proper to consider the easiest for the patient, each mode having its convenience and inconvenience, depending on the nature of the parts, to which it is applied, or on certain situations of life at the time. Hence, it should be given in the way, most suitable to such circumstances.

In many, the bowels can hardly bear mercury at all, and it should then be given in the mildest form possible, conjoined with such medicines, as will lessen, or correct its violent local effects, although not its specific ones on the constitution.

When mercury can be thrown into the constitution with propriety by the external method, it is preferable to the internal plan, because the skin is not nearly so essential to life as the stomach, and, therefore, is capable in itself of bearing much more than the stomach. The constitution is also less injured. Many courses of mercury would kill the patient, if the medicine were only given internally, because it proves hurtful to the stomach and intestines, when given in any form, or joined with the greatest correctors. Every one, however, has not opportunities of rubbing in mercury, and is therefore obliged, if possible, to take it by the mouth. (*Hunter*, *p.* 338.)

Mercury has two effects: one as a stimulus on the constitution and particular parts; the other as a specific against a diseased action of the whole body, or of parts. The latter action can only be computed by the disease disappearing.

When mercury is given in venereal cases, the first attention should be to the quantity, and its visible effects in a given time, which, when brought to a proper pitch, are only to be kept up, and the decline of the disease to be watched; for by this we judge of the invisible, or specific effects of the medicine, and know what variation in the quantity may be necessary. The visible effects of mercury affect, either the whole constitution, or some parts capable of secretion. In the first, it produces universal irritability, making it more susceptible of all impressions. It quickens the pulse, increases its hardness, and occasions a kind of temporary fever. In some constitutions, it operates like a poison; while, in others, it produces a kind of hectic fever, that is, a small quick pulse, loss of appetite, restlessness, want of sleep, and a sallow complexion, with a number of consequent symptoms; but, such effects commonly diminish, on the patient becoming a little accustomed to the medicine. Mercury often produces pains like those of rheumatism, and nodes of a scrophulous nature. (*Hunter*, *p.* 339, 340.)

The quantity of mercury to be thrown into the constitution, for the cure of any venereal complaint, must be proportioned to the violence of the disease. However, we are to be guided by two circumstances, namely, the time, in which any given quantity is to be thrown in, and the effects it has on some parts of the body, as the salivary glands, skin, or intestines. For, mercury may be thrown into the same constitution in very different quantities, so as to produce the same ultimate effect; but, the two very different quantities must also be in different times; for instance, one ounce of mercurial ointment, used in two days, will have more effect upon the constitution, than two ounces used in ten. The effects of one ounce, used in two days, on the constitution and diseased parts, are considerable. A small quantity, used quickly, will have equal effects, to those of a large one employed slowly; but, if these effects are principally local, that is, upon the glands of the mouth, the constitution at large not being equally stimulated, the effect upon the diseased parts must be less, which may be known by the local disease not giving way in proportion to the effects of mercury on some particular part. If it is given in very small quantities, and increased gradually, so as to steal insensibly on the constitution, a vast quantity at a time may at length be used, without any visible effect at all. (*Hunter*, *p.* 341.)

These circumstances being known, mercury becomes a much more efficacious, manageable, and safe medicine, than it was formerly thought to be; but, unluckily, its visible effects upon the mouth and the intestines are sometimes much more violent, than its general effect upon the constitution at large. These parts must therefore not be stimulated so quickly, as to hinder the necessary quantity of mercury from being used.

The constitution, or parts, are more susceptible of mercury at first, than afterwards. If the mouth is made sore, and allowed to recover, a much greater quantity may be thrown in, a second time, before the same soreness is produced. However, anomalous cases occur, in which, from unknown causes, mercury cannot at one time be made to produce any visible effects; but, afterwards, the mouth and intestines are all at once affected. (*Hunter*, *p.* 342.)

Mercury occasionally attacks the bowels, and causes violent purging, even of blood. This effect is remedied by discontinuing the use of the medicine, and exhibiting opium. At other times, it is suddenly determined to the mouth, and produces inflammation, ulceration, and an excessive flow of saliva. To obtain relief in this circumstance, purgatives, nitre, sulphur, gum-arabic, lime-water, camphor, bark, the sulphuret of potash, blisters, &c. have been advised. Mr. Pearson, however, does not seem to place much confidence in the efficacy of such means, and the mercury being discontinued for a time, he recommends the patient to be freely exposed to a dry cold air, with the occasional use of cathartics, peruvian bark, and mineral acids, and the assiduous application of astringent gargles. "The most material objection, (says Mr. Pearson,) which I foresee against the method of treatment I have recommended, is the hazard, to which the patient will be exposed, of having the saliva suddenly checked, and of suffering some other disease in consequence of it."

That the hasty suppression of a ptyalism may be followed by serious inconveniences, has been proved by Dr. Silvester, (*Med. Obs. and Inq. Vol.* 3,) who published the cases of three persons, who had been under his own care; two of whom were afflicted with violent pains; and the third scarcely retained any food in her stomach for the space of three months. I have seen not only pains, but even general convulsions, produced from the same cause. But, this singular kind of metastasis of the mercurial irritation does not appear to me to owe its appearance to simple exposure to cold and dry air; because, I have known it occur in different forms, where patients continued to breathe a warm atmosphere, but used a bath, the water of which was not sufficiently heated. Cold liquids, taken in a large quantity into the stomach, or exposure of the body to cold and moisture, will also prove extremely injurious to those, who are fully under the influence of mercury; whereas breathing a cool air, while the body is properly covered with apparel, has certainly no tendency to produce any distressing, or dangerous consequences.

"If, however, a suppression of the ptyalism should be occasioned by any act of indiscretion, the remedy is easy and certain; it consists only in the quick introduction of mercury into the body, so as to produce a soreness of the gums, with the occasional use of a hot bath." (*Pearson on the Effect of various Articles in the Cure of Lues Venerea, Edit.* 2, *p.* 163, 164.)

Mercury, when it falls on the mouth, produces, in many constitutions, violent inflammation, which sometimes terminates in mortification. In these habits, great caution is necessary. The ordinary operation of mercury does not permanently injure the constitution; but, occasionally, the impairment is very material; *mercury may even produce local disease, and retard the cure of chancres, buboes, and certain effects of the lues venerea, after the poison has been destroyed.* (*Hunter*, *p.* 342.)

From mercury occasionally acting on the system, as a poison, quite unconnected with its agency as a remedy, and neither proportionate to the inflammation of the mouth, nor the actual quantity of the mineral absorbed, Mr. Pearson noticed that one or two patients in general died suddenly every year in the Lock Hospital. The morbid state of the system, which tends to the fatal event, during a mercurial course, is named by Mr. Pearson *erethismus*, and is characterized by great depression of strength, a sense of anxiety about the præcordia, irregular action of the heart, frequent sighing, trembling, a small, quick, and sometimes an intermitting pulse, occasional vomiting, a pale contracted countenance, a sense of coldness; but the tongue is seldom furred, and neither the vital, nor natural functions, are much disordered. They, who die suddenly of the mercurial erethismus, have frequently been making some little exertion just before. To prevent the dangerous consequences of this state of the system, the use of mercury must be discontinued, whatever may be the stage, extent, or violence of the venereal symptoms. The patient should be directed to expose himself freely to a dry and cool air, in such a manner, as shall be attended with the least fatigue, and he should have a generous diet. In this manner, patients often recover sufficiently in ten, or fourteen days, to resume the use of mercury with safety. In the early stage, the mercurial erethismus may often be averted by leaving off the mercury, and giving the mistura camphorata with large doses of ammonia. When the stomach is unaffected, sarsaparilla sometimes does good. (*Pearson*, *p.* 154, *&c.*)

Occasionally, the use of mercury brings on a peculiar eruption, which has received the several names of *hydrargyria*, *mercurial rash*, *eczema mercuriale*, *eczema rubrum*, *lepra mercurialis*, *mercurial disease*, and *erythema mercuriale*.

"Eruptions of various kinds are very common symptoms of syphilis, but a very unusual effect of mercury. Therefore, until the real nature of this erythema was lately discovered, whenever it occurred in patients undergoing a mercurial course for syphilitic complaints, it was naturally enough considered, as an anomalous form of lues venerea. The mercury was consequently pushed to a greater extent, in proportion to the violence of the symptoms, and, from the cause of the disease being thus unconsciously applied for its removal, it could not fail to be aggravated, and hurried on to a fatal termination. The observation of this fact, conjoined with another, of less frequent occurrence, namely, that a similar eruption did sometimes appear in patients using mercury for other complaints, and in whom no suspicion of syphilis could be entertained, at last led some judicious practitioners in Dublin to the important discovery, that the eruption was entirely an effect of mercury, and not at all connected with the original disease. This discovery was not published till 1804." (*M'Mullin in Edinburgh Medical and Surgical Journal, No.* 5.) Mr. Pearson states, however, that he has been acquainted with the disease ever since 1781, and has always described its history and treatment in his lectures, since 1783.

The eruption is attended with more or less indisposition, is not confined to either sex, or any particular constitution, and seems to be equally produced by mercury applied externally, and by any of its preparations taken inwardly. Mr. Pearson has never seen it in subjects above 50; and he says, its occurrence is more common about eight, or ten days after beginning a mercurial course. (*P.* 166.)

Dr. M'Mullin has described three distinct stages of the erythema mercuriale. "The first stage commences with languor, lassitude, and cold shiverings; these symptoms are succeeded by increased temperature of the body, quick pulse, nausea, head-ach, and thirst. The patient is troubled with a dry cough, and complains of difficult respiration, anxiety, and sense of stricture about the præcordia. The tongue is usually moist, and covered with a white glutinous slime: it sometimes appears clean, and brightly red in the centre, whilst the margins remain foul. The skin feels unusually hot and itchy, with a sense of prickling, not unlike the sensation experienced from the application of nettles. The belly is generally costive; but a diarrhœa is often produced by very slight causes.

"On the first, or second day, an eruption most commonly shows itself, the colour of which is either dark or bright red: the papulæ are at first distinct and elevated, resembling very much those in rubeola. Sometimes, but rarely, the eruption appears like urticaria, and in such instances the disease is observed to be very mild. The papulæ very speedily run together in such a manner as to form a suffused redness, which disappears on pressure. In most cases, it begins first on the scrotum, inside of the thighs, forearm, or where mercurial friction has been applied, and the integuments of the parts affected become much swoln. There have also been observed instances, where an eruption of a purplish colour, and unaccompanied by papulæ, has diffused itself suddenly over the entire body. This, however, may be considered as uncommon. In every instance, which came under my observation, it was confined at first to a few places, and from thence gradually extended, until the different portions of the eruption had united, and the papulæ were also rough to the feel. But in those cases, which resemble urticaria, a number of minute vesicles, which contain a serous fluid, appear, from the commencement, interspersed among the papulæ. Contrary to what happens in most diseases accompanied with cutaneous affections, the febrile symptoms are much aggravated, and continue to increase after the eruption has been completed. The pulse in general beats from 120 to 130 in a minute, the thirst continues urgent, and the pateint, extremely restless, seldom enjoys quiet sleep. When the eruption has continued in this manner for a certain period, the cuticle begins to peel off in thin, whitish, scurfy exfoliations, not unlike those observed in rubeola. This desquamation has not been attended to by Dr. Moriarty or Mr. Alley, if they have not, by giving the same name to the decrustation which occurs in the last stage, confounded both together. It commences in those places where the eruption first made its appearance, and in this order spreads to other parts. About this period the fauces become sore, the tongue swells, and the eyes appear somewhat inflamed.

"The duration of this stage is very various; sometimes it continues from ten to fourteen days, and, in other cases, it terminates in half that time. When the disease has appeared in its mildest form, the patient recovers immediately after the desquamation, a new cuticle having formed underneath; but, if severe, he has only experienced the smallest part of his sufferings, and the skin now assumes a new appearance, which I have considered as the second stage.

"The skin at this period appears as if studded with innumerable minute vesicles, which are filled with a pellucid fluid. These vesicles may be expected, if the patient, at the close of the first stage, complains of increased itching, and sense of burning heat, in those parts from which the cuticular exfoliations have fallen. They remain sometimes for a day or two, but are most commonly burst, immediately after their formation, by the patient rubbing them, in order to relieve the troublesome itchiness with which these parts are affected. They discharge a serous, acrimonious fluid, which possesses such a very disagreeable odour as to induce nausea in the patient himself, and those who approach near his bed-side. The odour is so peculiar, that it can easily be recognised by any person who has once experienced it.

"This fluid is poured out most copiously from the scrotum, groin, inside of the thighs, or wherever the skin forms folds, and sebaceous glands are most numerous. The serous discharge from these minute vesicles forms, with the cuticle, an incrustation, which may be considered as the third or last state.

"These crusts are generally very large, and, when detached, retain the figure of the parts from which they have fallen. Their colour is yellowish; but sometimes appears dark and dirty. This period of the disease might be termed, I think, with much propriety, the stage of *decrustation*, in order to distinguish it more fully, from the *desquamation*, which has been already noticed. From the use of the two last terms indiscriminately, those who have described the disease have introduced into their descriptions a degree of confusion which has caused its progress not to be well understood. When this stage appears, the fauces become more affected, the eyes intolerant of light, and the tarsi tender, inflamed, and sometimes inverted. The crusts formed on the face, as in other parts of the body, before falling off, divide asunder, so as to leave cracks and fissures, which produce a hideous expression of countenance; and the eyelids are also, from the general swelling of the face, completely closed. The back and hairy scalp are last affected, and even in very severe cases, these parts are sometimes observed to escape entirely. The patient, whilst in this state, is compelled to desist from every kind of motion, on account of the pain which he experiences on the slightest exertion, and which he describes as if his flesh were cracking. The crusts also fall off in such abundance, that the bed appears as if strewed with the cones of hops. Whilst the eruption is only making its appearance in one place, another part may have arrived at its most advanced form; so that all the different stages of the disease may be present at one time in the same individual. It is attended with typhus through its entire course; but it is very curious to observe, that the appetite for food, in most cases, remains unimpaired, and sometimes is even voracious. This circumstance was particularly remarkable in a patient who laboured under the disease, in its worst form, for the space of three months, in the Royal Infirmary of Edinburgh; for double the usual hospital allowance of food was scarcely sufficient to satisfy his hunger. When the catarrhal symptoms have continued during the progress of the complaint, they are, at this advanced period, particularly aggravated: the anxiety and pain of the breast are also very severe, attended with cough, and bloody expectoration, and the patient always feels languid and dejected. The pulse becomes frequent, feeble, and irregular, the tongue black and parched, and, at length diarrhœa, delirium, convulsions, gangrene of the surface of the body, and death, supervene. In its mild form, it only goes through the first stage, and terminates, as we have already stated, in a few days, by a slight desquamation. But when severe, it is often protracted more than two months, every stage of the eruption continuing proportionably longer; and when, in this manner, it has run its course, it repeatedly breaks out on the new surface, and passes through the same stages." (*M'Mullin in Edinb. Med. and Surg. Journal, No.* 5.)

The remote cause is the employment of mercury. Dr. M'Mullin is inclined to believe with Dr. Gregory, that the application of cold to the body, while under the action of mercury, is absolutely necessary, for its production; an opinion strengthened by the constant prevalence of catarrhal symptoms. However, Mr. Pearson thinks, that cold has no concern in bringing on the complaint in patients under the influence of mercury. At the same time, it merits particular attention, that the disease is not exclusively occasioned by mercury, either in its general, or more partial attacks: it has been observed to follow exposure to cold, and to recur in the same individual, at irregular intervals, without any obvious or adequate cause. (*Bateman's Synopsis, p.* 256, *Ed.* 3; *Rutter in Edin. Med. and Surg. Journ. Vol.* 5. *p.* 143; *Marcet in Med. Chir. Trans. Vol.* 2, *art.* 9.)

In the early stage, Mr. Pearson recommends small doses of antimonial powder, with saline draughts, or the ammonia acetata. A gentle purgative should be given every three or four days, and opium to procure sleep. The latter medicine sometimes does most good, when joined with camphor, or Hoffman's anodyne liquor. Sarsaparilla and bark may be given, when the discharge is no longer ichorous, and the tumefaction has subsided. Vitriolic acid has seemed to give relief. The diet may be light and nutritive, without fermented liquors, however, till the desquamation has somewhat advanced. Frequent use of the warm bath, and often changing the patient's linen and sheets, which soon become stiff and rough with the discharge, afford much benefit. If the warm bath cannot be had, Mr. Pearson advises washing the body very tenderly with warm water-gruel; he also covers parts, from which the cuticle is detached, with a mild cerate, and renews the application twice a day. (*P.* 178.)

Dr. M'Mullin advises the immediate discontinuance of mercury; the removal of the patient from wards, where this mineral is in use; emetics and diaphoretics; but on account of the very irritable state of the bowels, he says antimonials are hardly admissible, and that when purgatives are indicated, only the mildest ones, such as ol. ricini, sulphate of magnesia, &c. ought to be given. He advises mucilaginous draughts with opium for relieving the soreness of the fauces. In the second stage, the cold infusion of bark with aromatics and opium, or, what is more praised, wine, porter, &c. To relieve the ophthalmia tarsi, the unguentum oxidi zinci, and to appease the painful sensation of the skin cracking, the linimentum calcis, which should be liberally applied as soon as crusts appear.

Consult *Essay on a Peculiar Eruptive Disease, arising from the Exhibition of Mercury, by G. Alley, 8vo. Dublin,* 1804: *also Observations on the Hydrargyria, or that Vesicular Disease arising from the Exhibition of Mercury, 4to. Lond.* 1810. *A Description of the Mercurial Lepra, by Dr. Moriarty, 12mo. Dublin,* 1804. *Spens and M'Mullin, in Edinburgh Med. and Surgical Journal, Nos.* 1 *and* 5. *Pearson on Lues Venerea, Edit.* 2. *Bateman's Synopsis, p.* 256, *&c. Ed.* 3.

Frictions with Mercurial Ointment.

No metal acts in its pure metallic state; it must first be more or less combined with oxygen. The mercury, contained in the unguentum hydrargyri, becomes in a certain degree oxydated, when triturated for the purpose of blending it with the fat. The metal, however, in mercurial ointment, is in the most simple, and least combined form, of all its preparations, and hence, it not only generally operates with more mildness on the system, but, with more specific effect on the disease. Various salts of mercury, when given internally, operate more quickly than mercurial frictions; yet, there are many practitioners, who do not like to confide solely in any internal preparations for curing the venereal disease, particularly, when the virus has produced effects in consequence of absorption. We shall only just mention in this part of the work, that rubbing in mercurial ointment is the mode of affecting the system with mercury, which is generally considered to agree best with most constitutions, and to act with most certainty on the venereal disease.

Mercurial Fumigations.

We have mentioned this method, as being one of the most ancient plans of affecting the constitution with mercury, and Lalonette and Abernethy have stated circumstances in its favour, which certainly render it sometimes a very eligible mode. The latter is of opinion, that if the peculiar advantages of mercurial fumigations were generally known to practitioners, they would be much more frequently employed. The advantages of the method consist in its affecting the constitution, when other means have failed, and in producing its effects in a much shorter time than any other mode requires. How desirable this celerity of operation must often be, when venereal ulceration is making great ravages in the palate, throat, &c. it is needless to insist upon. In patients, who have not strength to rub in ointment, and whose bowels will not bear the internal exhibition of mercury, the mode of fumigation may prove of great service.

"In the year 1776, the Chevalier Lalonette, a physician at Paris, laid before the public an account of a new mode of mercurial fumigation, free from the inconveniences of former ones, and which, in the space of thirty-five years, he had successfully employed in more than four hundred cases, that had resisted all the ordinary methods of cure. His method consisted in inclosing the patient, previously undressed, in a kind of box resembling a sedan-chair, with an opening at the top to let out the head, and another at the bottom, to which was fitted a small grate or furnace, having in it a heated iron for converting the mercurial remedy into fume. The preparation he made use of was a kind of calomel, which, by repeated sublimation from iron filings, was so far deprived of its muriatic acid, as to be in part reduced into running quicksilver; and, while it possessed considerable volatility, was perfectly unirritating. Some of this powder, being strewed upon the hot iron placed below, was immediately converted into smoke, which surrounded the patient's body, and after some time settled on his skin in the form of a white and very fine calx of quicksilver: a complete dress, having its inner surface fumigated with the same powder, was then put on.—The remedy being thus generally applied to to the mouths of the cutaneous absorbents, soon got admission into the circulating fluids, and the constitution became thereby more speedily affected, than by any other process known before."—(*Abernethy's Surgical and Physiological Essays, Part* 3.)

As the fumigating powder used by M. Lalonette was very operose, and consequently a very expensive preparation, and appeared to have no advantage over one made by abstracting the muriatic acid from calomel by means of ammonia, Mr. Abernethy has always employed the latter, which is prepared at the hospital in the following manner: Two drachms of liquor ammoniæ are added to six ounces of distilled water, and four ounces of calomel are thrown into this liquor, and shaken up with it; the powder is afterwards separated by a filter, and dried.

The powder thus obtained is of a grey colour, and contains a good deal of quicksilver in its metallic state, which of course is extremely volatile, but becomes oxydated when raised into fume, and afterwards condensed into a white subtle powder.

In local disease of the joints, such, for instance, as frequently takes place in the knee, and in sarcomatous enlargements of the breast in women, the late Mr. Sharp and Sir C. Blicke were accustomed to direct fumigated stockings, or under-waistcoats, to be worn; by which these complaints were relieved, and the constitutions of the patients affected, without the trouble and unpleasantness arising from the use of the common mercurial ointment. (See *Abernethy's Surgical and Physiological Essays, Part* 3.)

Mr. Pearson procured Lalonette's machine, and made a considerable number of experiments to determine the comparative advantages of this method, and mercurial frictions. He found, that the gums became turgid and tender very quickly, and that the local appearances were sooner removed, than by the other modes of introducing mercury into the system; but that it soon brought on debility, a rapid and premature salivation, and, of course, that the medicine could not be steadily continued. This gentleman concludes, that where checking the progress of the disease suddenly is an object of great moment, where the body is covered with venereal ulcers, or where the eruptions are large and numerous, so that there scarcely remains a surface large enough to absorb the ointment, the vapour of mercury will be advantageous. But he thinks it extremely difficult thus to introduce a sufficient quantity of mercury into the system to secure the patient from a relapse, and therefore the plan by no means eligible as a general practice. The vapour of mercury, he says, is singularly efficacious, when applied to venereal ulcers, fungi, and excrescences; but this plan requires an equal quantity of mercury to be given in other ways, as if the local application itself were not a mercurial one. (*Pearson on Lues Venerea, p.* 145, *&c.*)

For the purpose of fumigating sores, the hydrargyri sulphuretum rubrum is commonly used. Ulcers and excrescences about the pudendum and anus in women are said to be particularly benefited in this way; and, in these cases, the fumes are most conveniently applied by placing a red-hot heater at the bottom of a night-stool pan, and after sprinkling on it a few grains of the red sulphuret of quicksilver, placing the patient on the stool. On other occasions, a small apparatus, sold at the shops, is used, which enables the surgeon to direct the fumes through a funnel against the ulcer in any situation.

Though mention has just been made of *venereal* excrescences, I am opinion with Mr. Abernethy, that it is very questionable, whether any are ever really of this nature. I know, that many excrescences and verrucæ about the anus, and parts of generation, diminish and are cured by a course of mercury. This is the only argument in favour of their being venereal; for, when tied, cut off, or made to fall off by stimulating them with pulv. sabinæ and the subacetate of copper, they are as effectually cured, as if mercury had been given. In the military hospital at Cambray, I remember a man, on whose scrotum there were several warty excrescences of considerable size. Mr. Booty, assistant staff surgeon, prescribed mercury, by which they were certainly cured with surprising expedition. In this particular case, I think the plan of treatment adopted was the best, because, on account of the number of excrescences, and the situation of some of them at the lower and back part of the scrotum, it would have been difficult to have treated them altogether by local applications.

PREPARATIONS FOR INTERNAL EXHIBITION.

When it is wished to excite a salivation quickly, and mercurial ointment alone will not produce this effect, or cannot be employed, and when fumigations are not convenient nor agreeable, the hydrargyri oxydum rubrum is often prescribed. The common dose is a grain, which may be increased to two, a day. It is apt, however, to disagree with the stomachs and bowels of many patients; an inconvenience sometimes obviated by conjoining the preparation with opium.

At present, the hydrargyrus cum creta is rarely or never prescribed for the cure of the venereal disease. But it is frequently prescribed as a mild alterative for children in doses of from gr. v. to gr. x. twice a day, blended with any viscid substance.

The oxymuriate of mercury (corrosive sublimate) was a medicine highly praised for its antisyphilitic virtues by the celebrated Van Swieten, and, indeed, there is no doubt that, like other preparations of mercury, it possesses such qualities. It retains great reputation even now, and, probably, will always do so. However, like the red oxide, it sometimes deranges the stomach and bowels, and from some surgeons does not receive the same degree of confidence, in respect to its power over syphilis, as mercurial frictions. Mr. Pearson remarks, that "when the sublimate is given to cure the primary symptoms of syphilis, it will sometimes succeed; more especially when it produces a considerable degree of soreness of the gums, and the common specific effect of mercury in the animal system. But it will often fail of removing even a recent chancre; and where the symptom has vanished during the administration of corrosive sublimate, I have known a three months' course of that medicine fail to secure the patient, from a constitutional affection. The result of my observations is, that simple mercury, calomel, or calcined mercury, are preparations more to be confided in, for the cure of primary symptoms, than corrosive sublimate. The latter will often check the progress of secondary symptoms very conveniently, and I think it is peculiarly efficacious in relieving venereal pains, in healing ulcers of the throat, and in promoting the desquamation of eruptions. Yet, even in these cases, it never confers permanent benefit; for, new symptoms will appear during the use of it; and, on many occasions, it will fail of affording the least advantage to the patient, from first to last. I do sometimes, indeed, employ this preparation in venereal cases; but it is either at the beginning of a mercurial course, to bring the constitution under the influence of mercury at an early period, or during a course of inunction, with the intention of increasing the action of simple mercury. I sometimes, also, prescribe it after the conclusion of a course of frictions, to support the mercurial influence in the habit, in order to guard against the danger of a relapse. But, on no occasion whatever do I think it safe to confide in this preparation singly and uncombined, for the cure of any truly venereal symptom." (*Pearson on Lues Venerea.*)

The dose of oxymuriate is a quarter of a grain.

The following is a common mode of ordering it: ℞. Hydrargyri oxymuriatis, gr. i. Aquæ Nucis Moschatæ, ℥ij, Misce. Dosis uncia dimidia.

The submuriate of mercury (calomel) is not very much used by modern surgeons for the cure of the venereal disease. Sometimes, indeed, it is given in cases of gonorrhœa, both with the view of preserving the constitution from infection, and keeping the bowels regular. It is more extensively given as a purgative and an alterative, and for the cure of surgical diseases requiring the system to be slightly under the influence of mercury. It generally proves actively purgative, when more than two or three grains are given.

The most simple preparations of mercury have generally been deemed the most effectual in eradicating the venereal disease. The pilulæ hydrargyri are the most simple of the internal formulæ, being merely mercury triturated with mucilaginous or saccharine substances. Next to mercurial frictions, they are, perhaps, most frequently employed for the cure of the incipient form of the venereal disease, that is, while a chancre is the only complaint. They are also very commonly given in all stages of the disease, to aid mercurial frictions in bringing the system under the influence of the specific remedy. Ten grains of the mass, kept for these pills, is the usual dose. When they purge, opium will sometimes prevent this effect. See *Venereal Disease.*

Mercury is employed both constitutionally and locally in numerous surgical cases; for the removal of indolent thickenings and indurations of the parts; for the relief of porrigo, herpetic diseases, tetanus, hydrops articuli, irritis, and a multitude of other affections, which need not here be specified.

MEROCELE. (from *μεϱος*, the thigh, and *ϰηλη*, a tumor.) A femoral or crural hernia. See *Hernia.*

MEZEREON was recommended by Dr. A. Russell for a particular class of venereal symptoms, in the following terms: "The disease for which I principally recommend the decoction of the mezereon root as a cure, is the venereal node that proceeds from a thickening of the membrane of the bones. In a thickening of the periosteum, from other causes, I have seen very good effects from it; and it is frequently of service in the removal of those nocturnal pains, with which venereal patients are afflicted; though, in this last case, excepting with regard to the pain that is occasioned by the node, I own I have not found its effects so certain, as I at first thought I had reason to believe. I do not find it of service in the cure of any other symptom of the venereal disease." (*Med. Obs. and Inq. Vol.* 3, *p.* 194, 195.) Mr. Pearson, however, asserts unequivocally, that mezereon has not the power of curing the venereal disease in any one stage, or under any one form, and if the decoction should ever reduce the venereal node, yet there will be a necessity for taking mercury in as large quantity, and for as long a time, as if no mezereon had been exhibited. Cullen found this medicine of use in some cutaneous affections, but, excepting an instance or two of lepra, Mr. Pearson has very seldom found it possessed of medicinal virtue, either in syphilis, or the sequelæ of that disease, scrofula, or cutaneous affections. (*Pearson on Lues Venerea, p.* 55—59.)

As the *possibility* of curing most forms of the venereal disease, not only without mercury, but without any internal medicines whatever, is now well established, it is difficult to know what degree of importance to attach to observations, declaring certain articles of the materia medica efficient or inefficient in the cure of that disease; because, if it admit of a spontaneous cure, but will not get well when mezereon, or any other particular medicine, is exhibited, we are necessarily obliged to suppose, that such medicine is worse than useless.

MODIOLUS. The crown, or saw of a trepan.

MOLLITIES OSSIUM. A morbid softness of the bones, which become preternaturally flexible, in consequence either of the inordinate absorption of the phosphate of lime, from which their natural solidity is derived, or else of this matter not being duly secreted into their texture. The bones affected become specifically lighter. (*Saillant, Hist. de la Soc. Royale de Méd. T.* 8.) Dr. Bostock made some experiments, with the view of ascertaining the proportion of earthy matter in bones affected with mollities: he examined a dorsal vertebra of a woman whose bones were found soft and flexible after her decease. In one part of the diseased bone, he found, that the quantity of earthy matter only amounted to one-fifth of its weight, and in another, only to one-eighth, while the proportion in healthy bones amounted to more than one half of their whole weight. (See *Med. Chir. Trans. Vol.* 4, *and Wilson on the Bones and Joints, p.* 253.) In rickets, the bones yield and become distorted only by slow degrees, and retain their natural inflexibility; but, in the present disease, they may be at once bent in any direction, and frequently admit of being readily divided with a knife. The mollities ossium is an exceedingly uncommon disease, and its causes are buried in obscurity. It is supposed, however, to depend upon some peculiar state of the constitution, and the individuals, attacked with it, have been remarked to be mostly about, or rather beyond, the middle period of life (*J. Wilson, Vol. cit. p.* 252), and generally, if not always, women. (*Neumann in Abhandl. der K. K. Josephs Acad.* 2 *B. p.* 173; *Portal Cours d'Anatomie, T.* 1, *p.* 15.) One instance, however, is reported, in which the patient was a young man, seventeen years of age. (*Thomassin, in Journ. de Méd. T.* 43, *p.* 222.) Surgical writers have usually considered mollities and fragilitas ossium as two distinct and different affections. Boyer thinks, however, that this point is by no means well established. He admits, that there have been a few rare instances of mollities, where the bones were completely flexible, without any degree of fragility. But, he contends, that in almost all the cases on record, the fragilitas and mollities have been combined. He regrets, that bones, affected with fragility, have never been chemically, nor anatomically examined, particularly, as there have been persons, who while living merely betrayed the symptoms of mollities ossium, yet, in whom unsuspected fractures, evidently of long standing, were discovered after death; while other fractures also happened from the slightest causes during the examination of the same bodies. (See *Boyer, Traité des Maladies Chir. T.* 3, *p.* 607—609.) The truth of these observations is well illustrated in the case reported by Mr. Wilson. (*On the Bones, &c. p.* 254.) In the present place, I shall merely describe the pure mollities ossium, or that disorder of the bones, in which they become completely flexible, and lose all their natural firmness. And in order to give an idea of the disorder, I shall quote the case of Madame Supiot. In the year 1747 she had a fall, which occasioned her to keep her bed for some time, and left great pain and weakness in her loins, and lower extremities. In about a year and a half afterwards, she began to perceive her left leg particularly affected. Along with this weakness, she had violent pains over her whole body, which increased after a miscarriage, and still more after a natural delivery, in the year 1751. She was now seized with startings, great inquietude, and such violent heats, that she was almost continually in a sweat, and could not bear the least covering even in the coldest weather, and while her pains continually increased, she took notice that her urine precipitated a white sediment. Her pains abated on the appearance of the sediment, but she now observed that her limbs began to bend, and from this time the softness of them gradually increased till her death. In the month of April 1752, the trunk of the body did not exceed 23 inches in length, the thorax exceedingly ill formed, and the bones of the upper part very much distorted; those of the lower part were very much bent, and the thigh-bones became so pliable, that her feet might easily be laid on each side of her head. The right side did not, till after some time, become so deformed as the left; but it was surprising to observe the alterations which daily took place, and the different figures assumed by the limbs, in consequence of the increased softness of the bones; so that when the sediment in the urine was considerable, the disease of the bones seemed to be at a stand, increasing considerably when it was suppressed. Besides this, she had violent pains, startings, difficulty of breathing, spitting of blood, and, lastly, a fever, with convulsions. She died in the beginning of November 1752, and on dissecting her body, the following appearances were observed: 1. The muscles in general were of a very soft and pale consistence; the vastus externus, fascialis, quadriceps, biceps, and external parts of the gracilis, were much shorter than in their natural state, and more firm and tense; while those on the opposite side were much elongated, thin, and very tender; in short, the whole muscular system had suffered more or less, according to the action of the muscles in her lifetime. 2. The bones were entirely dissolved, the periosteum remaining unhurt, so that they exhibited only the form of a cylinder. 3. The heart and large blood-vessels, both veins and arteries, contained large black polypi, of a viscid consistence, and very unlike those usually found in dead bodies.

A case of softness of the bones is related by Mr. Gooch, but considerably different from the above, as it was attended with a remarkable fragility of them before they became soft. It likewise began with pains through the whole body, attended with feverish symptoms; but, after some weeks, these pains were confined chiefly to the legs and thighs, and they were not increased by pressure. This fragility of the bones does not appear to have been the case with Madame Supiot. In the month of June, 1749, Mr. Gooch's patient broke her leg in walking from her bed to a chair, and heard the bone snap. No callus, however, formed, though the fracture was instantly reduced, and treated by one of the best surgeons in her part of the country; but, instead of this, the bones began to grow flexible, and, in a few months, were so from the knee to the ankle. The disease still continued to increase, so that, in a short time, the other leg and thigh were affected in the same manner, after which both legs and thighs became œdematous, liable to excoriations, and to discharge a thin yellow ichor. Scorbutic symptoms began to appear in the winter after the leg was broken, and her gums began to bleed. Tonic medicines were exhibited without any success, except that her menstruation became more regular, and her appetite and digestion better than before; but, towards the end of her life, her breathing became difficult, the spine distorted, and a pain in the loins took place upon every motion of the vertebræ: and as her limbs were now quite useless, she was obliged to sit upright in bed. At last, the ends of the bones, on which she sat, having become also very soft, spread much, and the ends of her fingers and thumbs, by frequent endeavours to raise herself, became also very broad, and the phalanges crooked. The flexibility of the bones gradually increased, and became more general, attended with a wasting of the flesh, and excessive difficulty of breathing. The menstrual flux totally ceased four months before her death; her legs, which were very anasarcous, and excoriated almost all over, became erysipelatous; but she retained her senses to the last. She expired suddenly, having talked in a composed manner, concerning her miserable situation and approaching end, only a few moments before.

On examining the body, she was found to have lost two feet two inches of her natural stature. The heart and lungs appeared sound, but had been much confined, principally by the liver, which was enlarged in an extraordinary degree; it was not, however, scirrhous, nor in any other way diseased. The spleen was very small, and the mesentery had one large scirrhous gland. All the bones, except the teeth, were softened, so that scarcely any of them could resist the knife; but those of the lower extremities were the most dissolved, being changed into a kind of parenchymous substance, like soft dark-coloured liver, without any offensive smell. So completely, indeed, were they decomposed, that the knife met with less resistance in cutting through them than in sound muscular flesh, though some bony lamellæ were here and there to be met with, but as thin as an egg-shell. The most compact bones, and those which contained the greatest quantity of marrow, were the most dissolved; and it was observable, that the dissolution began internally, for the bony laminæ remained here and there on the outside, and nowhere else. The periosteum was rather thicker than ordinary, and the cartilages thinner; but not in a state of dissolution. The bones were found to contain a great quantity of oily matter and little earth. No cause could be assigned for the disease; and in the case of Madame Supiot, the one assigned, viz. that of her eating too much salt, seems totally inadequate to explain the origin of the disorder. All the cases of mollities ossium on record have proved fatal, and no means of cure are yet known.

For additional observations, connected with this subject, refer to *Fragilitas Ossium* and *Rickets*. Boyer and Richerand treat of the mollities ossium, and rickets, as one and the same disease. But, as Mr. Wilson observes, the first differs from rickets, in attacking people of middle age, or rather older, and not particularly children; and it differs also in the change, produced in the bones themselves, which, when dried, do not appear as if they had been long steeped in weak acid, with their animal part nearly unchanged; but both the phosphat of lime and the animal matter appear to have been absorbed, so as to leave mere shells, which are also softer than natural bone of the same thickness. Mr. Wilson further informs us, that large cavities are met with in the substance of the bones, and sometimes communicate with the soft parts surrounding them. In some of these cavities is contained oily matter, like boiled marrow; and in others, masses of coagulated blood, and a soft inorganic animal substance. (*J. Wilson on the Bones, &c. p.* 253. *Acrel, Diss. Descriptionem et Casus aliquot Osteomalaciæ sistens; Upsal,* 1788. *Morand, in Journ. des Savans,* 1792, *et Mém. de l'Acad. des Sciences,* 1752. *Morand, junr. in Mém. de l'Acad. des Sciences,* 1764, *p.* 206. *See also T. Lambert, Relation de la Maladie de Bernard d'Armagnac, sur un Ramollissement des Os; Toulouse,* 1700. *Fernelius, in lib. de abditis rerum causis. Th. Bartholinus, Hist. Anat. Cent.* 4. *Petit, Histoire de l'Acad. des Sciences,* 1722. *Hoin, ibid.* 1764. *Gagliardi, Anatomes Ossium. Romæ,* 1789. *C. G. Ludwig, Programma, quo observata in sectione Cadaveris Fœminæ cujus ossa emollita erant proponit; Lips.* 1757. *Fries, Dissert. de Emollitione Ossium; Argentor.* 1775. *Thompson, in Med. Observations and Inquiries, Vol.* 5, *p.* 259. *Chirurgical Observations and Cases, by William Bromfield, Vol.* 2, *p.* 50, *&c. Boyer, Traité des Maladies Chir. T.* 3, *p.* 607, *&c. Paris,* 1814. *Richerand, Nosogr. Chir. T.* 3, *p.* 142. *What these two writers say, however, chiefly relates to rickets. We meet with cases of Mollities Ossium in the Philosophical Transactions; Act. Haffniens.; Ephem. Nat. Cur.; Saviard's Obs. Chir.; the writings of Forestus; Gooch's Chirurgical Works, Vol.* 2, *p.* 393—399. *Ed.* 1792, *&c. J. Wilson, on the Structure and Physiology of the Skeleton; and on the Diseases of the Bones and Joints, p.* 252, *&c. 8vo. Lond.* 1820.)

MONOCULUS. (from μονος, single, and *oculus*, the eye.) A bandage formerly applied to the fistula lachrymalis, and diseases of the eye. It consists of a single-headed roller, the end of which is to be put on the back of the neck, and one turn made over the forehead, so as to meet the extremity of the bandage. The roller is then to descend under the ear of the side affected, and to pass obliquely over the cheek underneath the eye, and next over the root of the nose, and the parietal bone, to the nape of the neck. The third turn of the roller is to overlap the second a little; the third, the fourth; making what the French call *doloires;* and the application of the bandage is completed by making turns round the head.

MORTIFICATION is of two kinds; the one, without inflammation; the other, preceded by it. To this last species of mortification, the terms, *inflammatory, humid,* or *acute gangrene,* are often applied; while the second, or that which is not preceded by any or much inflammation has been distinguished by the epithets, *dry*, or *chronic*, and sometimes *idiopathic*, when no cause for the origin of the disease can be assigned. According to Mr. Hunter, inflammation is an increased action of that power, which a part naturally possesses; and in healthy inflammations, at least, it is probably attended with an increase of power. In cases, however, which are to terminate in mortification, there is no increase of power; but, on the contrary, a diminution of it. This, when joined to an increased action, becomes a cause of mortification, by destroying the balance, which ought to subsist between the power and action of every part. There are, besides, cases of mortification, preceded by inflammation, which do not arise wholly from that, as a cause: of this kind, are the carbuncle and the slough formed in the small-pox pustule. (*Hunter.*)

The first general division of mortification, therefore, is into two kinds; first, into the *inflammatory*, *humid*, or *acute*; and secondly, into the *dry*, or *chronic*. But the disorder is also subdivided into many species, which are determined by the nature of their particular exciting causes, as will be presently detailed.

However, it is remarked, that acute, or rapid mortifications, are not necessarily humid, as the slough from the application of kali purum proves, and the converse also is true in some cases of sphacelus senilis. (*James on Inflammation*, *p.* 96.) Mr. Guthrie also asserts, that mortification from wounds and external injuries may be either humid, or dry, or of both kinds together, where the circumstances are particular. (*On Gunshot Wounds*, *&c. p.* 122, *Ed.* 2.) The doctrine also, that any case of mortification is entirely without inflammation, has sometimes been deemed questionable; and Mr. James expresses his belief, that the disorder is generally preceded by inflammation, and invariably *accompanied* with some degree of it. And, says he, "whether mortification be a consequence of inflammation, or not, it may, perhaps, with reason be considered, as standing in the same relation to inflammation, as adhesion, suppuration, or ulceration; they may all be preceded by a high degree, or it may be scarcely sensible." (P. 84, 85.)

When any part of the body loses all motion, sensibility, and natural heat, and becomes of a brown, livid, or black colour, it is said to be affected with *sphacelus*, that is, complete mortification. As long as any sensibility, motion, and warmth, continue, the state of the disorder is termed *gangrene*. This word is here made use of to signify only a degree of sphacelus, or rather the process, by which any local disorder falls into the state of complete mortification. Many authors use both terms synonymously; but it is to be observed, that gangrene does not invariably end in sphacelus; nor is the latter always preceded by the former. (*Richter*, *Anfangsgr. der Wundarzn. B.* 1, *Kap.* 3.) There are some surgical writers, who make the distinguishing circumstance of sphacelus to be the extension of the disorder to the bones as well as the soft parts. (*Lassus*, *Pathologie Chir. T.* 1, *p.* 30, *Ed.* 1809.)

At present, however, this last application of the term sphacelus is never made; for, as Mr. Pearson has rightly observed, the distinctions, "which are founded merely upon the parts, that suffer, or upon the profundity, to which the disease has penetrated, seem inadequate and useless." (*Principles of Surgery*, *p.* 115. *Ed.* 2.) The manner, in which Dr. J. Thomson views the subject, may be considered as coinciding with the general sentiments of the best modern surgeons. "I shall employ the term, *gangrene*, (says he) to express that state of mortification, in inflamed parts, which precedes the death of the part; a stage, in which there is a diminution, but not a total destruction of the powers of life; in which the blood appears to circulate through the larger vessels; in which the nerves retain a portion of their sensibility; and in which, perhaps, the part affected may still be supposed to be capable of recovery. The word, *sphacelus*, I shall use to denote the complete death, or mortification of a part; that state, in which the powers of life have become extinct; in which the blood ceases to circulate; and in which the sensibility of the nerves is lost, whether the dead, or mortified part has, or has not, become actually putrid, or shown any tendency to separate and fall away from the living and sound parts. Putrefaction, or the spontaneous process, by which animal bodies are decomposed, is an accidental, and not a necessary effect of the state of mortification. It takes place at very different periods, after the death of particular parts; and these periods, it may be remarked, are always regulated, not only by external circumstances, such as the humidity and temperature of the atmosphere, but, also, by the peculiar structure and morbid conditions of the animal texture, or organ, in which the putrefaction occurs. The term, sphacelus, has, I know, been employed to express, that a part is not only completely dead, or mortified, but, also, that that part has become putrid, and is in a state of separation from the surrounding and living parts. But, as putrefaction is not a necessary, or immediate, consequence of mortification, or partial death in animal bodies, this use of the term sphacelus is obviously improper." (*On Inflammation*, *p.* 504.)

The causes of mortification are either internal, or external. It is commonly taught in the medical schools on the Continent, that the internal causes probably operate after the manner of a deleterious substance, which being introduced into the circulation, occasions a putrefaction of the fluids. (*Lassus*, *op. et loc. cit.*)—Boyer also professes a similar notion, (see *Traité des Maladies Chir. T.* 1, *p.* 140,) as well as Larrey in his account of *traumatic* gangrene; a statement, which has drawn forth the criticisms of Mr. Guthrie. The doctrine is supported by no sort of proof, and may be considered as entirely hypothetical, if not decidedly erroneous. There are, indeed, as Boyer has noticed, some spontaneous mortifications, the primitive cause of which is not always well understood: an inflammation, apparently slight, may become gangrenous immediately it has made its appearance. In scorbutic, venereal, and small-pox cases, we have daily instances of this fact. Other internal causes, without any very evident pre-existing disease, sometimes destroy persons, by gangrenous mischief, who are but little advanced in years. (*Saviard*, *Obs.* 16. *Haller*, *Disput. Chir. T.* 4, *p.* 551.) Certain poisonous, acrid, caustic substances taken inwardly, or introduced under the skin, may have the same effect, by annihilating the vital action, or destroying the texture of the parts. (*Lassus, Pathologie Chir. T.* 1. *p.* 31.) But, though these observations may all be entirely correct, they by no means justify the conclusion, that the internal causes of mortification ever act like a deleterious matter producing a putrefaction of the fluids. The mortification of the toes and feet, so well described by Mr. Pott, is supposed to proceed chiefly from unknown internal causes, though sometimes attended with an ossified state of the arteries.

Another remarkable specimen of mortification from an internal cause, is that originating from eating bread made of bad black wheat, or rye. Besides occurring as an original idiopathic disease, and from obstruction of arteries, chronic, or dry gangrene (observes Dr. Thomson) may be induced by the action of substances taken into the stomach, which seem to produce it as a specific effect in parts remote from the source of the circulation. The most singular example, which we have of this, is in the gangrene produced by the eating of a particular kind of unsound or diseased rye. This species of mortification has been rarely observed in England; but it has been frequently seen on the Continent, where it has been repeatedly known to prevail in some districts, where rye forms a principal article of food, as an endemial disease. It occurs, however, in such districts only after wet seasons, in which that grain is affected with a particular disease, well known in France by the name of the *Ergot*, or cockspur rye. In this disease, the grains of rye grow to a large size, acquire a black colour, and have a compact horny consistence. The species of mortification, produced by eating this substance, was first particularly described by Dodard. (See *Journ. des Savans, an* 1676.) The part affected became at first insensible and cold, and, in the progress of the disorder, dry, hard, and withered. In very malignant cases, there was delirium. Dodard's description of the complaint was very imperfect; but he has mentioned a circumstance, tending strongly to prove, that the disease actually arose from the alleged cause; viz. that fowls, fed with cockspur rye, are killed by it. Saviard informs us, that he saw this disease in the year 1694, at the Hôtel-Dieu of Orleans. It attacked the upper and lower extremities, which were rendered, in the course of the disorder, as dry as touchwood, and as emaciated as Egyptian mummies. In 1710, Noel, surgeon to the Hôtel-Dieu at Orleans, transmitted to the Royal Academy of Sciences at Paris an account of this peculiar mortification. About fifty people, men and children, had come that season into his hospital, with the affliction. According to Noel, the disorder always began in the toes, and extended itself gradually along the foot and leg, till it sometimes rose to the upper part of the thigh. He had never seen any of the female sex affected with it, and had observed only one instance of it in the upper extremities. The Academy received the history of one case, in which the lower extremities were separated from the body in the articulations of the thigh-bones with the acetabula; the first example, (Dr. Thomson believes) of this separation upon record; and it was the occurrence of this, and of similar cases, that probably first suggested the operation of amputation at the hip-joint. (See *Thomson's Lectures on Inflammation, p.* 541.) As Noel's patients did not come under his care, till after the disease had existed some time, he could not describe from his own observation the early symptoms; but the patients had often told him, that the disease generally began in one, or both feet, with pain, redness, and a sensation of heat, as burning as the fire; and that, at the end of some days, these symptoms ceased, as quickly as they had come on, when the extreme sensation of heat, which they had formerly felt, was changed into cold. The part affected (adds Noel) was black, like a piece of charcoal, and as dry as if it had passed through the fire. After some time, a line of separation was formed between the dead and living parts, like that which appears in the separation of a slough produced by the cautery; and the complete separation of the limb was, in many cases, effected by nature alone. In others, Noel was obliged to have recourse to amputation.

This disease appeared in Switzerland in 1709 and 1716, and its symptoms and progress in that country have been accurately described by Langius in a dissertation, entitled, "*Descriptio Morborum ex Esu Clavorum Secalinorum.*"

Gassaud, physician in Dauphiny, where this disease appeared also in 1709, states, that many of the patients were affected with swellings of the feet and legs, and of the hands and arms, which degenerated into a gangrene, that penetrated to the bone, and produced a separation of the affected limb. The disorder was attended with different symptoms in different individuals. Some suffered very violent pain, accompanied by an insufferable sensation of heat, although the part affected often felt cold to the touch. In other patients redness, with much swelling, supervened, attended with fever and delirium. Other patients were without any fever, or delirium, though they seemed to suffer equal pain. In some patients, the parts affected became withered, dry, and black, like charcoal. The separation of the dead parts from the living took place with the most excruciating pain, and a sensation resembling that produced by the direct application of fire. This sensation was sometimes intermittent; and, in other instances, it was succeeded by an equally harassing sensation of cold.

According to Bossau, surgeon to the hospital of St. Antoine, in Dauphiny, the cases, which he saw, were not all of the dry kind, the limb sometimes becoming putrid, and maggots being generated. He says, that the disease was not infectious, and it attacked indiscriminately men, women, and children.

The degree of fatality, caused by this species of mortification, seems to have been extremely various. In the Memoirs of the Royal Academy of Sciences for 1748, M. Duhamel mentions, that of 120 persons afflicted, scarcely four or five recovered with their lives. According to Langius, it was equally fatal in Switzerland.

Dr. Thomson believes, that the preceding sort of gangrene has never occurred in this country, excepting, perhaps, the cases recorded by Dr. Charlton Woolaston, in the Phil. Trans.

for 1762; and which proceeded from eating unsound wheat, not rye. (See *Lectures on Inflammation, p.* 548.) For further particulars, relating to this curious kind of mortification, I must refer the reader to this valuable work.

The external causes of mortification, which are manifest, and act mechanically or chemically, are burns; excessive cold; the application of caustics; the presence of any ichorous, urinary, or fecal matter effused in the cellular substance; violent contusions, such as are produced by gunshot wounds, or bad fractures; the strangulation of a part, as in cases of hernia, or when polypi, or other tumors are tied; a high degree of inflammation; and, lastly, every thing, that has the power of stopping the circulation and nervous energy in parts. (*Lassus, Pathologie Chir. T.* 1, *p.* 34, 35.)

Inflammation is one of the most frequent occasional causes of mortification. But, as I have already remarked, the death of a part may take place without any well marked appearance of previous inflammatory disorder; and the latter, even when present, has frequently less share in the mischief, than other incidental circumstances, and is, in reality, only an effect of the very same cause, which produces the sphacelus itself. It is often a matter of doubt, whether actual inflammation precedes the occurrence, or not; for a part, before it mortifies, is in certain instances only affected with pain, and with no degree of preternatural redness. Lastly, when mortification is, unquestionably, preceded by inflammation, there are so many varieties of the disorder, depending on incidental causes, that these latter demand more attention than the inflammation. (*Richter, Anfangsgr. B.* 1, *Kap.* 3.)

Mr. James enumerates the following circumstances, as capable of influencing, in a very great degree, the disposition of inflammation to terminate in mortification. 1. The powers of the part, in which the inflammation occurs, being naturally weak, as in fibrous membranes, the scrotum, &c. 2. The remote supply of blood, or nervous energy, as in the lower extremities. 3. Obstruction to the return of blood. 4. To the supply of blood. 5. Disease in the heart, or vessels. 6. Debility from age, habits of life, disorder of the digestive organs, or fever. 7. Poor living, foul air, improper food, scurvy, &c. 8. Impairment of organization from external injury. 9. Of the nervous power by poisons. 10. Undue excitement of weakened parts. 11. Depressing remedies. 12. Pressure and tension. 13. Excessive violence of inflammatory action. 14. Peculiar disposition in the constitution. (*James on Inflammation, p.* 102.)

Healthy phlegmonous inflammation seldom ends in mortification, except when it is unusually violent and extensive.

Of all the inflammatory complaints, to which the system is liable, erysipelas is observed most frequently to terminate in gangrene; and whenever phlegmon is, in any degree, conjoined with an erysipelatous affection, which it not unfrequently is, it seems thereby to acquire the same tendency, being more difficult to bring to resolution or suppuration than the true phlegmon, and more apt to run into a mortified state.

The symptoms of mortification from inflammation take place variously, yet generally, as follows:—The pain and sympathetic fever suddenly diminish, the part affected becomes soft, and of a livid colour, losing, at the same time, more or less of its natural warmth and sensibility. In some places, the cuticle is detached; while, in other situations, vesicles arise, filled with a clear, or turbid fluid. Such is the state, to which we apply the term *gangrene*, and which stage of the disorder too often rapidly advances to *sphacelus*, when the part becomes a cold, black, fibrous, senseless substance, called in technical language a *slough*.

It merits notice, however, that, "in cases, in which gangrene immediately succeeds inflammation, these two morbid states may, in some measure, be regarded as stages, or periods, of the same disease. They pass insensibly into one another; nor is it possible to say precisely where the one state ends, and the other commences. The symptoms of inflammation, in these cases, do not disappear before those of gangrene come on; but seem rather to undergo a gradual and almost imperceptible change, or conversion, into one another. *The redness acquires a deeper tinge, and spreads farther*, than formerly; *the swelling increases and becomes more doughy;* and, in this incipient stage, the gangrene, particularly when it attacks the cutaneous texture, often bears a considerable resemblance to erysipelas." (See *Thomson's Lectures on Inflammation, p.* 506.)

It is to be observed, also, that "the part of the body, which becomes affected with gangrene, *does not immediately lose its sensibility*, for the pain, on the contrary, is often very much aggravated by the approach of this state. *The blood also still continues to circulate*, at least, *in the larger vessels of the part*, but, perhaps, *with less force;* and from the resistance which it meets with in passing through the capillaries, *in less quantity* than formerly. The serous effusion into the cellular membrane continuing to increase, and the action of the absorbent and sanguiferous vessels to diminish, the part becomes at length incapable of being restored to its former office in the animal economy. It is, therefore, in its earlier stages only, that gangrene is to be considered as an affection admitting of cure; for there are limits, beyond which, if it pass, recovery becomes impossible. These limits it may not, in every instance, be easy to define; but they form the boundaries between incipient gangrene and the ultimate termination of that state in sphacelus." (*Thomson, op. cit. p.* 507.)

The causes which produce mortification by impeding the return of blood from the part affected, for the most part operate by making pressure on the trunk, or principal branches, of a vein. In these instances, there is always an accumulation of blood in the part which first swells, becomes of a livid colour, tense, and very painful. Soon afterwards, blisters arise, and the part becomes soft, œdematous, cold, insensible, emphysematous, black, and fetid. Such are the circumstances, which happen in strangulated hernia, in tied polypi, and in a limb, in which the veins have been so compressed by any hard swelling, such as the head of a dislocated bone, as to excite mortification.

Other causes operate by preventing the entrance of arterial blood. The application of a ligature to an artery, as practised in several surgical cases, and all external pressure, that closes the artery, or arteries, on which a part entirely depends for its supply of blood, have this effect. Mortification does not, however, always take place, when the trunk of an artery is rendered impervious, because nature furnishes the necessary supply of blood, through collateral ramifications. But, when the disorder does happen, the part commonly first becomes pale, flaccid, and cold, and soon afterwards shrinks, loses its sensibility, grows black, and perishes.

In some cases, the mortification proceeds not simply from the interruption of the course of the blood through the principal artery, or arteries, but its occurrence is promoted by great violence done to the limb, and in particular, by the injection and distension of the cellular membrane with effused blood. No doubt all these causes operated in the fatal example of mortification, which followed a fracture of the thigh, attended with laceration of the femoral artery, as related by Sir A. Cooper. (See *Lancet, Vol.* 1, *p.* 296.)

It is usually represented by writers, that mortification may proceed from a mere lessening of the communication of blood and nervous energy to a part. However, it is to be observed, that parts, deprived of all connexion with the sensorium, by the division, or paralytic state, of their nerves, do not frequently perish on this account. But, as their functions are carried on with less vigour, and their vitality is weakened, the same causes, which sometimes produce mortification in parts differently circumstanced, must much more readily occasion it in them. Among the causes of the present species of mortification, may be mentioned great debility; extreme old age; a thickening and ossification of the coats of the arteries, and a consequent diminution of their capacity, and of their muscular and elastic power.

Cowper, the anatomist, was one of the earliest writers, who took notice of this ossification of the arteries of the leg, in persons who had died of mortification of the feet and toes. (See *Phil. Trans. Vol.* 23, *p.* 1195, *and Vol.* 24, *p.* 1970.) A similar case was remarked by Mr. Becket, of which he has given an account in his Chirurgical Observations. The occurrence was also mentioned by Naish. (See *Philosoph. Trans. Vol.* 31, *p.* 226.) Dr. J. Thomson has seen one example of a very complete ossification of the arteries of the leg, accompanying a mortification of the feet and toes. (*On Inflammation, p.* 537.) Speaking of the same subject, Mr. Hodgson remarks: "Experience has proved this condition of the arteries to be at least a constant attendant upon one species of gangrene, to which the extremities of old subjects are liable; and I have found the three principal arteries of the leg nearly obliterated by calcareous matter in two fatal cases of this disease. But our knowledge of the power of collateral circulation, in every part of the body, will not allow us to admit the obliteration of the trunks as a sufficient cause of mortification, from a deficient supply of blood. It is therefore necessary for us to remember, that the same disease may probably exist in the collateral branches, upon which it has produced similar effects. But if an extent of vessel be converted into a calcareous cylinder, it loses its elasticity and organic powers, so as to be unable to afford any assistance to the propulsion of the blood; and the existence of parts, supplied by vessels in this state, constitutes a strong argument against the agency of the arteries in the circulation of the blood. The above observations, on the cause of this species of gangrene, at once exposes its incurable nature; and this state of the blood vessels renders the danger of amputation very considerable, unless fortunately the disease in the arteries does not extend to the part, at which the ligature is applied." (See *Hodgson's Treatise on the Diseases of the Arteries and Veins, p.* 41.) However, although the ossified state of an artery must certainly be unfavourable to its healing, it does not constantly prevent this desirable event. (See *Case in Medico-Chir. Trans. Vol.* 6, *p.* 193.)

The preceding facts are particularly entitled to attention, because, as we shall presently find, the opinion that the mortification of the toes and feet arose from an ossification of the arteries was considered by Mr. Pott as destitute of foundation.

It is probable, however, that sometimes other causes are concerned. Fabricius Hildanus mentions a fatal case of mortification of the feet and legs, where the patient was in the vigor of life, and apparently of good constitution. After death, a scirrhous tumor was found surrounding and compressing the inferior vena cava, and aorta, near their bifurcation, so as to prevent the free circulation of the blood in the lower extremities. Mortification of the extremities also sometimes occurs from deficient circulation, in the progress of diseases of the heart. In a case of dropsy of the chest, Sir A. Cooper has seen a small spot on the leg become all at once black, without any appearance of inflammation. (See *Lancet, Vol.* 1, *p.* 296.)

The mortification arising from long continuance in the same posture, is chiefly attributable to debility and the unremitted pressure which parts sustain, and which obstructs the circulation. Surgeons have frequent occasion to see melancholy examples of this kind of mortification, particularly in cases of fractures, paralysis from disease of the vertebræ, injuries of the spine or pelvis, &c. The mischief most readily occurs where the bones have the least flesh upon them, and, consequently, where all external pressure has the greatest effect; as, for instance, about the os sacrum, os ilium, spines of the scapulæ, &c. The disordered part always first becomes soft, livid, red at the circumference, and œdematous, afterwards losing its sensibility, and acquiring a black appearance: at length, it is converted into a foul sloughing ulcer.

Though long continuance in the same posture is the grand cause of this kind of mortification, yet incidental circumstances are frequently combined with it, and have great influence over the disorder. These are, great debility, the same state of the system, as exists in typhus fever, impure air, unclean bedding, &c. According to Sir A. Cooper, some fevers have a greater tendency than others, to produce gangrene, as is the case with scarlatina. In slight cases of this disorder, he says, the most horrible effects will sometimes arise from gangrene. The tonsils will slough to a great extent; parts of the Eustachian tube, and even the tympanum will separate, and large portions of bone exfoliate. He also adverts to the dangerous sloughing frequently brought on in the measles by the application of large blisters to the chests of children, and points out the disposition to sloughing, occasioned by the immoderate use of mercury, or by whatever tends to weaken the constitution. (See *Lancet, Vol.* 1, *p.* 295.)

There are some causes, which produce death in a part at once, by the violence of their operation. A very powerful blow on any portion of the body may destroy its vitality in this sudden manner. Lightning, strong concentrated acids, and gunshot violence, sometimes act in a similar way. When a ball enters parts with great force and rapidity, many of the fibres, which are in its track, are frequently killed at once, and must be thrown off in the form of sloughs, before the wound can granulate and heal. (See *Hunter on Gunshot Wounds.*)

Cold is often another cause of mortification, and, when parts which have been frozen, or frostbitten, are suddenly warmed, they are particularly apt to slough.

I find in Baron Larrey's valuable publication, some interesting observations on the gangrene from cold. He acquaints us, that after the battle of Eylau, one of the most grievous events, to which the French soldiers were exposed, was the freezing of their feet, toes, noses, and ears: few of the vanguard escaped the affliction. In some, the mortification was confined to the surface of the integuments of the toes, or heels; in some, the skin mortified more deeply, and to a greater or lesser extent; while, in others, the whole of the toes, or foot, was destroyed. (See *Programma quo frigoris acrioris in corpore humano effectus expendit. Haller, Disp. ad Morb. Lips.* 1775.)

" All the writers on this species of mortification (says Larrey) have considered cold as the determining cause; but, if we attend to the period when the complaint begins its progress, and the phenomena, which accompany it, we shall be convinced, that cold is merely the predisposing cause. In fact, during the three or four exceedingly cold days, which preceded the battle of Eylau (the mercury having then fallen to 10, 11, 12, 13, 14, and 15 degrees below zero of Reaumur's thermometer), and until the second day after the battle, not a soldier complained of any symptom depending upon the freezing of parts. Nevertheless, they had passed these days, and a great portion of the nights of the 5, 6, 7, 8, and 9th of Feb. in the snow, and the most severe frost. The imperial guard especially had remained upon watch in the snow, hardly moving at all for more than four-and-twenty hours, yet no soldier presented himself at the ambulance,* nor did any one complain of his feet being frozen. In the night of the 9th and 10th of February, the temperature suddenly rose, the mercury ascending to 3, 4, and 5 degrees above zero. A great quantity of sleet, that fell on the morning of the 10th, was the forerunner of the thaw, which took place in the course of that day, and continued in the same degree for several days. From this moment, many soldiers of the guards and the line applied for succour, complaining of acute pain in the feet, and of numbness, heaviness, and prickings in the extremities. The parts were scarcely swollen, and of an obscure red colour. In some cases, a slight redness was perceptible about the base of the toes, and on the back of the foot. In others, the toes were destitute of motion, sensibility, and warmth, being already black, and, as it were, dried. All the patients assured me, that they had not experienced any painful sensation during the severe cold, to which they had been exposed on the night watches of the 5, 6, 7, 8 and 9th of February, and that it was not till the night of the 10th, when the temperature had risen from 18 to 20 degrees, that they felt the first effects of the cold." It is further noticed by Larrey, that such patients as had opportunities of warming themselves in the town, or at the fires of the night watches, suffered in the greatest degree. (See *Mémoires de Chirurgie Militaire, T.* 3, *p.* 60—62.)

Sometimes mortification seems to depend either upon the operation of some infectious principle, or, at all events, upon causes which simultaneously affect numerous individuals; for instances have been known, in which almost all the ulcers and wounds in large hospitals became nearly at the same time affected with gangrenous mischief. (See *Hospital Gangrene.*)

Mortification is very frequently occasioned by the injury which parts sustain from the application of fire, and heated substances to them. When the heat is very great, the substance of the body is even decomposed, and of course killed at once. On other occasions, when the heat has not been so violent, nor sufficiently long applied, inflammatory symptoms precede the sloughing.

Cutaneous texture is that in which we have the best opportunity of observing the phenomena and progress of gangrene. When it occurs as a consequence of inflammation, the colour of the skin changes from the florid red to a darker shade; and in the progress of the disease it acquires a livid hue. The cuticle often separates at certain points from the skin, and the vesications, termed *phlyctenæ*, are formed, which usually contain a bloody-coloured serum. As sphacelus comes on, the livid hue disappears, and a slough is formed, which is sometimes ash-coloured; sometimes black. It is not always easy to judge of the extent of mortification from the appearance of the skin; for, when the subjacent cellular membrane is affected, the disorder may occupy a greater extent internally, than upon the surface.

In a spreading gangrene, the red colour of the affected skin is insensibly lost in the surrounding integuments; but, when gangrene, followed by sphacelus, stops, a red line, of a colour more lively than that of gangrene, is generally perceptible between the dead and living parts. It is at the inner edge of this inflamed line, where we usually see the ulcerating process begin, by which the separation of the dead from the living parts is effected. (See *Thomson's Lectures on Inflammation, p.* 511, 512.)

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* The ambulances of the French army are caravans, furnished with an adequate number of surgeons, and every requisite for the dressing of wounds, and the immediate performance of operations, upon which last circumstance, in particular, the life of the wounded soldier often depends. These caravans follow the most rapid movements of the army, and are always capable of keeping up with the vanguard.

Mortification frequently takes place in cellular texture. The skin, which covers dead cellular substance, generally has a gangrenous appearance, and afterwards either ulcerates, or sloughs. In some cases, the portion of sphacelated cellular texture is small, as in the malignant boil; in others, extensive, as in cases of carbuncle. In erysipelas phlegmonoides, the cellular membrane, connecting together the muscles, tendons, nerves, blood-vessels, &c. often perishes to a great extent. Here large portions of skin are frequently also destroyed by sloughing, or ulceration, so that muscle, blood-vessel, tendon, nerve, &c. are exposed to view, quite denuded of their proper coverings, and in different states of disease.

Artery is the texture, endowed with the greatest power of resisting its own destruction by mortification. "I have (says Dr. Thomson) in various instances of erysipelas phlegmonoides, seen several inches of the femoral artery laid completely bare by the gangrene, ulceration, and sphacelus of the parts covering it, without its giving way before death. The arteries in these, and other similar instances, in which I have seen them laid bare in the neck and arm, by abscess terminating in mortification, had the appearance of raw flesh, and were obviously thicker and more vascular than natural. The blood circulated through them, and assisted in supplying with nourishment, the parts upon which they were distributed." (*P.* 523.) I have often seen the truth of the foregoing statement sadly illustrated in cases of sloughing buboes, by which several inches of the femoral artery were exposed. I have seen the throbbing brachial artery denuded for more than a month, nearly its whole extent along the inside of the arm, by the ravages of malignant and pseudo-syphilitic ulceration, attended with repeated sloughing; and yet hemorrhage had no share in carrying off the unfortunate patient.

It is a curious fact, that the blood coagulates in the large arteries, which lead to a mortified part. This occurrence takes place for some distance from the slough, and is the reason why the separation of a mortified limb is seldom followed by hemorrhage.

The same occurrence also affords an explanation, why, in the amputation of a mortified limb, there is sometimes no hemorrhage from the vessels, although the incisions are made in the living part. This fact was first particularly pointed out by Petit, the surgeon. (See *Mém. de l'Acad. des Sciences,* 1732.) "When a gangrened limb (says this celebrated surgeon) is cut off in the dead part, no hemorrhage occurs, because the blood is coagulated a great way in the vessels." He adds, "We have several examples of limbs amputated, on account of gangrene, in which no hemorrhage occurred, although the amputation was made a considerable way in the living parts; because the clot was not confined in these cases to the dead part, but was continued forwards into the living, as far as the inflammatory disposition extended."

According to Dr. Thomson, cases, in confirmation of the foregoing statement, are recorded by other practical writers, especially Quesnay, and Mr. O'Halloran. In one of the cases, mentioned by the latter gentleman, and in which no hemorrhage followed the removal of the limb, the incisions were made four inches above the division of the dead from the living parts. Dr. Thomson has seen a still longer portion of femoral artery closed up with coagulated blood, after a mortification of the foot and leg; and, in one example, where the mortification began in the thigh, he saw the coagulation of the blood in the external iliac, extending up to the origin of this vessel from the aorta. "So common, indeed, is this coagulation of the blood in the limbs affected with mortification (observes Dr. Thomson), that it has been supposed to be a necessary and constant effect of this disease. This opinion, however, does not appear to be well founded; for I have now seen several instances in which a limb has mortified and dropt off, without hemorrhage having occurred from the vessels divided by nature; and yet, in examining the vessels of the stumps of these patients after death, I have not been able to find any clots, either of coagulated blood, or of coagulable lymph. In the cases to which I allude, the adhesive inflammation, occurring in the line of separation between the dead and living parts, had extended to the blood-vessels, and their inner surfaces being inflamed and pressed together by the swelling which occurs, had adhered so as to close up their extremities. It is in this way we shall find, that the common ligature acts, which is applied to the divided extremities of arteries and veins; and it is this obliteration, by the process of adhesion of the extremities of the arteries and veins in the neighbourhood of the sphacelated parts, that in reality prevents the occurrence of hemorrhage, when the mortified limbs fall off, or are removed by the knife. The coagulation of the blood in the canal of the vessel is not alone sufficient. It may tend, in the cases in which it occurs, for a time to restrain hemorrhage; but it is by the obliteration by adhesion, of the canal in the extremities of the arteries and veins, that the occurrence of hemorrhage can be securely and permanently provided against. Indeed, to me it seems doubtful, whether that coagulation of blood, which takes place in mortified limbs, ever takes place in the canal of the vessel, till its extremity and lateral communications have been plugged up by the coagulating lymph, which is extended during the state of the adhesive inflammation." (See *Thomson's Lectures on Inflammation, p.* 554.)

When gangrene and sphacelus happen to any extent, the patient is usually troubled with an oppressive hiccough; a symptom well known to the surgeon of experience, and often an indication of the mischief, when external signs are less instructive. The truth of this remark is frequently seen in strangulated hernia.

The constitution also suffers immediately a considerable dejection. The patient's countenance suddenly assumes a wild, cadaverous look; the pulse becomes small, rapid, and sometimes irregular; cold perspirations come on, and the patient is often affected with vomiting, diarrhœa and delirium.

As Dr. Thomson observes, the constitutional symptoms "form fevers, which partake in individual cases, more or less, of an inflammatory, typhoid, or bilious character. But, the degree of these fevers varies, in every particular case, from their almost total absence to the highest degree of intensity. The skin is usually hot, and dry at the commencement of the attack; the tongue is without moisture, brown and hard; the pulse is quicker, and less full and strong, than in inflammation; and this state of the pulse is often attended by flattering intermissions, and a considerable degree of subsultus tendinum. The fever has, in general, more of the asthenic, than of the sthenic character; or it is more of the typhoid, than of the inflammatory type; a circumstance of great importance in the constitutional treatment of mortification. The fever in gangrenous affections is often accompanied with great uneasiness and restlessness, dejection of spirits, wildness of the looks; and, in severe cases, with almost always more or less delirium. In the progress of the disease, cold sweats, palpitations, and convulsions, sometimes occur; a hiccough, accompanied with nausea, often comes on, and proves a most distressing symptom to the patient. Frequently, this hiccough is the forerunner of death. Some patients die comatose; others, after suffering severe pains, spasms, and delirium. But, in some, a slow, in others, a sudden abatement of the constitutional symptoms takes place, accompanied also with the amelioration of the local affection. The gangrenous inflammation stops, and a red line is formed by the adhesive inflammation in the extreme verge of the living parts; the dead part separates, and granulations form; and when the constitution has strength to sustain the injury it has received, recovery takes place." (See *Lectures on Inflammation, p.* 509.)

It is an erroneous supposition, that mortification arising from an external local cause, is more easy to be stopped and cured, than that originating from an internal cause. The local cause is sometimes exceedingly difficult, or even incapable, of removal; and a sphacelus, which is at first entirely local, may afterwards become a general disorder, by the universal debility, and derangement of the system, resulting from the complaint. Hence, it is obvious, that a sphacelus may easily extend beyond the bounds of its outward local cause. On the other hand, a mortification may be reduced to one of a nature entirely local; though it arose at first from constitutional causes. Sphacelus from extreme debility, or from such a state of the system, as attends the scurvy, typhoid fevers, &c. is constantly perilous, because these causes are very difficult to remove. It is also a fact, that, when numerous causes are combined, it is an unfavourable occurrence, not merely because the surgeon is apt to overlook some of them, but because there are in reality more obstacles to the cure.

Humid gangrenes, which are frequently accompanied with emphysema of the cellular membrane, usually spread with great rapidity. (See *James on Inflammation, p.* 96.)

Sometimes a mortification spreads so slowly, that it does not occupy much extent at the end of several months, or even a whole year. The case, however, is often not the less fatal on this account. The danger is never altogether over, until the dead part has completely separated. The entrance of putrid matter into the circulation (says Richter) is so injurious, that patients sometimes perish from this cause, long after the mortification has ceased to spread. (*Anfangsg. der Wundarzn. B.* 1, *Kap.* 3, *p.* 78, 79.)

This last circumstance is very much insisted upon, by all the modern continental surgeons; but the doctrine has never gained ground amongst English surgeons, who entertain little apprehension of the bad effects of the absorption of putrid matter in cases of mortification; and the opinion of Mr. Guthrie may be more correct, that nature receives the shock through the nervous system, and not through the absorbents.— (*On Gunshot Wounds, p.* 123, *Ed.* 2.)

The idea of a deleterious principle being absorbed was long ago well refuted by Mr. J. Burns, who pointed out, that the impression upon the constitution was in no degree commensurate with the size of the slough, and consequently with the quantity of putrid matter, as the effects produced by a small slough of intestine, or cornea, will exemplify. But when the sloughs are of equal size, and in the same parts, the differences of constitutional sympathy, as Mr. James observes, may depend upon the nature of the surrounding inflammation, which, however, he conceives, may itself be affected by the quantity of putrid irritating fluids. (*On Inflammation, p.* 98.)

The danger of sphacelus materially depends upon the size and importance of the part affected, and upon the patient's age and constitution. The indications already pointed out, of the stoppage of mortification, must also considerably influence the prognosis, especially the red line at the edge of the living parts, and the incipient separation of the dead from the living parts.

Sphacelus implies the total loss of life in the part affected, the destruction of its organization, the abolition of all its functions, and an absolute inability to resume them again. However, even when we see the surface of a part manifestly sphacelated, we must not always conclude, that the entire destruction of its whole substance or thickness is certain; for, in many cases, the disorder only affects the skin and cellular substance. In this state, the integuments frequently slough away, leaving the tendons, muscles, and other organs perfectly sound.

TREATMENT OF MORTIFICATION.

I shall arrange under two heads what is to be said of the treatment of mortification. Under the first, will be comprehended every thing, which relates to internal remedies, and such other means, as are indicated by the general state of the system; under the second, topical remedies, and the local treatment of the parts affected.

In the treatment, the surgeon will always have one thing for immediate consideration; viz. whether the case before him is one of acute mortification, attended with inflammation and inflammatory fever; or whether it is a chronic mortification, beginning without fever, or attended with a fever of a typhoid nature and great prostration of strength? By making up his mind upon this point, the practitioner will establish a useful general principle for his guidance, especially in the commencement of the treatment.

1. When mortification is acute, and seems to depend on the violence of inflammation, the first indication is to moderate the inordinate action of the sanguiferous system, by the prudent employment of such means as are proper for counteracting inflammation. In short, relief is to be sought in the antiphlogistic regimen, which consists in the employment of blood-letting, purgatives, diaphoretics, and diluents, and in abstinence from all vegetable, or animal substances, which have a tendency to excite, or to augment the febrile action. This regimen must be pursued as long as inflammatory fever continues. It is only in cases in which the fever, from the first, assumes a typhoid character, or where the mortification takes place without the previous occurrence of fever, that any deviation from the antiphlogistic regimen can be allowed.

Dr. Thomson, from whom I have borrowed the foregoing passage, also notices the present common aversion to bleeding in compound fractures, erysipelas, carbuncle, hospital gangrene, burns, and frost-bite; cases in which the patient, it is said, can seldom bear with impunity any considerable loss of blood. "In many instances of these injuries and affections (says he) blood-letting, I know, is not required; but I am doubtful, even if it were generally employed, whether it would produce all the mischiefs, which have of late years been ascribed to it. I believe it to be the most efficacious of any of the remedies that can be employed, in all cases of inflammatory fever threatening to terminate in gangrene, and that its use in such cases ought never to be omitted in the young, strong, and plethoric." (See *Lectures on Inflammation*, *p.* 559.) When bleeding has not been sufficiently practised, during the inflammation antecedent to mortification; when the general symptoms, which point out the existence of this state, continue violent; and, especially, when the pulse is still quick, hard, or full; it is absolutely necessary to empty the vessels a little more, even though mortification may have begun, particularly, if the patient be young and plethoric. Bleeding, by diminishing the fever, and abating the general heat, is frequently the best means of all. It may then be considered better, than all antiseptics, for stopping the progress of the disorder. But this evacuation is to be employed with a great deal of circumspection; for, should it be injudiciously resorted to, from the true state of the system not being understood, the error may be followed by the most fatal consequences. Owing to the constitution being generally broken by intemperance, or enfeebled by an impure atmosphere, Sir A. Cooper considers it rarely safe in this metropolis to take blood from the arm, with the view of checking gangrene; though he acknowledges, that the removal of a few ounces of blood is a practice, which sometimes answers in the country. It should also be well remembered, that however strongly bleeding may be indicated, the moment is not far off, when this evacuation is totally inadmissible, especially if the mortification make much progress.

In cases of acute mortification, after as much blood has been taken away as may be deemed safe or proper, the other parts of the antiphlogistic regimen must be continued, as long as any increased action of the heart and arteries continues. "The use of purgatives seems to be particularly required in those cases, in which the local inflammatory affection is accompanied with derangement of the digestive and biliary organs. Antimonial diaphoretics are those, from which I should be inclined to expect most advantage in the commencement of the attack; but, after the inflammatory action has been subdued, opiates, either alone, or combined with antimony, or what is still better, with ipecacuanha, as in Dover's powder, are frequently of singular service, not only by diminishing pain, but also, by inducing a soft and moist state of the skin." (*Thomson, p.* 560.) A strict regimen, which may have been useful and even necessary, during the inflammatory stage, may have a very bad effect, if continued too long, by diminishing the patient's strength, which, on the contrary, should be supported by the most nourishing food.

Sir A. Cooper recommends two or three grains of the submuriate of mercury at night, in order to restore the secretions of the intestinal canal and liver; and the liquor ammoniæ acetatis, with a few drops of the tinct. opii, several times a-day, with the view of lessening irritability, and tranquillizing the system.

A vegetable diet, as Dr. Thomson observes, is to be preferred in the commencement both of acute gangrene with inflammatory fever, and of chronic gangrene with a fever from the first of a typhoid nature. Wine and animal food given too early in diseases, which have a tendency to gangrene, increase the febrile heat and frequency of the pulse, oppress the stomach, render the tongue foul, the patient restless and delirious, and his situation dangerous, if not hopeless. In the transition from gangrene to sphacelus, an abatement of the symptomatic fever usually takes place in almost all cases, which have ultimately a favourable termination. Dr. Thomson believes, that *this is the first period, at which it is safe to allow vinous liquors, or diet, chiefly animal.* (*P.* 561.)

I next come to a second very essential and important indication to be fulfilled, as soon as the symptoms, announcing the existence of the inflammatory state, appear to abate, and the patient begins to be debilitated. This indication is *to prevent excessive weakness by the suitable employment of cordials, and, particularly, of tonics.* These same means also contribute to place the system in a proper state for freeing itself from the mortified parts, or in other words, for detaching them. For, inflammation is the preparatory step, which nature takes to accomplish the separation of mortified parts from the living ones, and this salutary inflammation cannot take place, if the energies of life be too much depressed.

In order to fulfil the above indication, it is necessary to prescribe a nourishing diet, with a certain quantity of good wine, proportioned to the patient's strength, and the symptoms of the complaint. This diet is generally productive of more real benefit, than the whole class of cordial and stimulating medicines. However, when the patient is much weakened, when the mortification of the part affected is complete, and the disorder is spreading to others, some of the following remedies may be ordered: ammonia, aromatic confection, æther, &c. In general, however, wine is best, because more agreeable than cordials; and for this purpose, one ought to prefer the most perfect wines, such as those of Spain and Madeira.

Of all the medicines, hitherto recommended for the stoppage of mortification, none ever acquired such a character for efficacy, as the Peruvian bark. It is said, that this remedy often stops, in a very evident and expeditious manner, the course of the disorder. Being a very powerful tonic, it is thought to operate by strengthening the system, and thus maintaining in every part the necessary tone for resisting the progress of mortification. But, whatever may be its mode of acting, the advocates for this medicine contend, that it ought to be employed in almost all cases of mortification, as soon as the violence of the inflammatory symptoms has been appeased.

It was Mr. Rushworth, a surgeon at Northampton, who made this discovery in the year 1715. Amyand and Douglas, two surgeons in London, soon afterwards confirmed the virtue of this remedy. Mr. Shipton, another English surgeon, also described, in the Philosophical Transactions, the good effects which he saw produced by it. In the Medical Essays of Edinburgh, Drs. Monro and Paisley published several cases, illustrative of its efficacy. We are there informed, that when its exhibition was interrupted, the separation of the eschars was retarded, and that, on the medicine being resorted to again, the separation went on again more quickly. Since this period, all practitioners, in England and elsewhere, have employed bark very freely in the treatment of mortification; and the exaggerated statements of its effects led to its exhibition in all cases of this nature, without discrimination of the varying states of the general health and local disorder, in the different stages of the complaint, and without any reference to its causes and nature, which are subject to variety.

We cannot indeed doubt, that bark has frequently had the most salutary effect, in cases of mortification, though sometimes it may probably have had imputed to it effects, which were entirely produced by nature. The following observation, made by Dr. Thomson, is highly worthy of recollection: "In attending to the effects, supposed to result from the operation of the external and internal remedies, which are daily employed for the cure of mortification, there are two facts, well ascertained, which appear to me to be peculiarly deserving of your regard. The first of these is, that mortification often stops spontaneously, without any assistance whatever from medicine; the second, that it often begins, and continues to spread, or even, after it has stopt for a while, recommences and proceeds to a fatal termination, in spite of the best directed efforts of the healing art." (See *Lectures on Inflammation, p.* 557.)

It is quite wrong to prescribe bark, in every instance; for there are many cases, in which it is unnecessary; some, in which it does harm; and others, in which it is totally inefficacious. It is a medicine obviously of no service, when the mortification arises from an external cause, and is the only complaint, in a healthy, strong constitution. It is equally unnecessary, when the sphacelus is of the dry sort, and has ceased to spread, at the same time, that the living margin appears to be in a state of inflammation, without any universal debility. But it deserves particular notice, that the circumstances of each individual case are liable to so considerable variation, that though bark may be at first unnecessary, it may afterwards be indicated.

When mortification is complicated with serious disorder of the functions of the abdominal viscera, a very frequent case, bark is manifestly pernicious. Here, the indication is to correct the state of the stomach and bowels, with mild opening medicines, and especially calomel. When this has been done, if bark should be indicated by any of the circumstances, already pointed out, it may be safely administered.

Sometimes, mortification is accompanied with a low typhoid kind of fever, which, whether the cause, or the consequence of the local mischief, may require the exhibition of bark.

However, mortification may be attended with common inflammatory fever, and then the living margin is generally inflamed and painful. This is particularly the case, when mortification is the consequence of genuine acute inflammation, or of an external injury, in a healthy subject. Here, bark must obviously be injurious. Still, it is wrong to regard this medicine as invariably hurtful, whenever sphacelus is the effect of inflammation. It has already been observed, that the inflammation frequently has less share in the origin of the disorder than some incidental cause, which often requires the exhibition of bark. Even when mortification is the pure effect of inflammation, great prostration of strength may subsequently arise, and indeed does mostly take place at a certain period of the disorder. In this circumstance, the voice of experience loudly proclaims the utility of bark, though its exhibition would have been at first useless or hurtful. While genuine inflammatory fever, and local inflammation, are coexistent with mortification, antiphlogistic means are undoubtedly useful; but, great caution is requisite, since, in cases of humid gangrene, as it is termed, the inflammatory state very soon changes into one, in which the great feature is prostration of strength.

When there is mere prostration of strength, without any symptom of gastric disorder, or of inflammation, or typhoid fever, bark is evidently proper, though seldom effectual alone; diaphoretic, and nervous medicines being also proper, opium, wine, camphor, ammonia, brandy, &c.

We meet with one species of mortification, in which the patient experiences severe pain in the part, without the smallest appearance of inflammation. Here bark is never of any use, and opium is regarded as the only medicine of much efficacy. This subject will be more fully considered presently, when Mr. Pott's remarks on a peculiar mortification of the toes and feet will be introduced.

Bark sometimes occasions purging, and then it must be immediately discontinued, unless that hurtful effect can be prevented by the addition of a few drops of laudanum to each dose, or by employing the sulphate of quinine, instead of the common preparations. Bark frequently disagrees with the stomach; in which case, I should say, that it ought not to be continued at all; though, in this circumstance, the usual plan has been to give, instead of the decoction, the infusion, or the powder finely divided, and mixed with wine, or some aromatic water. Here the sulphate of quinine is likely to prove the safest preparation of bark; but, further experience, with respect to its real efficacy, is still needed.

Several years ago I published a critique on the indiscriminate employment of bark in cases of mortification, and my remarks were inserted in the article *Gangrene* in *Dr. Rees's Cyclopædia.* Many of them were introduced into the 2d edition of this Surgical Dictionary, printed in 1813. (See *Cinchona.*) Since this period, I am happy to find, that the blind enthusiasm, with which bark was prescribed, is beginning to subside, and that, on this subject, some eminent surgeons have of late publicly avowed sentiments, which entirely coincide with my former statements. "I think (says Dr. Thomson) I have frequently seen it prove hurtful, when administered in cases of mortification, by loading the stomach of the patient, creating a dislike to food, and sometimes by exciting an obstinate diarrhœa. *I believe it to be, in mortification, a medicine completely inert and inefficacious.*" (See *Lectures on Inflammation, p.* 563.) By this expression, Professor Thomson does not mean to say, that bark can never be useful in cases of mortification, but only that it has no specific power in checking the disorder, as many have erroneously inculcated.

"Bark (says Professor Boyer) has been considered by several distinguished English practitioners, as a true specific against gangrene in general, and especially against that, which depends upon an internal cause; but, subsequent observations to those published in England have proved, that it has no power over the immediate cause of gangrene, and that it only acts as a powerful tonic in stopping the progress of the disorder, and promoting the separation of the mortified parts." (See *Traité des Maladies Chir. T.* 1, *p.* 151. *Paris*, 1814.) Boyer also particularly objects to bark being given while inflammatory fever prevails; but, whenever he prescribes bark in cases of mortification, he seems to entertain the old prejudice of expecting benefit in proportion to the quantity which can be got into the stomach. On the contrary, Mr. Guthrie declares, that he has not found bark useful, "further than as a tonic, and given in such quantities as not to overload the stomach," (*On Gunshot Wounds, p.* 148, *Ed.* 2;) a plan, which I have always recommended. For further observations on bark, the reader is referred to the article *Cinchona.*

Sometimes, sulphuric acid may be advantageously given with bark, and the best method of exhibiting it is to acidulate with it every thing which the patient drinks. Other acids are also sometimes used for the same purpose.

Carbonic acid gas is another remedy of the highest efficacy in cases of chronic mortification. It has even been known to produce highly beneficial effects when bark has been of no service. Water impregnated with it may be recommended, as common drink.

Hospital gangrene is a case, for which bark has been much recommended. The best mode of treating this particular case, however, has been detailed in a separate article. (See *Hospital Gangrene.*)

A third indication, which should be observed together with the second, or which should even precede it in many instances, is *to lessen the irritability and sufferings of the patient, by the use of opium.* Attention to this desideratum frequently contributes more, than any thing else, to stop the progress of the disorder, and is often indispensable, in order to promote the operation of other remedies. In all cases of mortification, every thing which heats, irritates, or adds to the patient's sufferings, appears, in general, to augment the disorder, and increase the rapidity of its progress. On the other hand, every thing which tends to calm, assuage, and relax, frequently retards the progress of mortification, if it produce no greater good. The pain also, which is a constant mark of too much irritation, contributes of itself to increase such irritation, and, in this double point of view, we cannot do better, in the majority of cases, than endeavour to appease it by the judicious and liberal use of opium. When the inflammatory stage evidently prevails, this medicine may be conjoined with antiphlogistic remedies, such as the nitrate of potassa, antimony, &c. In other instances, attended with debility, it may be given with bark and cordials.

Mr. Pott has described a species of mortification, for which bark is most frequently ineffectual, and opium the remedy which is to be depended upon. The case here alluded to, is very unlike the mortification from inflammation, that from external cold, from ligature, or bandage, or from any known and visible cause, and this as well in its attack as in its progress. In some few instances, it makes its appearance with little or no pain; but, in the majority of the cases, the patients feel great uneasiness through the whole foot and joint of the ankle, particularly in the night, even before these parts show any mark of distemper, or before there is any other, than a small discoloured spot on the end of one of the little toes.

It generally makes its first appearance on the inside, or at the extremity, of one of the smaller toes, by a small black or bluish spot; from this spot the cuticle is always found to be detached, and the skin under it to be of a dark red colour.

If the patient has lately cut his nails, or corn, it is most frequently, though very unjustly, set to the account of such operation.

In some patients, it is slow and long in passing from toe to toe, and from thence to the foot and ankle; in others, its progress is rapid, and horridly painful: it generally begins on the inside of each small toe, before it is visible either on its under or upper part; and when it makes its attack on the foot, the upper part of it first shows its distempered state, by tumefaction, change of colour, and sometimes by vesication; but wherever it is, one of the first marks of it is a separation or detachment of the cuticle.

Each sex is liable to it; but, (says Mr. Pott) "for one female in whom I have met with it, I think I may say, that I have seen it in at least twenty males. I think also that I have much more often found it in the rich and voluptuous, than in the labouring poor; more often in great eaters, than free drinkers. It frequently happens to persons advanced in life, but is by no means peculiar to old age. It is not, in general, preceded or accompanied by apparent distemperature either of the part, or of the habit. I do not know any particular kind of constitution which is more liable to it than another; but as far as my observation goes, I think that I have most frequently observed it to attack those who have been subject to flying uncertain pains in their feet, which they have called gouty, and but seldom in those who have been accustomed to have the gout regularly and fairly. It has, by some, been supposed to arise from an ossification of vessels; but for this opinion I never could find any foundation but mere conjecture.

In this article I have already stated the observations of Cowper, Dr. Thomson, and Mr. Hodgson, upon the ossified state of the arteries in this species of mortification. The facts, recorded by the two latter writers, at least prove, that the opinion is founded, not upon mere conjecture, as Mr. Pott alleges, but upon actual observation and experience.

In this particular kind of mortification, Mr. Pott found bark, used internally or externally, by itself, or joined with other medicines, completely ineffectual.

Mr. Pott afterwards relates the first cases in which he gave opium. His plan was generally to give one grain every three or four hours; but never less than three, or four grains, in the course of four-and-twenty hours. Mr. Pott, however, did not propose opium, as a universal infallible specific: but only as a medicine, which would cure many cases, not to be saved by bark.

The observations of Mr. Pott on the local treatment of these cases are of great practical importance: no part of his writings has a stronger claim to attention.

"I have found (says he) more advantage from frequently soaking the foot and ankle in warm milk, than from any spirituous, or aromatic fomentations whatever; that is, I have found the one more capable of alleviating the pain, which such patients almost always feel, than the other; which circumstance I regard as a very material one. Pain is always an evil, but, in this particular case, I look upon it as being singularly so. Whatever heats, irritates, stimulates, or gives uneasiness, appears to me always to increase the disorder, and to add to the rapidity of its progress; and, on the contrary, I have always found, that whatever tended merely to calm, to appease, and to relax, at least retarded the mischief, if it did no more.

"The whole plan of the chirurgic treatment of this disease is founded on a general idea of warming, invigorating, stimulating, and resisting putrefaction; and the means generally made use of are very proper for such purpose: but I must own that I think the purpose, or intention, to be improper."

Mr. Pott afterwards observes: "Cases exactly similar, in all circumstances, are not to be met with every day, but I am from experience convinced, that of two, as nearly similar as may be, in point of pain, if the one be treated in the usual manner, with a warm, stimulating, cataplasm; and the other only with a poultice made of the fine farina seminis lini, in boiling milk or water, mixed with ung. sambuc. or fresh butter, that the pain, and the progress of the distemper, will be much greater and quicker in the former than in the latter.

"When the black or mortified spot has fairly made its appearance on one or more of the toes, it is the general practice to scarify or cut into such altered part with the point of a knife or lancet. If this incision be made merely to learn whether the part be mortified or not, it is altogether unnecessary, the detachment of the cuticle, and the colour of the skin, render that a decided point: if it be not made quite through the eschar, it can serve no purpose at all: if it be made quite through, as there is no confined fluid to give discharge to, it can only serve to convey such medicines as may be applied for the purpose of procuring digestion to parts capable of feeling their influence, and on this account they are supposed to be beneficial, and therefore right.

"When the upper part of the foot begins to part with its cuticle and to change colour, it is a practice with many to scarify immediately; here, as in the preceding instance, if the scarifications be too superficial, they must be useless; if they be so deep as to cause a slight hemorrhage, and to reach the parts which have not yet lost their sensibility, they must do what indeed they are generally intended to do, that is, give the medicines, which shall be applied, an opportunity of acting on such parts.

"The medicines most frequently made use of for this purpose are, like the theriaca, chosen for their supposed activity; and consist of the warm, pungent oils and balsams, whose action must necessarily be to stimulate and irritate: from these qualities they most frequently excite pain, which, according to my idea of the disease, is diametrically opposite to the proper curative intention; and this I am convinced of from repeated experience.

"The dressings cannot consist of materials which are too soft and lenient; nor are any scarifications necessary for their application. But I would go farther and say, that scarifications are not only useless, but, in my opinion, prejudicial, by exciting pain, the great and chiefly to be dreaded evil in this complaint. The poultice should be also soft, smooth, and unirritating; its intention should be merely to soften and relax; it should comprehend the whole foot, ankle, and part of the leg; and should always be so moist or greasy as not to be likely to become at all dry or hard, between one dressing and another."

Sir A. Cooper prefers to emollient applications a poultice, composed of port wine and oatmeal, or that made with stale beer grounds.

When the toes are, to all appearance, perfectly mortified, and seem so loose as to be capable of being easily taken away, it is, in general, thought right to remove them. But, however loose they may seem, if they be violently twisted off, or the parts, by which they hang, be divided, a very considerable degree of pain will most commonly attend such operation, which therefore had much better be avoided; for Mr. Pott has seen this very pain, thus produced, bring on fresh mischief, and that of the gangrenous kind.

If the patient does well, these parts will certainly drop off; if he does not, no good can arise from removing them.

When the disorder is attended with a great deal of irritation, many subsequent practitioners have attested the efficacy of opium; though it has not always had the same success in their hands, when the mortification depended chiefly on constitutional debility. Dr. Kirkland observes, that we must be careful not to force the doses, especially at first; and that the medicine does more harm than good, when its soporific effects go so far as to occasion delirium, take away the appetite, or cause affections of the heart. Sir A. Cooper joins opium with ammonia.

Some authors recommend camphor. Pouteau attributes considerable efficacy to it, when given in the dose of five grains, with a double quantity of nitre, every four hours.

Few surgeons of the present day believe, that opium possesses as much power in the preceding cases, as Mr. Pott represented. While Dr. Thomson allows, that opium is much more entitled to the attention of practitioners than bark, as a useful medicine in the treatment of mortification, yet, "in saying so much in favour of opium, (he observes,) I would not by any means have you to place the same reliance on its powers for stopping, even the mortification of the toes and feet in old people, which appears to have been done by Mr. Pott. From the trials, which I have made, and which I have seen made by others, I cannot allow myself to believe, that its powers in stopping this particular sort of mortification are greater, than in stopping any other form, or variety of the disease. It is obvious, however, from Mr. Pott's account, that his mind was strongly impressed with a very different opinion. His opinion seems to me to have been formed from the results of a very small number of cases, and in complete forgetfulness of the invaluable observations of his preceptor Mr. Sharp, with regard to the frequent spontaneous stoppage of mortification in cases in which no medicines whatever are used." (See *Thomson's Lectures on Inflammation, p.* 568.)

2. With respect to the external, or local treatment of mortification, the first indication consists in removing, if possible, such external causes, as may have occasioned, or kept up the disorder; as the compression of bandages, ligatures, tumors; all irritating substances, &c.

When mortification arises from inflammation, which still prevails in a considerable degree, it is evident, that the dead part itself only claims secondary consideration, and that the principal desideratum is to prevent the mortification from spreading to the living circumference, by lessening the inflammation present. Hence, under such circumstances, the application of linen, wet with the saturnine lotion, and the maintenance of a continued evaporation, from the inflamed parts surrounding the mortified flesh, must be just as proper as if the mortification itself did not exist, and were quite out of all consideration.

It has been justly remarked by an eminent man, (*Hunter*) that the local treatment of mortification, (meaning that in consequence of inflammation) has been as absurd as the constitutional; scarifications have been made down to the living parts, in order that stimulating and antiseptic medicines might be applied to them; such as turpentines, the warmer balsams, and sometimes the essential oils. Warm fomentations have been also applied, as being congenial to life; but, warmth always increases action, and should, therefore, be well adjusted to the case; for, on the other hand, cold debilitates or lessens powers, when carried too far, though it first lessens action. Stimulants are likewise improper, as the actions are already too violent. It is proper to keep the parts cool, and all the applications should be cold. In cases of mortification, from inflammation, good effects have also been seen to arise from the topical, as well as internal employment of opium.

But it must be acknowledged, that however proper the employment of cold applications may be in principle, in cases of mortification, attended with inflammation, fomentations and emollient poultices are most commonly preferred in practice.

Besides common poultices, there are several others, which have acquired great celebrity, as topical applications in cases of mortification. Of this kind are the cataplasma carbonis*, cataplasma cerevisiæ†, and the cataplasma effervescens‡.

These local remedies are, perhaps, in nine cases out of ten, superior to all others.

With respect to stimulating, and spirituous applications, such as brandy, spirit of wine, balsams, resins, and aromatic substances, which have been recommended by a vast number of authors, they are almost entirely laid aside by modern practitioners. Though such things are indeed really very useful in preserving dead animal substances from becoming putrid, a very little knowledge of the animal economy is requisite to make us understand, that they cannot act in this manner on parts still endued with vitality; but, on the contrary, that they must have highly prejudicial effects, in the cases under consideration, by reason of the violent irritation, which they always excite, when applied to the living fibres. It may now and then, however, be justifiable to apply spirituous applications to the dead parts themselves with a view of diminishing the fetid effluvia, which, by contaminating the air, have some share in injuring the patient's health; but the greatest care is requisite to keep these stimulants from coming into contact with the living surfaces around, and beneath, the sloughs.

There are a few surgeons, however, who still place confidence in certain stimulating applications. "In the less acute and more chronic cases of gangrenous inflammation, as in malignant erysipelas and carbuncle, in the gangrene of the toes and feet of old people, in the sphacelating state of hospital gangrene, and in severely contused wounds, in which gangrene and sphacelus have supervened, the emollient poultice, which is applied to promote the separation of the dead parts, may have an addition made to it of a greater or less quantity of the unguentum resinosum, or even of oil of turpentine itself. In the more severe of these cases, where we have reason to dread the extension of the sphacelus, warm dressings, as they have been termed, which are formed by dipping pledgets of charpie in a mixture of equal parts of the unguentum resinosum and oil of turpentine, may be applied, of a temperature as hot as the patient can bear without pain; and over these we may lay an emollient poultice, of a large size and soft consistence.

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* Prepared by mixing about ℥ij. of finely powdered wood-charcoal with half a pound of the common linseed poultice.

† Prepared by stirring into the grounds of strong beer as much oatmeal, as will make the mass of a suitable consistence.

‡ Prepared by stirring into an infusion of malt, as much oatmeal, as will render the substance of a proper thickness, and then adding about a spoonful of yeast.

"After the sphacelus stops, and the process of ulceration begins in the inflamed line of contact, between the dead and living parts, it will often be found, that the turpentine dressings are too stimulating, and occasion a considerable degree of pain. When this happens, we must either diminish the quantity of the turpentine in the dressings, or remove it altogether, according to circumstances. Besides the pain, a considerable extension of the ulceration would be, in general, the effect of continuing these applications after they begin to produce uneasiness. The ulcerating surface is, in the progress of separation, liable to pass under every mode of treatment, into the state of a painful and irritable ulcer; and in this state, it may require to be treated with decoctions of poppy heads, or with the application of the turnip, carrot, fresh hemlock leaf, stale beer, fermenting, poultices, &c." (See *Thomson's Lectures, p.* 577, 578.)

Hospital gangrene is undoubtedly a case, that requires powerful applications, like Fowler's solution of arsenic, or the undiluted mineral acids; and, in Guy's Hospital, phagedenic sloughing ulcers are usually treated by Sir A. Cooper with the nitric acid lotion, 50 drops to a pint of water, and the internal exhibition of the subcarbonate of ammonia. He speaks also of a port wine poultice as an excellent application. The cases also termed sloughing phagedœna by Mr. Welbank, and considered by him as analogous to hospital gangrene, may be cured by dressing them with the undiluted nitric acid. (See *Hospital Gangrene.*) I conceive, that it has only been in hospital gangrene, and other cases of sloughing phagedenic ulcers, that various acids, diluted, or undiluted, other caustic substances, and the actual cautery, have proved really serviceable. The muriatic acid, diluted with six times its quantity of water, was particularly recommended by Van Swieten, who applied it after making scarifications. In this manner, he stopped a sloughing disease extending all over the scrotum and penis. This author strongly recommends the same topical application to the sloughy state of the gums in cases of scurvy. In this kind of case, he mixed the muriatic acid with honey, in various proportions; sometimes, he even employed the pure acid itself for touching the parts, which were likely to slough. It is also by supposing, that the diseases, referred to, were of a phagedenic character, that I account for the good effects, imputed by Dr. Kirkland and others, in cases of mortification, to another still more active caustic, namely, a solution of mercury in nitrous acid, with which the edges of the living flesh were touched. At all events, if the diseases were common cases of sloughing, I infer, that such remedies were not really necessary, and that nature triumphed both over the disease and the supposed remedy. The following is a case, related by Dr. Kirkland:

A man met with a fracture of the fore-arm, and the ends of the bones projected through the integuments. The fracture was very expeditiously reduced; but at the end of five or six days, the whole arm seemed to be completely mortified up to the shoulder. Amputation was performed as near the joint as possible, and the stump, which had mortified as far as the acromion, was cauterised. The following day, the mortification had reached the inferior extremity of the scapula. A little of the solution of mercury in nitrous acid was now applied, by means of a probe, along the edges of the parts affected, and from this moment the disorder made no further progress. This cauterizing was repeated every day, for seventeen or eighteen days. The sloughs, and even the scapula itself, were detached, and the patient got well.

On the Continent, liquid caustics are sometimes used as topical applications to gangrenous diseases, more especially, however, in cases of hospital gangrene, and malignant carbuncle. Of this last disorder, Larrey has recorded a very dangerous example, in which he effected a cure by first cutting away as much of the sloughs as possible, and then applying to the disorganized surface underneath liquid caustics. Under the use of emollients, two persons had already fallen victims to the disease in the same family. (See *Mém. de Chir. Militaire, T.* 1, *p.* 53.)

With respect to the actual cautery, Celsus recommended it to be applied to the line, which separates the dead parts from those which are still living, whenever medicines, and, particularly, topical emollient applications failed in stopping the progress of the disorder. Pouteau ventured to revive this practice, which had been entirely exploded from modern surgery, and he was of opinion, that the method would have the most beneficial effects, in cases of erysipelatous gangrene, which is so often seen in hospitals, in consequence of wounds. For this purpose, he recommends cauterizing chiefly the edges of such parts as are of a dark red colour, and are on the point of perishing; and he advises this to be done with a heated iron, or boiling oil, and to repeat the cauterizing of the dead parts, at every time of dressing them, until the sensation of heat is even felt with a certain degree of force in the sound parts. The whole of the affected part is afterwards to be covered with a large emollient poultice.

Pouteau relates a case of anthrax, which took place on a woman's cheek, and which he cured in the above manner. The tumor, which, on the third day, was quite black, and as large as a walnut, was accompanied by an erysipelatous œdema, which extended over the whole cheek, eyelids, and front of the neck. Pouteau, after having opened the tumor in different directions with a lancet, introduced the red hot cautery, and repeated the application several times, until the heat was felt by the sound flesh. The patient felt herself very much relieved immediately after this had been done; an oppressive head-ach, and a very afflicting sense of strangulation, which she had before experienced, were got rid of, and, in ten days more, the slough was detached on the occurrence of suppuration. (*Encyclopédie Méthodique, Partie Chirurgicale, Art. Gangrene.*)

But, perhaps, of all the species of mortification, hospital gangrene is that, for which the use of caustics and the actual cautery itself has had the most numerous and respectable advocates. The heated iron is even now employed by the first surgeons of Paris for this particular case. (See *Sketches of the Medical Schools of Paris by J. Cross, p. 84, and Hospital Gangrene.*)

The foregoing observations are introduced into this work, that the reader may not be left entirely ignorant of what violent measures have been adopted in cases of mortification, and the account is not given, in order that such practice may be again imitated, with the exception perhaps of certain cases of phagedœna and hospital gangrene, cases, in which the most powerful local applications seem indispensable. (See *Hospital Gangrene*, and *Nitric Acid.*) The common employment of these terrible applications, viz. the actual cautery, the undiluted mineral acids, and boiling oils, is as unscientific, and unnecessarily painful, as it is unproductive of any essential good. The grand object in almost every case of mortification, is to diminish the irritation of the parts in immediate contact with those already dead. This is indicated, lest the parts still alive, and so situated, should experience the same fate, as the contiguous ones. In most of the other cases specified by Dr. Thomson, my experience leads me to prefer emollient soothing applications, none of which are stronger than the cataplasma carbonis, or the stale beer, fermenting, hemlock, or carrot poultices. When the process, by which a slough is detached, is somewhat advanced, I have seen a weak solution of the extract of opium in water put under the emollient poultice, along the line of separation give considerable ease, at the same time, that it seemed to promote the changes, by which the dead parts were loosened.

In the gangrene, produced by pressure and weakness in persons, who are compelled by diseases and injuries to lie for weeks and months in one posture, the mode of treatment is a matter of extreme importance, and frequently makes the difference of life, or death, to the poor sufferer. This affection usually has its seat in parts, which are but thinly covered with muscular flesh. It occurs towards the latter stages of long continued febrile diseases, as after typhus, or hectic fever, attended with tedious suppurations; or even without these fevers, as in paralysis, and in very bad compound fractures. However, as Dr. Thomson observes, there are two forms of disease, arising from pressure, which have not always been accurately discriminated. One of these is the preceding sort of sloughing; the other is a chafed, excoriated, and ulcerated state of the parts.

Sometimes uncleanliness tends to cause this sort of mortification, that is, when the urine wets the patient's clothes. When this is the case, such irritation must be prevented by every possible means. If the skin be excoriated and broken, the powder of tutty, or lapis calaminaris, should be sprinkled over the part; or if an ointment be required, says Dr. Thomson, those, which contain zinc or lead, are the best. But, when the ulceration threatens to extend, these remedies are to be laid aside, and an emollient, hemlock, carrot, or fermenting poultice used. (*P.* 580.) I have seen in the irritable state of such ulceration, the solution of opium under a common linseed poultice do more good, than any other application.

Sir A. Cooper recommends the application of turpentine. Sometimes he uses a mixture of vinegar and camphorated spirit.

But no topical remedies will in any of these cases avail, unless the chief cause of the disorder be removed. This is to be effected by change of position, and laying pillows and cushions of the softest materials in convenient places under the patient; not directly under the disease itself, but in situations, where they will tend to raise the parts affected from the contact of the bedding. A circular hollow pillow will often accomplish this important object; but, when possible, an entire change of posture is to be preferred.

When sphacelus succeeds to gangrene from pressure, I have often seen camphorated spirit applied; but never with decided advantage. A common emollient poultice, and in very bad cases, the topical use of the solution of opium along the living margin, are the means, upon which I place most reliance, care being taken to improve the general health, without which grand indication, neither the removal of the pressure, nor the virtues of any dressings, will answer. Dr. Thomson speaks most highly of the fermenting poultice, which I believe to be in these cases an excellent application. He confesses, however, that he has sometimes found it too stimulating, and been obliged to substitute the simple emollient, carrot, or turnip poultice. (*P.* 580.)

When mortification arises from cold, every sort of warm emollient application must be avoided, and cold water, or even snow, or ice, employed. (See *Chilblains.*)

The local treatment of the mortification of the toes and feet, as described by Mr. Pott, has been already considered, and is that to which my observations incline me to give the preference.

The gangrenous affection of the pudenda, to which female children are liable, was successfully treated by Mr. K. Wood, by applying the liquor plumbi acet. dilutus in a tepid state, and bread poultices made with the same lotion. As soon as the ulcers became clean, they were dressed with the unguentum zinci. (See *Med. Chir. Trans. Vol.* 7.) Other cases, which also ended well, have been dressed with lint, dipped in camphorated spirit, and covered with a poultice; or, at first, poultices made with the opium lotion, and, after the separation of the sloughs, the ulcer was dressed with port wine and decoction of bark in equal proportions. In some cases, however, mild stimuli proved injurious. (*James on Inflammation, p.* 289.)

Deep scarifications in the integuments. The majority of authors who treat of mortification recommend this plan in all cases. They even advise the incisions to be made down to the sound parts, in order to facilitate the application of topical stimulants, and to favour the operation of the supposed antiseptic qualities of these dressings. But, with the exception of cases, in which the gangrenous parts lie under an aponeurosis, or others, in which the integuments which have escaped destruction, cover a mixture of matter and sloughy cellular substance, either in consequence of foregoing inflammation, or any other cause, such as the extravasation of urine in the scrotum, all scarifications, which penetrate as far as the living parts, are often productive of the most serious mischief, instead of advantage. Such incisions cannot be practised, without occasioning a great deal of pain, and producing inflammation, which often makes the mortification spread still further. But, as parts, which are in a complete state of sphacelus, are absolutely extraneous substances, in regard to those which still retain their vitality, all such portion of them as is already loose should be removed. By lessening the size of the putrid mass, the fetor is diminished, an outlet may sometimes be made for the escape of a great deal of putrid discharge, which, being confined, might have a bad effect on the neighbouring living parts; and the latter are enabled to free themselves more easily from the rest of the sloughs.

The too common practice of accelerating, with a cutting instrument, the separation of the mortified parts, previously to the completion of the process, by which nature breaks the connexion between them and the living flesh, in general ought to be strongly reprobated, as causing unnecessary pain, and irritation, and creating the risk of a renewal of the sloughing. As far as my experience goes, gangrenous phagedœna is the only instance, in which it seems useful to remove the sloughs, before they are loose, so as to let the topical applications extend their action without delay to the subjacent living surface. (See *Hospital Gangrene.*) Pott's sentiments with respect to the danger and inutility of cutting the tendons and ligaments, in the mortification of the toes and feet, have been already stated.

If the surgeon prudently let nature work, without disturbing her, the separation of the mortified from the living parts will soon follow the establishment of inflammation and suppuration at the edges of the slough.

But, when the whole thickness of a limb is affected with mortification, ought the surgeon to leave things to nature? or ought he to have recourse to amputation?

In general, the performance of amputation is indispensable; not that nature would not in many instances detach the sphacelated part; but, because a great length of time would be required for the completion of the process, and a serviceable stump would rarely be left.

Another important question then arises, should the surgeon amputate, while the mortification is in a spreading state? Or ought he to defer the operation, until the line of separation begins to form between the dead and living parts.

In the mortification of the toes and foot, in old persons, Sir A. Cooper forbids amputation whether there be healthy granulations or not, and he declares that if the operation be done, mortification of the stump, and the patient's death will certainly follow.

" Amputation (says a distinguished professor) was long regarded as one of the most effectual means which could be employed to prevent the extension of gangrene. This practice, however, has not received the sanction of experience; on the contrary, it has been generally found, wherever it has been practised, in either acute or chronic gangrene, to accelerate much the progress of the disease; and, in this way, to hasten the death of the patient. The parts, which were divided in amputation, though at a distance from a spreading gangrene and from sphacelus, were found speedily to assume the appearance of the affection, for which the operation had been performed. *Till, therefore, the adhesive inflammation comes on, and a distinctly marked separation of the dead from the sound parts takes place, amputation is, in few, if in any cases of mortification, admissible.* We never know, previously to this, where a gangrene, or sphacelus, is to stop, nor whether the powers of the constitution be sufficient to sustain the injury that the mortification has inflicted. Even when the adhesive inflammation comes on, it is in most cases best to allow some time to elapse before we operate, partly with a view to give time for the constitutional symptoms to abate; in other instances, to allow the patient's strength to be recruited by nourishment and cordials; and partly also with a view to learn whether the constitution of the patient be indeed capable of so great a fresh shock, as that which amputation must necessarily occasion." (See *Thomson's Lectures, p.* 582.)

According to Richter, there is never any certainty, that we are amputating in living parts. Mortification rapidly ascends along the cellular substance, surrounding the large blood-vessels, and is frequently much more extensive internally than external appearances would lead one to suppose. The adjacent surface, still apparently alive, is often so affected, that it must inevitably slough, though, at present, it may not actually have sphacelated. The surgeon imagines, that amputation is performed on living parts; but, soon afterwards discovers, that he has been dividing those which are dead. The operation, he observes, can do no good, while the mortification is in a spreading state, and it may do considerable mischief. The disorder enlarges its limits, because its cause still operates, and this is not removable by amputation. If the operation be now injudiciously undertaken, the sphacelus invades the wound, and is the more certainly mortal, as the patient has been further weakened by amputation, and its consequences.

Many mortifications, especially those which arise from external causes, very often spontaneously stop and separate. But the place, where this will happen, can never be foreseen. By amputating in this circumstance, we run the risk of disturbing nature in her salutary work, and rendering the disorder fatal.

The following are the only cases, in which Richter allows that the use of the knife is justifiable and proper. There exists a species of sphacelus, which rapidly occasions death, before it is yet of great extent. Here, indeed, amputation might be really advisable; but the nature of the case is unfortunately never disclosed, before the fatal catastrophe. Were it not for the operation, some external injuries would be inevitably followed by mortification. In such cases, early amputation is evidently proper; for, the simple incision is attended with less danger, than sphacelus. Sometimes, says Richter, a sphacelus spontaneously stops. This happens most frequently in cases which originate from an external cause, such as a violent contusion, burn, &c. But the occurrence is not restricted to this kind of case, nor is it invariably attendant on it. When there are no other occasional causes present, the mortification does not readily go beyond the limits of the contusion, or violent burn; but the interference of surgery can hardly ever put a stop to its progress, before it has spread as far as the extent of the local injury. (*Anfangsgründe der Wundarzneykunst*, *B.* 1, *Kap.* 3.)

How different are the doctrines of Baron Larrey upon this subject from those entertained by Richter, and, indeed, the generality of eminent modern surgeons! "Writers on gangrene, or sphacelus of the extremities (says Larrey) indiscriminately recommend the amputation of a sphacelated limb never to be undertaken before the mortification is bounded or limited by a reddish circle, forming a true line of separation between the dead and living parts. This circumstance can only occur in a case of spontaneous gangrene from an internal cause; or if it happens, as is very unusual, in a case arising from a wound, its progress is different, and it would be exceedingly imprudent to wait for it. *The gangrene from external injuries almost always continues to spread; the infection becomes general; and the patient dies.*" (*Mém. de Chir. Militaire*, *T.* 3, *p.* 142.) Respecting the want of foundation for this hypothesis of infection, I need here offer no remarks, having already expressed my opinion upon it in a foregoing page. On the other hand, Larrey asserts, that, in the dry, or spontaneous gangrene, absorption takes place with more difficulty, and it is not uncommon to see the sphacelated parts separate from the living ones by the powers of nature alone, without the general functions being impaired. He argues that there is a manifest difference between what he terms the *traumatic* and the *spontaneous* gangrene, or, in other words, between the *humid* gangrene from an external cause, and the *dry* gangrene, which ordinarily proceeds from an internal cause. (*P.* 148.)

In cases of mortification, arising from external injuries, Larrey maintains, that, "notwithstanding any thing that writers and practitioners may allege to the contrary, we should not hesitate about promptly performing amputation, as soon as the necessity for the operation is decidedly established. There is no reason to apprehend, that the stump will be seized with gangrene, as in the spontaneous mortification, which has not ceased to spread, *because the traumatic gangrene, after having arisen from a local cause, is only propagated by absorption*, and a successive affection of the texture of parts by continuity of the vessels. Amputation, performed in a proper situation, stops the progress and fatal consequences of the disorder.

"Supposing then the lower half of the leg should be affected with sphacelus, in consequence of a gunshot injury, attended with a violent contusion of the part, and a forcible concussion of the vessels, nerves, and ligaments, if the skin is elsewhere uninjured, the operation may be done in the place of election, without any fear of the stump becoming gangrenous, notwithstanding the cellular membrane of the upper part of the member may be already affected. But, when the skin of the whole leg is struck with mortification, the operation must be done on the thigh, and no time should be lost. The same practice is applicable to the upper extremities. We must be careful not to mistake a limb affected with stupor for one that is actually sphacelated. In the first case, warmth, motion, and sensibility are still retained, although the skin may be blackish and the parts may be swollen. Besides, if there were any doubt, it would be proper to try at first tonic repellent applications, and cordial medicines, &c." (See *Mém. de Chir. Militaire*, *T.* 3, *p.* 152, 153.)

When amputation has been practised, this author recommends the exhibition of bark, good wine, tonics, &c. in order to promote the good effects of the operation. (*P.* 154.)

"The facts (says Larrey) which I shall relate in the course of this dissertation, will prove, I think, in an incontestable manner, the truth of the principle, which I lay down, that *when gangrene is the result of a mechanical cause, and puts the patient's life in danger, amputation ought to be performed, without waiting until the disorder has ceased to spread.*

"I have been a witness of the death of several individuals, from too rigorous an adherence to the contrary precept; and, at length, grievously impressed with this loss, I had long ago determined to depart from an axiom, which was always considered by me as false. Besides, following the maxim of Celsus, I preferred employing an uncertain remedy, rather than abandon the patient to an inevitable death. *Satius est enim anceps auxilium experiri quàm nullum.*

"I made the first attempt at Toulon, in the year 1796, upon a soldier, who, in consequence of a violent contusion of the foot, was afflicted with a gangrenous ulcer, which soon threw the whole part into a sphacelated state. While the mortification was yet spreading, I resolved to amputate the leg. The success of the operation surpassed my expectations; the stump healed; and in less than forty-five days, the patient got quite well. This case served to encourage me.

"During the siege of Alexandria, in Egypt, in 1801, a second case, very analogous to the preceding, occurred in my practice; it happened in a dragoon of the 18th regiment, whose forearm and afterwards arm, sphacelated, in consequence of a gun-shot wound in the articulation of the left arm. The mortification had extended nearly as high as the shoulder, and the patient's life was in great danger, when I determined to amputate the limb at the shoulder-joint. The disorder was manifestly spreading, and the patient's brain already affected, for he had symptoms of ataxia; the operation, however, arrested the progress of the sloughing, and saved the patient's life, who, at the conclusion of the siege of Alexandria, was quite cured.

"After the taking of Ulm, M. Ivan, surgeon to his majesty the Emperor, performed in my presence, and at my ambulance established at Elchingen, the amputation of the thigh of a soldier belonging to the 76th regiment of the line, the leg having sphacelated in consequence of a gunshot injury. The gangrene was not limited, and evidently extending itself; yet, the effects of the disorder were destroyed, and the patient was quite cured on our return to Austerlitz.

"A fourth patient, an officer in the same regiment, shot in the ankle, at the capture of the same town, was conveyed to my ambulance, in order to be dressed: it was the third day after the accident: the foot was gangrenous, and the leg was swelled, and threatened likewise with mortification. Febrile symptoms had also come on. I hastened to amputate the leg a little above the place of election. The cellular membrane of the stump, of a yellow blackish colour, was already infected with the gangrenous principle (as Larrey terms it). The operation, however, stopped the progress of the mischief; suppuration took place in the stump; some sloughs were detached; the wound assumed a cleaner appearance; and cicatrization was completed on the fifty-second day. The patient could already walk with a wooden leg, when he caught the hospital fever, which was epidemic at Ulm, where he awaited his regiment, and, to my great regret, he was carried off by this disease, after having escaped the former danger.

"After the battles of Austerlitz and Jena (continues Larrey), several of my colleagues, surgeons of the first class, undertook, in consequence of my advice, and the examples of success, which I had recited to them, the amputation of limbs equally sphacelated, although the mortification was not limited, rather than abandon the patients to a death, which appeared inevitable. In general, these practitioners experienced the same success as I did myself." (*Mém. de Chir. Militaire, T.* 5, *p.* 154—157.)

In Larrey's memoir upon this subject, there are some additional facts and arguments in favour of what he endeavours to prove, viz. that, in cases of mortification from external injuries, if the patient's life be in danger, amputation ought to be performed, although the sloughing may yet be in a spreading state. I must be content, however, with having stated the particulars already explained; and the reader, desirous of more, must refer to Larrey's own publication. Certainly, the facts, which he has adduced, are highly important: they tend to subvert a doctrine, and to prove the error of a practice, which have been urged in most forcible terms by most of the distinguished surgeons of modern times. The sentiments of Mr. Sharp are rendered questionable; and the truth of the positive assertions of Mr. Pott is yet a matter to be examined. The latter, it is well known, tells us, that he has often seen the experiment made of amputating, while a mortification was spreading, but never knew it answer. Are we to conclude, that all these cases which Pott alludes to, were mortifications from an internal cause? Or, are we to suppose, that the operation failed from having been delayed too long? Or, must we imagine, that the nature of the human constitution has been changed, between the æra of Pott, and that of Larrey?

It should be remarked, that the practice of amputation, in cases of spreading mortification, has generally had some partisans for many years past; but the weight of authorities has unquestionably been against it, and few surgeons in this country have ventured to deviate from the advice of Sharp and Pott. It is curious, however, that Mehee, a writer, who wrote for the express purpose of declaring his disapprobation of the early performance of amputation in gunshot wounds, should have admitted of only one case, in which the operation is proper, namely, *gangrene succeeding the wound made by a cannon shot.* Here he thinks, that amputation ought to be performed on the first appearance of the gangrene, in order to prevent it from spreading up the limb. (See *Traité des Plaies d'Armes à feu, Paris,* 1799.) It appears that about the year 1809, Mr. A. C. Hutchinson performed with success two amputations in cases of spreading gangrene from gunshot wounds. (See *Practical Obs. on Surgery, p.* 72.)

My friend Mr. Lawrence has also successfully amputated at the shoulder joint in a spreading mortification of the arm, the consequence of external violence. "The skin of the amputated limb was greenish and livid; but the cuticle not yet detached. The cellular substance distended with air, and with a discoloured offensive sanies; its appearance was not quite natural, where the incision took place; it was yellowish and anasarcous. Small effusions of blood were observed here and there in the course of the nerves; even as high as the amputated part. No coagulation of blood in any of the arteries, even down to the ulnar and digital branches. All the soft parts were discoloured, dark red, and livid, and a frothy reddish fluid issued on incision." This case had the most favourable termination, and it clearly proves, that the *humid* kind of gangrene, which occurs in a healthy subject from severe local injury, which so rapidly affects a whole limb, and reaches the trunk in a few hours, must constitute an exception to the general maxim, that amputation should never be done, before a line of separation is established between the dead and living parts. Mr. Lawrence, however, would not be understood as meaning to recommend the practice in all instances of mortification from local injury. He conceives, that a gangrene may arise, in an unsound constitution, from a comparatively slight accident; so that it may be regarded as the result of constitutional disposition, rather than of the local cause. Amputation would be hopeless under such circumstances. It is particularly in mortification, following very severe injury, in a subject otherwise healthy, that Mr. Lawrence believes the operation to be proper. (See *Medico-Chir. Trans. Vol.* 6, *p.* 184.)

He also reports another instance, in which he saw the operation succeed, though the mortification was in a spreading state. I was once consulted in private practice about the propriety of amputating at the shoulder in a spreading mortification of the arm from external violence. The operation was done, and the patient, who without it would certainly have perished in a few hours, lived a fortnight; at one time he had a fair prospect of recovery, and died, not of gangrene of the stump, but in consequence of a large abscess over the scapula.

Amongst the experienced approvers of Larrey's advice, I must not omit to mention Dr. Hennen, who has repeatedly amputated, under the circumstances above pointed out, without waiting for the line of separation; "and (says he) although I certainly was not uniformly successful, I have no reason to imagine, that death was occasioned by a departure from the rule so generally laid down by authors." (*On Military Surgery, p.* 243, *Ed.* 2.)

With regard to the early performance of amputation, where the substance of a limb perishes after exposure to cold, I find some difference of sentiment between two very high authorities. Thus Schmucker observes :—" The mortification which comes on after a part has been frozen, increases so rapidly, if the limb be exposed to warmth, that in the space of twenty-four hours, its vitality and organization are quite destroyed, and nothing will now avail in restoring its sensibility. Here the speedy performance of amputation is the only means of preservation to be depended upon. In mortification from an internal cause, the case is different." (See *Vermischte Chirurgische Schriften, B.* 1, *p.* 15, *8vo. Berlin,* 1785.) According to Larrey, however, this species of gangrene at length stops, and a line of separation forms between the dead and healthy parts. If the disorder be superficial, the sloughs are usually thrown off between the ninth and thirteenth days, leaving an ulcer of proportionate extent, that soon heals up. If the whole of the limb be sphacelated, nature cannot of herself effect a cure, or but very rarely, the patient mostly falling a victim to the effects of absorption, when the sloughs are detached, and the mouths of the lymphatics are opened on the occurrence of suppuration. Larrey assures us, that he has seen numerous patients carried off by this cause, while the examples of a spontaneous cure were exceedingly few, and, in these, the stump was left irregular, and unfit for bearing the pressure of a wooden leg. He agrees, therefore, with the generality of surgeons, that it is in these instances advantageous to amputate the mortified portion of the limb, *but not before the extension of the gangrene has ceased, and the mischief is bounded by an inflammatory line.* (See *Mém. de Chir. Mil. T.* 3, *p.* 65—72.)

In the article *amputation,* notice has been taken of a sloughing, which commences in the foot, and extends up the leg, and sometimes follows gunshot injuries of the thigh, which involve the femoral artery : this is a case particularly instanced by Mr. Guthrie, as requiring the very early performance of amputation. Sir Astley Cooper also refers to cases, in which the rule was successfully deviated from, of not amputating, before limits are set to the spreading of mortification ; the instances in question arose from injury of blood vessels, and other local violence, in patients of a healthy constitution. In such cases, it is admitted by this very experienced surgeon, that the practice should be different from what is usually pursued in mortification from constitutional causes. (*Surgical Essays, Part* 2, *p.* 186.)

Fabricii Hildani Tract. Methodicus de Gangræna et Sphacelo. Quesnai, Traité de la Gangrene, 12*mo. Paris,* 1749. *Encyclopédie Méthodique, Partie Chirurgicale, Art. Gangrene. Kirkland on Gangrene, and on the Present State of Medical Surgery. Richter, Anfangsgr. der Wundarzn. B.* 1, *Kap.* 3. *Various parts of Hunter on Inflammation, &c. Sharp's Critical Enquiry into the present State of Surgery, Chap.* 8. *Richerand, Nosographie Chir. T.* 1, *p.* 215, *&c. Edit.* 4. *Lassus, Pathologie Chir. T.* 1, *p.* 30, *&c. Edit.* 1809. *Levéillé, Nouvelle Doctrine Chir. T.* 4, *p.* 321, *&c. Paris,* 1812. *Larrey, Mémoires de Chirurgie Militaire, T.* 3 ; *particularly the Mém. sur la Gangrène de Congélation, p.* 60, *and that sur la Gangrène Traumatique, p.* 141. *Callisen, Systema Chirurgiæ Hodiernæ, Vol.* 2, *p.* 374, *Edit.* 1800. *Dr. J. Thomson's Lectures on Inflammation, p.* 501. *Edinb.* 1813. *O'Halloran on Gangrene and Sphacelus, 8vo. Dublin,* 1765. *Pott's Obs. on the Mortification of the Toes and Feet in his Chirurg. Works, Vol.* 3. *J. Kirkland, Thoughts on Amputation, &c. with a short Essay on the Use of Opium in Mortification, 8vo. London,* 1780. *J. Harrison. The remarkable Effects of fixed Air in Mortifications of the Extremities, 8vo. Lond.* 1785. *J. A. Murray, In Gangrænam Scroti Obs.* (*Frank Del. Op.* 10.) *C. White, Observations on Gangrenes and Mortifications, accompanied, &c. with convulsive spasms, 8vo.* 1790. *Pearson's Principles of Surgery, p.* 114, *Edit.* 2. *Lawrence in Med. Chir. Trans. Vol.* 6, *p.* 184, *&c. Delpech, Mémoire sur la Complication des Plaies et des Ulcères, connue sur le Nom de Pourriture d'Hôpital ; also, Précis Elémentaire des Maladies réputées Chirurgicales, T.* 1, *p.* 73, *&c. Paris,* 1816. *Boyer, Traités des Maladies Chir. T.* 1, *p.* 105, *&c. Paris,* 1814. *John Bell's Principles of Surgery. Himly's Abhandlung über der Brand der Weichen und harten Theile, Gött.* 1800. *For an account of the dry gangrene, see particularly the Writings of Hildanus, Tulpius, Quesnai, Mém. de la Soc. Royale de Médecine, T.* 1. *Opere di Bertrandi; Medical Museum, &c. For a description of the mortification caused by eating cockspur-rye, see Dodard's letter in Journal des Savans,* 1676. *Noel, in Mém. de l'Acad. des Sciences,* 1710. *Langius, " Descriptio Morborum ex Esu Clavorum Secalinorum." Duhamel, in Mém. de l'Acad. des Sciences,* 1748. *Dr. C. Woolaston in Philosophical Trans.* 1762. *Tessier, in Mém. de la Societé Royale de Médecine, T.* 1 *and* 2, *&c. O. Prescott, A Dissertation on the Natural History and Medicinal Effects of the Secale cornutum, or Ergot, 8vo. Lond.* 1813. *D. F. Heffter, Doctrinæ de Gangræna brevis Expositio, 4to. Lips.* 1807. *C. L. G. Liessching, De Gangræna, 4to. Gott.* 1811. *Hennen's Principles of Military Surgery, p.* 241, *&c. Ed.* 2, *8vo. Lond.* 1820. *G. J. Guthrie on Gunshot Wounds, &c. p.* 111, *&c. Ed.* 2, *8vo. Lond.* 1820. *J. H. James, Obs. on the Principles of Inflammation, p.* 84, 287, *&c. 8vo. Lond.* 1821. *Sir A. Cooper, Surgical Essays, part* 2, *p.* 186, *8vo. Lond.* 1820.

MOXA.—The Chinese moxa consists of the tomentum of the leaves of the artemicia latifolia. That which Baron Percy employs is made of the stalk of the great sunflower, soaked in a solution of nitre, and afterwards well dried ; cotton, however, similarly prepared, completely answers the purpose. Mr. Dunglison, who has translated Larrey's memoir on this subject, and added to it some interesting matter, shows that the moxa has been used in the eastern parts of the world many centuries. The cone, or cylinder of moxa is composed of a certain quantity of cotton wool, over which a piece of fine linen is rolled, and fastened at the side by a few stitches. This conical cylinder should be about an inch long, and of a proportionate thickness; the size, however, may be varied according to circumstances.

A porte-moxa, is intended to fix the cylinder upon the precise spot, where the application is to be made. The metallic ring of this instrument is kept from touching the skin by means of three small supports of ebony, which is a bad conductor of caloric. After the extremity of the cone has been set fire to, the combustion is kept up by means of a blow-pipe; however, it should not be too much hastened, but allowed to proceed slowly. The precise spot, to which the moxa is to be applied, ought to be first marked with a little ink, and all the surrounding surface covered with a wet rag, that has a hole in the middle, so as to leave the part bare, which has been marked. After the top of the moxa has been set on fire, the base of it, held in the porte moxa, must be placed upon the intended part, and the combustion kept up with the blow-pipe, until the whole is consumed. In order to prevent the subsequent inflammation and suppuration from being too considerable, the liquor ammoniæ should be immediately applied to the burnt part.

The diseases, in which Baron Larrey has found the moxa efficacious, are amaurosis, and incipient cataract, (cases in which he applies it over the course of the facial nerve, just behind the angle of the jaw;) deafness and aphonia arising from cold; tic douloureux, and partial paralysis of the muscles of the face; palsy of the lower extremities; phthisis; diseased spine; disease of the hip-joint, &c.

M. Roux, when he visited the London hospitals, had two opportunities afforded him of applying the moxa, in order to convince the rising generation of surgeons in this country of its superior efficacy. The first was in a case of spontaneous paralysis of the deltoid muscle at St. Bartholomew's. The moxa was applied a little below the acromion, and a few days afterwards the motion of the arm began to be restored. This, however, was a case, which, according to the account of Roux himself, had relapsed, after having been cured by other means. I think one of the surgeons of St. Bartholomew's informed me, that notwithstanding the moxa, the relief proved again only temporary. If, however, the moxa had succeeded, a caustic issue, a blister, or volatile liniments, would probably have answered equally well. The second instance, in which M. Roux applied the moxa, was a case of white swelling at Guy's Hospital; but the disease had advanced too far to allow any hope of a favourable issue. (See *Voyage fait à Londres en* 1814, *ou Parallèle de la Chirurgie Angloise avec la Chirurgie Francaise, p.* 19, 20.) M. Roux flatters himself that, "*les chirurgiens Anglois répugneront sans doute moins à l'avenir à faire usage du moxa.*" The truth is, English surgeons, as well as English farriers, knew very well before the arrival of M. Roux what might be done with moxa and the actual cautery. But, though the application of fire still prevails in the veterinary art, as a mode of curing diseases, it has long been abandoned as a means of relief in the English practice of surgery; not on the ground of its being always ineffectual; but, because equal good has been found to result from measures, which are milder, always less terrific, and frequently less painful. In order to convince an English surgeon that moxa and the actual cautery ought to be introduced into practice, M. Roux should prove, that there is at least some particular disease, which may in this manner be cured, but which cannot be cured by other means, ordinarily employed in our practice. He should also make us forget, that the application of actual fire was once as common in English surgery as in French; but that it had not attractions enough to maintain its ground.

However, that the reader may know the arguments used by the advocates for the practice, I submit to him the following observations, which are contained in a useful periodical work. All the world knows, that counter-irritation is of great use in the treatment of disease; and almost all the world knows, that different forms of counter-irritation produce different effects on the human body. We do not pretend to specify what is the reason of these different effects, simply because we do not know. But, while such men as Percy and Larrey, and twenty others of character, speak so highly in favour of the actual cautery, we perhaps are scarcely authorized to say, that the action of the potential cautery can be made to resemble it in all cases. We can easily understand how the actual cautery should fall into disuse, however good a remedy it might be; for, if we ourselves were patients, we should be slow in believing, that the pain of the application was not so severe as our fears point out; but, the scepticism of the medical man ought to rest on different grounds. We may say, respecting the moxa, that its action may be more easily regulated than that of caustics, so that by the more or less sedulous use of the blow-pipe, we may create a superficial eschar, or a deep suppurating wound. In fact, in all cases, where more than a mere irritation of the skin is required, the moxa affords a certainty in its application possessed by none of the other caustics. Of course, it would be improper to compare the moxa with blisters, or with any other counter-irritant, which acts by irritating the skin, without destroying it: if we compare it, therefore, with the emetic tartar ointment, issues, setons, and the caustics, properly so called, we shall find, that it possesses greater advantages than they do. The first of these is a long time in destroying the cutis, and it is very uncertain in the quantity of its effect: moreover, whether the effect be produced at all, generally depends on the diligence and knowledge of the patient's attendants, and not on the medical man. Hence, it is not likely, often to be properly applied. Issues and setons produce but little instantaneous effect; their efficacy, therefore, depends on the irritation and discharge daily kept up. Indeed, these also, if they are left to the care of the patient, which they almost always are, soon become inert and useless. The different caustics approach to the moxa in their properties. Their effect is, in some degree, rapidly produced and a suppurating ulcer is formed; but, still to produce their smallest effect, a longer time is necessary, than the surgeon can conveniently stay with his patient; so that, as the operation of the remedy is dependent on time, and that time varies according to the constitution of the patient, the quantity of effect produced can never be calculated upon. It is very different, however, with the moxa. The effect is almost instantaneous, and the surgeon's hand regulates the quantum of action; so that not only is the moxa the most manageable of counter-irritants that destroy the skin, but, as many medical men believe, that suddenness of operation forms not a small part of the efficacy of counter-irritants, the moxa stands also pre-eminent on this ground. (See *Med. Intelligencer, Vol.* 3, *p.* 578 : *also Larrey, Recueil de Mémoires de Chirurgie, Paris* 1821, *and particularly, Mr. Dunglison's Translation of the first memoir.)*

MURIATIC ACID. Gargles containing this acid, are often made use of with advantage in various cases of sore throat, and the disease known by the name of cancrum oris. The following formula is employed at St. Bartholomew's Hospital. ℞. Rosæ rubræ exsiccatæ ʒij. Aquæ ferventis ℔j. Infunde per horam dimidiam, dein cola, et adde Acidi muriatici ʒj. Mellis Rosæ ℥ij. Sacchari purificati ʒvj. Misce.

Muriatic acid appears to have been tried in syphilis earlier than the nitric, Dr. Zeller, of Vienna, having employed it as a successful remedy for this disease ever since the year 1789. (*Vide Sim. Zeller's Prakt. Bemerk über den vorzügl. Nutzen d. allerem, bekannt. Badeschwamens, &c. Nebst. einem Anhange v. d. Salzsaürc, &c. Wien.* 1797.)

As a medicine capable of improving the appearance of venereal ulcers, and of restraining for a time the progress of the disease, it has been known to Mr. Pearson many years. He says, that he was first induced to give this acid in venereal ulcers of the tongue, and of the throat, in consequence of the great benefit which he had seen result from its use in examples of cancrum oris: and without viewing it as an antidote for lues venerea, he has frequently availed himself of its useful qualities, when it was desirable to gain a little time previously to the commencement of a mercurial course. (*Obs. on the Effects of various Articles in the Cure of Lues Venerea, p.* 193, *Ed.* 2.) From what he saw, however, he never inferred, that the sulphuric and muriatic acids could radically cure the venereal disease; and he ascribed the benefit derived from them partly to their salutary effects on the stomach and constitution, and partly to their agency on ulcers of the throat and tongue, as local applications. (*P.* 117.) When Mr. Pearson made these observations, the fact, which has now been so unequivocally demonstrated in the army hospitals, that nearly, if not all, the forms of disease, going under the name of syphilis, may be cured without mercury, had not undergone the strict and impartial investigations, which have of late years been devoted to the subject. (See particularly *Obs. on the Treatment of Syphilis, with an account of several cases of that disease, in which a cure was effected without the use of mercury, by T. Rose, in Medico-Chir. Trans. Vol.* 8, *p.* 349.) If this point be admitted as fully established, the question about the antisyphilitic virtues of various articles of the materia medica requires to be taken up in a very different light, not clouded with a notion, that the disease will certainly get worse and worse, if no remedy whatever be exhibited, or that it cannot finally get well of itself. While these doctrines prevailed, the amendment of any syphilitic affection during the use of muriatic, or any other acid, was entirely referred to some specific effect, supposed to appertain to such medicine. But now the question involves several considerations; first, the actual virtue of the medicine in expediting the cure of the disease; secondly, the changes which might happen, if the complaint were left to itself; and, thirdly, the benefit sometimes ascribable to the improvement produced in the constitution, under particular circumstances by the discontinuance of mercury. The latter mineral no longer claims the name of a specific for the venereal disease, either in the sense of the only, or a completely certain, antidote; because nature herself would in time bring most cases to a favourable conclusion; because the cure can be completed by a variety of other medicines, noticed in this publication; and, lastly, because mercury, though it may be generally the quickest means of cure, is, in particular cases, complicated with much debility and constitutional irritability, the surest medicine to aggravate the complaint, and prevent any progress towards a favourable termination. Here it is enough to know (and Mr. Pearson himself acknowledges the fact) that in the circumstances above specified, muriatic acid is a safer medicine than mercury. The dose is from ten to twenty drops, which are to be mixed with a proper quantity of water.

Muriatic acid has sometimes been employed, as the active ingredient in injections for the cure of gonorrhœa, in the proportion of eight or ten drops to four ounces of distilled water.

In cases of poison from muriatic acid, the experiments, made by Orfila, lead him to consider calcined magnesia and prepared soap the most fit substances for neutralizing such portion of the acid, as may not yet be combined with the texture of the œsophagus, stomach, &c. They should be given as soon as possible after the corrosive poison has been swallowed, care being taken to let the patient drink copiously of warm water, milk, broth, or some mucilaginous diluting liquid. When, from the symptoms, there is reason to believe that inflammation exists in the viscera, or when spasms and convulsions come on, antiphlogistic remedies, and antispasmodics, are indicated. (*Traité des Poisons, p.* 476, *Vol.* 1, *Ed.* 2, *Paris,* 1818.) In order to detect the presence of muriatic acid, when mixed with wine, or other fluids, we are recommended to distil a portion of it from a small retort over a candle, into a phial containing a solution of nitrate of silver. The precipitation of muriate of silver, which is soluble in ammonia, but not in nitric acid, will take place if the poison contain muriatic acid. (*Thomson's Dispensatory, p.* 434, *Ed.* 2.)

By Morveau, who employed himself in investigating the merits of Dr. Carmichael Smith's mode of destroying infection, the muriatic acid in the new form of gas, was alleged to have the very important quality of neutralizing putrid miasmata. The gas is extricated from common salt, by means of sulphuric acid. In this way, it is often employed in hospitals as a mode of preventing and obviating infection.

The use of muriatic acid, as an application to certain cases of sloughing, and phagedœna, has been explained in the articles *Hospital Gangrene,* and *Mortification.*

MYDRI'ASIS. (from μεδαω, to abound in moisture.) A preternatural dilatation of the pupil.

N.

NÆVUS. (*Congenitæ Notæ; Envies; Mutter-mahl; Mother spots, &c.*) A mole, or congenital mark, or excrescence of the skin. Nævi materni signify the little spots excrescences, or swellings, with which many children are born. Some of them (says Dr. Bateman) are merely superficial, or stain-like spots, and appear to consist of a partial thickening of the rete mucosum, sometimes of a yellow, or yellowish-brown, sometimes of a bluish, livid, or nearly black colour. To these the term *spilus* has been more particularly appropriated. Others again exhibit various degrees of thickening, elevation, and altered structure of the skin itself, and consist of clusters of enlarged and contorted veins, freely anastomosing, and forming little sacs of blood. These are sometimes spread more or less extensively over the surface, occasionally covering even the whole of an extremity, or one half of the trunk of the body; and sometimes they are elevated into prominences of various forms and magnitude. Occasionally, these marks are nearly of the usual colour of the skin; but most commonly they are of a purplish red colour, of varying degrees of intensity; such as the presence of a considerable collection of blood-vessels, situated near the surface, and covered with a thin cuticle, naturally occasions. (See *Bateman's Practical Synopsis of Cutaneous Diseases, p.* 324, *Edit.* 4.) When a nævus is of a dark red colour, its intensity is generally augmented by every thing which tends to accelerate the circulation of the blood. Fits of anger, hot weather, fevers, and the period of menstruation, in particular, are observed to be attended with an increased turgescence and discoloration of the part affected. Indeed the excrescence sometimes bursts, and pours out a dangerous quantity of blood, and in females it has been known to become the seat of a regular menstrual discharge. (*Boyer, Traité des Maladies Chir. T.* 2, *p.* 277; *and John Bell's Principles, Discourse* 9.) Some nævi, especially those usually called *moles*, frequently have long, irregular hairs growing upon them; while the surface of others is streaked, and even granulated. Such as appear in the form of a mere red, purplish stain, have been absurdly supposed to arise from a desire for claret, or some other wine of that colour, entertained by the mother of the patient during her pregnancy. The granulated nævi have been compared with raspberries, strawberries, mulberries, &c. for which the mother's longing is ascribed by the vulgar as a cause. The truth is, however, that this doctrine, imputing the origin of nævi to fancies of the mother, is neither consistent with experience nor sound physiology. The causes (as Callisen observes) "potius autem in evolutione primorum staminum, a naturæ solita via aberrante, uti in aliis rebus monstrosis quærendæ erunt." (*Syst. Chir. Hodiernæ, Vol.* 2, *p.* 201.)

From what has been said, then, it appears that certain nævi are merely cutaneous spots, of a red violet, or purplish colour, of greater or lesser extent, and with scarcely any perceptible elevation. They are an organic malformation of the skin, the natural texture of which does not exist, but has substituted for it a plexus of vessels, not endued with the natural sensibility of the cutis itself. These nævi generally continue stationary during life, and may be regarded rather as a deformity than a disease. (*Lassus, Pathologie Chir. Tom.* 1, *p.* 477.) Other nævi are either of the same nature as the disease, well known by the name of the aneurism by anastomosis, or bear a considerable resemblance to it. They are sometimes of great size; and their shape is subject to much variety. They are soft, and indolent, and of a violet, or dark red colour The skin which covers them is very thin, and when they are opened, their structure is like that of a spleen, whose blood-vessels are varicose. Some are covered with a delicate white skin, and do not increase with age. Others are more disposed to grow large. These tumours frequently occur in the skin of the face, and in other parts of the integuments, on the inside of the labia pudendi, and cheeks, and in the substance of the upper and lower lip, where they sometimes form a kind of elongation, attended with great disfigurement. Nævi of this kind, so situated in new-born infants, may produce a serious obstacle to the action of sucking. M. A. Severinus has particularly described them under the appellation of "tuberculum atro-cruentum labii inferioris." (*De Abscessuum Natura, Cap.* 29, *p.* 803.)

The nævi, which form in the subcutaneous cellular substance, and were named by Petit "loupes variqueuses," (*Œuvres Posthumes, Tom.* 1, *p.* 276,) are also of the same nature as the aneurism by anastomosis. In time, they attain a very large size. Mr. Latta says, he once saw in a child, two years old, a tumour of this kind, weighing fourteen ounces, which at the time of birth was only equal in size to a large bean. During the first year, it did not enlarge much; but it afterwards grew rapidly to the size already specified. (*System of Surgery, Vol.* 2, *Chap.* 22.) Lassus has even seen a tumour of this description as large as a man's head. (*Pathologie Chir. Tom.* 1, *p.* 479.) Having treated particularly of the "aneurism by anastomosis," in another place (see *Aneurism*), I shall merely repeat the necessity there is for cutting every particle of the disease away, every portion of the congeries of vessels and cells of which it consists, whenever it is meddled with at all. Puncturing the swelling, or the partial removal of it, has cost many persons their lives by hemorrhage, as the records of surgery fully prove. (*Petit Traité des Maladies Chir. T.* 1; *Lassus, Pathologie Chir. T.* 1, *p.* 484, *&c.*)

Although the original causes of nævi are buried in obscurity, experience proves, that whatever produces irritation in the part affected, or an increased determination of blood to it, has generally the effect of accelerating the growth and enlargement of the swelling. Thus, a trifling bruise, or a tight hat, will sometimes excite a mere stain-like speck, or a minute livid tubercle, into that diseased action, which occasions its growth. (*Bateman's Pract. Synopsis, &c. p.* 327, *Edit.* 3.)

With regard to the treatment of nævi, the subject may be explained in a few words. When these marks, or swellings are superficial, without any disposition to enlarge, or spread, and their trivial elevation does not expose them to accidental rupture, there appears to be no good reason for interfering with them. Indeed, they could only be destroyed with caustic, or the knife, and these severe means would leave scars, accompanied with nearly the same degree of disfigurement.

But, as a valuable writer observes, when nævi evince a tendency to enlarge, or are very prominent excrescences, and either troublesome from their situation, or liable to be ruptured, either their growth must be repressed by sedative applications, or the whole congeries of vessels extirpated with the knife. Mr. Abernethy has proposed the application of cold washes, and the pressure of a bandage. This practice was found by him in several instances to have the desired effect of checking the growth of the tumors, which afterwards shrunk, and became no longer objects of any consequence. (*Surgical Works, Vol.* 2, *p.* 224.) Boyer also knew of a case, in which a nævus of the upper lip was cured by the mother pressing the part with her finger unremittingly for seven hours at a time, and the use of alum wash. (*Traité des Maladies Chir. T.* 2, *p.* 269.) Boyer, however, is not generally an advocate for this mode of treatment; and Dr. Bateman expressly states, that, in the majority of cases, pressure is the source of great irritation to these maculæ, and cannot be employed. (*P.* 329.)

For all those examples, which partake of the nature of aneurism by anastomosis, and are disposed to grow, the best general mode of cure is extirpation with the knife. The prudence of this practice, and the necessity of taking away every particle of the disease, has been already explained; this is what was advised by F. Hildanus, (*Cent.* 5, *Obs.* 46); what was strongly urged by the celebrated Petit, (*Œuvres Posthumes, T.* 1); what was recommended in still more animated terms by Mr. John Bell, (*Principles of Surgery, Discourse* 9); and it is what is particularly insisted upon in another part of this Dictionary. See *Aneurism.*

In general, stimulating applications cannot be made to nævi, without risk of exasperating, instead of lessening them. Mere thickenings, and discolourations of the rete mucosum, however, have sometimes been removed by a mixture of spirit and the liquor potassæ. (*Bateman, p.* 330.)

Formerly caustic was much in vogue for the removal of nævi; but, unless its action extend deeply enough to destroy every part of the disease, it may cause a dangerous degree of irritation, copious hemorrhages, and a sudden and fatal enlargement of the tumor. Therefore, as it is a more painful measure than the knife, and less certain in its effects, it should be on every account discarded from practice. It cannot be denied, however, that the old surgeons had success with their caustics, where the nævi were altogether superficial. Thus, in speaking of caustic remedies, Callisen observes: "inter quæ eximio cum successu adhibetur sapo cum æquali parte calcis vivæ subtilissime commixtus, nævo per emplastrum perforatum admovendus, et alio emplastro imposito firmandus; hoc remedio eschara inuritur, qua soluta, cicatrix alba remanere solet." (*Syst. Chirurgiæ Hodiernæ, Vol.* 2, *p.* 202.)

Consult *Petit's Œuvres Posthumes, T.* 1. *Lassus, Pathologie Chir. T.* 1. *p.* 476, *&c. Ed.* 1809. *Callisen's Systema Chirurgiæ Hodiernæ, Vol.* 2, *p.* 201, *Hafniæ,* 1800. *Abernethy's Surgical Works, Vol.* 2, *p.* 224, *&c. Latta's System of Surgery, Vol.* 2, *Chap.* 22. *J. Bell's Principles of Surgery, Vol.* 1, *Discourse* 9. *Boyer, Traité des Maladies Chirurgicales, T.* 2, *p.* 225, *&c. Paris,* 1814. *A Practical Synopsis of Cutaneous Diseases, by T. Bateman, M. D. Edit.* 3, 1814. *Delpech Précis Elémentaire des Maladies Chir. T.* 3, *p.* 244, *Paris,* 1816. *J. Wardrop, On one Species of Nævus, with the Case of an Infant, where the Carotid Artery was tied, in Med. Chir. Trans. Vol.* 9, *p.* 199, *&c.*

NECROSIS. (from νεκροω, to destroy.) This word, the strict meaning of which is only mortification, is, by the general consent of surgeons, confined to this affection of the bones. It was first used, in this particular sense, by the celebrated M. Louis, who restricted its application, however, to examples, in which the whole thickness of a bone was destroyed. (See *Mém. de l'Acad. Royale de Chirurgie, T.* 5, 4*to.*) By the ancients, the death of parts of bones was not distinguished from caries. However, necrosis and caries are essentially different; for, in the first, the affected part of the bone is deprived of the vital principle; but this is not the case when it is simply carious. Caries is very analogous to ulceration, while necrosis closely resembles mortification of the soft parts.

Between caries and necrosis, says Weidmann, there is all that difference, which exists between ulcers and gangrene, or sphacelus, of the soft parts. In caries, the nutrition of the bone is only impaired, and an irregular action disunites the elements of the bony structure, which consequently sustains a loss of substance; but every remaining part of it is yet alive. In necrosis, on the contrary, the vitality and nutritive functions cease altogether in a certain portion of the bone, the separation of which then becomes indispensable. (*De Necrosi Ossium, p.* 7.)

I have mentioned, that M. Louis confined the term necrosis to cases, in which the whole thickness of a bone perished; but Weidmann judiciously criticises this limitation of the word, and maintains, that the nature of the disorder is the same whether it affect a single scale, the whole, or a mere point, of the bone. He also objects to the definition of necrosis proposed by Chopart (*Dissert. de Necrosi Ossium, Paris,* 1765), and adopted by David. (*Obs. sur une Maladie connue sous le nom de Nécrose, Paris,* 1782.) These two authors have defined necrosis to be a disorder, in which a portion of bone perishes, and turns dry, in order to be soon separated from the living parts, and replaced by a new bony substance, which is to perform its functions.

But, as Weidmann observes, it may happen, that a piece of bone, which dies and separates, may not be replaced by any new formation of bone, though the disease is of the same character, and merely varies in some modifications. He therefore argues, and every rational surgeon will agree with him, that a true necrosis must always be said to exist, whenever a dead portion of bone has either separated, or is about to separate. "*Vera demum necrosis semper est, si aliquod ossis ramentum, in quo vis vitæ extincta est, abscessit, vel proxime abscessurum, est.*" (*B.* 7.)

The tibia, femur, lower jaw, clavicle, humerus, fibula, radius, and ulna, are the bones most frequently affected with necrosis. Excepting the lower jaw and scapula, the process of regeneration has only been noticed, in the cylindrical bones. From 12 to 18 years of age, is the time of life, most subject to necrosis. Necrosis of the lower jaw, however, seldom occurs before the age of 30.

No climate, age, sex, mode of life, nor condition, (says Weidmann) is exempt from this disorder. Childhood and puberty, however, are the periods most liable to it. The same thing may be said of persons, who labour hard, and are much exposed to external injuries. Every bone of the human body is subject to necrosis; but those which are superficial, and enter into the formation of the extremities, are more frequently affected, than others whose situation is deeper. Necrosis less commonly attacks the spongy substance of the bones, because this being endued with a higher degree of vascularity and life, suppuration is most apt to occur. Necrosis, on the contrary, is oftener seen in the compact substance, where the vital principle is less energetic, and more readily extinguished. Lastly, the disorder may affect the long bones, or the broad; the large or small; and even those of the very least size; since it is well known, that the ossicula of the ear may be destroyed by necrosis, and separate. I have seen this happen in two instances, and the fact is recorded by several writers. (See *Astruc de Morbis Venereis, lib.* 4, *cap.* 1. *Henri, Journal de Médecine, T.* 15, *p.* 363.)

Though necrosis mostly attacks the cylindrical bones, the flat ones are not exempt from the disease. Pott makes mention of a parietal bone, the whole of which was detached, and of an os frontis, the greatest part of which came away. In a thesis on necrosis, written in 1776, may be found the case of a young man, a very large part of whose scapula perished and separated. Chopart, who relates the case, mentions, that he saw the patient quite recovered, and felt a new triangular moveable bone, firmly supporting the clavicle, but smaller and flatter than natural, and without any spinous process. The same has happened to the lower jaw, as may be seen by referring to the *Ephemerides Nat. Cur.* and *Mém. de l'Acad. de Chirurgie.* In the fifth volume of the latter work, is an account of a woman, who applied to be relieved of some venereal complaints. From the beginning of the treatment, the bone was discovered to be loose just under the gums, and seemed, shortly afterwards, to move backwards and forwards with a tooth. Mr. Guernery took hold of the tooth with a key-instrument, and found it firmly inserted in the movable jaw; he made with caution the necessary manœuvres for extracting the portion of bone; but was greatly surprised on finding what an extensive part yielded to his very moderate efforts. It was the whole of the lower jaw, above its right angle, from its division into the coronoid and condyloid processes to the space between the first and second of the front grinders of the left side. On the right, there only remained the condyle in the articular cavity of the temporal bone. This destruction left a considerable empty space, from which great deformity was apprehended, in consequence of the unsupported soft parts falling down. The woman, however, got well in two months, and had the most perfect use of a new jaw. A similar fact is recorded in the *Journal de Médecine*, 1791.

When the body of a cylindrical bone, or the middle portion of a flat bone, is destroyed by necrosis, their extremities, which are of a cellular texture, continue unaffected, so that, for example, in the cylindrical bones, the articular ends are always formed of portions of the original bone, which are engrafted, as it were, on the new production. There are, however, a few bad cases, in which the necrosis does not altogether spare the heads of the bones, and the disease communicates with the joint. These examples are very uncommon, and are attended with considerable danger to the limb: indeed they generally require amputation. (See *Boyer, Traité des Mal. Chir. T.* 3, *p.* 442.) Mr. Brodie has known an instance, in which, without any obvious cause, a large portion of the head of the tibia died, and exfoliated, and the destruction of the knee-joint was the consequence. (*Pathol. and Surg. Obs. on the Joints, p.* 269.)

I am now attending at Staines, with Dr. Smith of Egham, and Messrs. Tothill, of the former town, a young gentleman, eight years old, the two upper thirds of whose thigh-bone is affected with necrosis, and the limb two inches shorter, than the opposite one, either from a disjunction at the epiphysis, or a destruction of the ligaments and acetabulum. This case, like the hip-disease, has been attended, from the first, with great emaciation of the lower part of the limb, severe pain about the knee, and a bent position of the thigh. Indeed, if it were not for the plain enlargement and irregularity, caused by the new bony matter, and the affected bone having been frequently touched with a probe in an earlier stage of the complaint, the case might be regarded as a common diseased hip, unattended with any particularity. There was, however, in the beginning, no lengthening of the limb, and, instead of a flatness, an increased fulness of the buttock on the affected side was observed.

Besides the differences arising from the particular bones affected, necrosis also varies, according as the portion of bone attacked happens to be thin, and of little extent, or large and of considerable thickness. The disease is *simple*, when it is confined to one bone, and the patient is in other respects healthy; *compound*, when several different parts of the same bone, or several distinct bones, are affected at the same time; when the health is bad; and other parts of the body are also diseased. It should also be known, because the information is of practical importance in the treatment, that necrosis has three different stages, or periods. In the first, the bone affected perishes; in the second, the process of exfoliation, or separation of the dead bone from the living, is going on; and, in the third, the separation is completed. (See *Weidmann, p.* 8.)

The causes of necrosis are not essentially different from those which produce ulcers and gangrene of the soft parts. As, however, the vitality of the bones is weaker, we may infer, that necrosis may be occasioned in them by causes, which are less numerous and intense, and such as would only give rise to suppuration in the soft parts. Every thing, whether in the periosteum, or the substance of the bone itself, that tends to interrupt the nutrition of the bone must be regarded as conducive to the origin of necrosis. It is observed, however, that when the mischief in the periosteum, medulla, or substance of the bone, is of trivial extent, the consequence is merely an abscess. Some of the causes of necrosis are *external*, while others are *internal*, or constitutional. Sometimes the life of the bone is instantaneously destroyed by them; but, in other instances, the bone is first stimulated and enlarged, so that its death is preceded by true inflammation.

The external causes, which injure the periosteum and medullary structure, and thus produce necrosis, are wounds, contusions, pressure, fractures, comminutions, acrid substances, caustics, and extreme degrees of heat, or cold.

When the periosteum, in consequence of an external cause, inflames and sloughs, or is at once deprived of its vitality, as it may be by the action of caustic, fire, or intense cold, the vessels, which conveyed nourishment to the bone are destroyed, and the death and exfoliation of the denuded portion of the bone are inevitable. But, if the detachment of the periosteum is of little extent, the patient young and healthy, and the treatment calculated to prevent inflammation, and preserve uninjured the vessels distributed to the bone, hopes may be entertained, that no part of the bone will die, but that granulations will very soon arise from its surface, being adherent to it as the periosteum was, and that they will grow to, and cicatrize with, the surrounding parts. Weidmann has explained, that this fact of bones not always exfoliating when deprived of the periosteum, which is of great practical importance in the treatment of wounds, was inculcated by Felix Wurtz, Cæsar Magatus, and Belloste, at a time when the contrary opinion prevailed. Weidmann also adverts to his own experience and to the experiments of Tenon, in further proof of the preceding fact. (*Mém. de l'Acad. des Sciences*, 1758, *p.* 372.)

On the other hand, when the detached piece of the periosteum is extensive; when the bone itself is contused; or when it has been long exposed to the air, the effect of which is to dry up the few vessels, which belong to it; when the inflammation is violent and extensive; when the patient is old, decrepit, or of bad constitution; and, more especially, when improper applications are used, as was almost always the case in former times; necrosis cannot be avoided.

An internal necrosis, affecting the spongy texture of bones, generally arises from constitutional causes, though sometimes an external cause, which seems to affect only the surface of a bone, extends its action to the interior, so as to destroy the medullary membrane, and produce an internal necrosis.

In external injuries of the head, where the pericranium is lacerated, contused, or otherwise hurt, or where the outer table, or the diploe of the skull, is injured, the inflammation frequently extends to the inner table, and the dura mater becomes detached. Hence, a collection of matter forms, which may occasion many bad symptoms, and even death itself; or, if the patient survive, exfoliation of part of both tables of the skull is the consequence. (See *Pott's Chir. Works, Lond.* 1779, *Vol.* 1, *p.* 32.)

The same thing may occur in other bones, as well as those of the cranium. Bromfield had an opportunity of seeing a necrosis of the spongy substance of the upper and internal part of the tibia, brought on by the improper mode, in which an issue was dressed. In order to keep the peas from slipping out of their places, a compress with a shilling in it, and a tight bandage were applied; but, the part was attacked with excruciating pain, and the spongy texture of the tibia in the vicinity became affected with necrosis. (*Chir. Observations and Cases, Vol.* 2, *p.* 9.)

This circumstance, as Weidmann observes, ought not to surprise us: as numerous vessels quit the periosteum to descend into the substance of the bone, to ramify on the medullary cells themselves, and freely anastomose there, it cannot be difficult to conceive, how inflammation, which is at first confined to the outside of the bone, may (through the medium of the vessels, which serve as conductors to it) penetrate more deeply, and extend its ravages in every direction.

But, necrosis may proceed from another description of causes, which are of a constitutional nature. In fevers of bad type, in the small-pox, and in the measles, experience has fully proved, that the bones are sometimes attacked with necrosis. Scrofula, lues venerea, and the scurvy, are also diseases, which, according to the testimony of all surgical writers, frequently produce such mischief in the bones as terminates in necrosis. It is likewise well ascertained, that mercury may itself give rise to the disorder, especially in the lower jaw-bone. (See *Mém. de l'Acad. de Chir. T.* 5, *p.* 356, 4*to.*)

This happens either in consequence of mercury having been introduced too quickly into the system, or because the patient exposes himself to cold, or deviates in some other respect from a proper regimen. Certain necroses of the lower jaw, however, appear also to have been caused by blows, and the application of acrid substances to carious teeth. But, says Weidmann, "I feel it incumbent upon me particularly to declare, that the irrational treatment pursued by the ancient practitioners, who neither understood the nature of the bones, nor the differences of their diseases, and which treatment is too confidently adopted in our own days, had frequently the effect of killing these parts, by attacking with spirituous, acrid, or caustic remedies, or even with the knife, diseases, which required the mildest applications, and to be left in a great measure to nature. The old surgeons were afraid of laying on the exposed injured surface of a bone unctuous emollient dressings, and yet, for what reason I know not, they subjected the part to the action of spirituous, acrid, drying applications. As for myself, I deem it proved by infallible and frequently repeated trials, not only that an exposed injured bone may be dressed with a mild ointment without any ill consequences, but even with the greatest advantage. Why should that, which is beneficial to the soft parts, be so prejudicial to the bones? In ulcers of the soft parts, indeed, the employment of the remedy, which I recommend, is less important, because these parts are naturally humid, and there is no risk of their becoming dry. But with regard to the bones, whose dry texture is only penetrated by few vessels, which may easily be destroyed if they be suffered to become quite dry, it is absolutely necessary to use an emollient ointment, as a dressing, well calculated to defend these vessels, which are the support of life, and preserve them from the bad effects of exposure to the air. Therefore, observes Weidmann, if a surgeon would avoid producing a necrosis himself, and not neglect any means, that tend to prevent such disorder, *he should make it a rule never to apply any thing acrid to exposed bones, but, on the contrary, to defend them with a dressing of some unirritating ointment.*" (*De Necrosi Ossium, p.* 11.)

It was formerly supposed, that purulent matter, collected near a bone, might in time become acrimonious, corrode the bone, and produce necrosis. Hence, it was a rule to open such an abscess as soon as its existence was known. But, Weidmann questions whether there was any real necessity for this practice. No doubt, says he, the preceding erroneous opinion arose from the circumstance of the bones being often found bare, carious, or even affected with necrosis, when abscesses were near them; but things happened thus, because the inflammation, which caused the suppuration, had also extended its effects to the periosteum and bone. He affirms, that he has witnessed ulcers, in which the surface of bones, bare and uncovered by the periosteum, lay bathed in pus for a very considerable time; yet, being dressed with a mild ointment, they continued entire, granulations grew from them, and cicatrization followed. He had also in his possession portions of bones, affected with necrosis, which had lain for years in pus; still their surface was smooth, and presented no marks of erosion. If then these pieces of bone underwent no alteration, how much less likely to do so are bones, which are endued with life!

But, though Weidmann wisely rejects the doctrine of pus being capable of destroying the periosteum and bones by any corrosive qualities, he acknowledges his belief, that the matter of an abscess may by its quantity compress and inflame the adjacent parts, and occasion their removal by the absorbents. While the periosteum intervenes between an abscess and the bone, he does not see how the latter can be hurt by the pus; but, when the abscess is copious and lodged between that membrane and the bone, the vessels passing from the former will be destroyed, and either caries or necrosis ensue.

The inflammation, arising from the causes which excite necrosis, may be either *acute* or *chronic*. It is chronic, when it begins and passes through its different stages slowly, and when the mildness of the symptoms may lead us to mistake the nature of the case. This sort of inflammation chiefly happens in debilitated constitutions, in which the necrosis only affects the external part of a bone, and originates from some chronic cause, such as scrofula, lues venerea, and the scurvy. But, when necrosis attacks the interior, and the disease occurs in a strong, irritable, plethoric subject, inflammation is immediately kindled, attended with the most acute symptoms, severe pain, considerable fever, restlessness, delirium, &c. Chronic inflammation is more supportable; but its duration is longer: acute inflammation is more afflicting, but sooner comes to a crisis.

The part, in which a necrosis is situated, is affected with swelling. What has been observed, respecting the inflammation, is also applicable to this tumor, which most frequently forms gradually, but sometimes with great rapidity. In the first case, the accompanying pain is dull and inconsiderable; in the second, it is violent. The swelling has not, like that of abscesses, an elevated apex. On the contrary, it is so widely diffused, that the limits, which circumscribe it, can hardly be distinguished.

This diffusion of the swelling is the greater, in proportion as the diseased bone is more deeply buried in soft parts: it may extend over the whole morbid bone, or even over the whole limb.

The swelling comes on at the very beginning of the disorder, and continues to increase, until the matter which it contains finds its way out, when the evacuation is followed by a partial subsidence of the tumor. The swelling is sometimes also combined with œdema, especially in persons, whose constitutions have been impaired by the severity of the disease, the violence of the sufferings, and the long and profuse discharge.

When the inflammation is acute, purulent matter of good quality soon collects in the vicinity of the necrosis. In the contrary case, the pus forms slowly, and is thinner and less healthy.

The abscess, which accompanies a necrosis, naturally soon bursts when it arises from intense inflammation, and is situated near the skin, which is itself inflamed. But, when the bone is surrounded by a great thickness of soft parts, and the inflammation is chronic, the quantity of matter daily increases, the cavity, which it occupies, becomes larger and larger, and considerable pressure is made in the abscess on every side. The bones and tendons resist for a long while the progress of the matter; but the cellular substance yields, and different sinuses form, which sometimes run to a vast distance from the main collection of matter, especially when the abscess lies under an aponeurosis.

It was supposed a few years ago, that, in cases of necrosis, the matter was invariably sanious, acrid, and fetid. But the celebrated Weidmann exposed the error of this opinion. He had often seen abscesses and ulcers, arising from necrosis, discharge a whitish, inodorous, thick pus, absolutely devoid of any bad quality whatsoever. He had particularly seen this happen in patients, whose necroses proceeded from an external cause, or an internal one of a slight nature, and whose health was generally good. (*De Necrosi Ossium, p.* 16.) If, says the same excellent writer, we sometimes find in practice the suppuration dark and fetid, we must not ascribe it to the affection of the bone; but to the weakness and bad state of the patient's health. Under the same circumstances, common sores of the soft parts would also emit a discharge of bad quality.

After the ulcerated openings have emitted for some time a profuse discharge, the sinuses, if considerable, receive the appellation of fistulæ, on account of their edges putting on a callous appearance, throwing out fungous granulations, and there being impediments to cicatrization. These impediments are caused by the dead portions of bone, which, whether loose, or adherent, act as extraneous bodies in hindering the sores from healing. In some instances, also, the ulcers will not heal, though the dead bone has come away, because they run to a great depth, and such a quantity of pus is secreted from every point of their surface, as prevents all contact, and the adhesions, which would result from it.

The fistulæ vary in number; but, they are fewer in proportion as the disease is slighter. In an extensive necrosis, several of these openings are seen, either near together, or separated by considerable spaces; and, when the necrosis affects every side of the bone, the fistulæ in the integuments occur on every side of the limb.

Besides the inflammatory fever, which attends the beginning of every severe case of necrosis, which is sometimes accompanied with exceedingly violent symptoms, and which usually abates when matter is formed, the patient is subject to another fever of a slow hectic type. This takes place in the decline of the disease, is the effect of the long continued profuse suppuration, gradually reduces the patient, and at length brings him to the grave, unless the timely removal of the sequestrum be effected either by nature, or art.

Let us next endeavour to trace the signs, by which we may not only ascertain the presence of the disease, but its modifications.

In the first place, we should make ourselves acquainted with every thing, which may have predisposed to the disorder; as, for instance, what accidental circumstances have occurred, and what symptoms followed them. We should also inquire into any previous treatment, which may have been adopted; for, as Weidmann truly remarks, injudicious remedies have caused many a necrosis, that would not have occurred at all, if the case had been properly treated, or confided to nature.

The kind of inflammation, with which the disease commences, may afford grounds for suspecting that necrosis will happen: it is generally slow and deeply seated, passing through its stages tardily, and the attendant symptoms are severe. The skin retains its natural colour a long while; but, at length, exhibits a reddish, or livid discoloration. The matter does not reach the skin, till a considerable time has elapsed, and when the abscess bursts, the inflammatory symptoms are still slow in subsiding. When the inflammation is acute, the patient suffers intolerable pain a long time.

There are also other symptoms of a necrosis; viz. the swelling which accompanies the inflammation, is situated upon a bone, or rather the bone is included in the tumor; the swelling is at the same time very diffused; and the suppuration lies deeply, and can only be felt in an obscure way.

The ulcers, beneath which a necrosis is situated, discharge a large quantity of matter, and their edges are bent inward. The granulations are either yellowish and pale, or else of an intense red colour; they are also irregular, and generally not very tender, though sometimes extremely painful, and on being slightly touched, they bleed.

It has been already noticed, that, some years ago, the discharge from the sores, which attend necrosis, was described as being always thin, fetid, and sanious; and such qualities of the matter were regarded as a symptom of the disease of the bone. But that excellent practical writer Weidmann has well explained, that it is a symptom, undeserving of confidence. In cases of necrosis the pus is often thick, white, and inodorous; while other ulcers, unattended with diseased bone, sometimes discharge thin fetid matter. Weidmann, at the same time, does not mean to assert, that, in cases of necrosis, the sores never emit unhealthy pus; but, he firmly believes, that such discharge is not always the result of a disease of the bone. As far as he could judge, the suppuration from ulcers, situated over diseased bones, continues white and laudable, as long as the patient's general health is good; but, that it deviates from these properties, in proportion as the health becomes impaired.

Neither is the black colour, imparted to the dressings of ulcers, a circumstance, which necessarily indicates the existence of necrosis; for it may occur, when the bone is sound, and may not happen, when the bone is affected.

None of the preceding symptoms convey such information, as leaves no doubt of the positive existence of necrosis. The touch is the only thing, which can give us this knowledge, when the bone is not too deeply situated, and the sinuses not tortuous, nor obstructed with fungous growths.

When the openings of the ulcers are considerable, the finger may be introduced. If in this way the bone can be felt to be extensively uncovered by the periosteum, the surgeon may conclude, that all such portion of the bone has perished. He may be still more certain of the fact, when he finds the edges of the denuded bone unequal and rough.

The examinations, made directly with the finger, give the most correct and exact information of the state of the bone; but the orifices of the sores are sometimes so small, that the finger cannot be introduced, without causing great pain. A probe must then be used for the purpose of ascertaining the extent of the denudation of the bone; whether its edges are rough; whether the dead portion is loose, and likely to separate soon.

Sometimes, the dead fragment of bone protrudes from the ulcer, or is visible on separating its edges. When it is black, there cannot be a doubt of its being actually dead; but, on the other hand, when its whiteness is increased, the diagnosis is difficult, because bones being naturally white, much experience is necessary to be able to judge whether they are so in excess.

It merits attention, also, that the black colour of the bone is not owing to the necrosis itself, but seems rather to depend upon the fragment having been exposed to the air. In fact, dead pieces of bone with which the air comes into contact, turn black, while those, which are covered with matter, retain their whiteness. The cylindrical portion of a humerus, which was almost totally affected with necrosis, was universally black at the part, which protruded through the flesh; but the rest, which lay under the integuments, was white. (*Weidmann de Necrosi Ossium, p.* 19, *et Tab.* 9, *fig* 1.)

When the early symptoms of the disease are mild, the surgeon may infer, that it is only a superficial portion of the bone, which is about to be separated. But, this judgment will be more certain, if confirmed by examination with the finger, or probe; or if the swelling, which occurred in the beginning, has not spread beyond the affected point, and if the pain affects only the outer part of the bone. In this sort of case, there is also great probability, that the dead bone will be separated within a moderate time.

It is also of importance to ascertain the existence of an internal necrosis, and to learn whether it is situated in the spongy substance, or in the internal parietes of the canal of the bone; whether it affects only a part, or extends to the whole body of the bone. When there is an internal necrosis, says Weidmann, the disease is generally more aggravated, and of longer duration; and in the first stage, the patient is affected with severe symptoms, intolerable pain, loss of rest, a great deal of fever, profuse perspirations, and such disorder of the system as may prove fatal, unless the patient be young and strong. The hard swelling, which was observable at the commencement of the disease, increases but slowly, and extends very gradually over the circumference of the limb, while the skin yet remains free from redness and tension. *If the part be somewhat roughly handled, the pain, which is fixed in the bone, is not rendered more acute, as would happen, were the case an external inflammation.* In this suffering condition, the patient continues a good while, before the formation of matter brings a degree of relief. When the matter is formed, it spreads through the adjacent cellular substance, amongst the muscles and other parts, and the abscess generally bursts, after a considerable time, by several openings, very distant from the main collection of matter, as also remote from each other, sometimes in diametrically opposite situations. The evacuation of the matter, however, does not produce any material subsidence of the swelling. The pus is of good quality, and issues in large quantities from the ulcerated apertures, *the quantity, however, not being increased when pressure is made.* If some of the openings heal, others are formed; but, in general, the edges become callous, and they lose all disposition to cicatrize. When the case presents the foregoing circumstances, and the weakened limb can neither bear the action of the muscles, nor the weight of the body, and by either of these causes, its shape becomes altered, the surgeon may conclude, that the disease is an internal necrosis. But, in order to avoid mistake, he should introduce into the sinuses a probe, which, passing through the openings in the subjacent bone, will touch the dead piece, which it contains, and which will sometimes be even distinguished to be loose and moveable. *The extent of the sequestrum must be judged of, by the extent of the swelling, and the distances between the apertures in the bony shell, which includes the sequestrum.*

The surgeon should also endeavour to ascertain with the probe, whether there is only a single sequestrum, or several. When there are several, they may be felt with the probe in different places, down to which this instrument is passed, and the removal of one, or two of the fragments, is not followed by a cure. It ought to be remembered, however, that the same fragment may be touched by the probe in several different places, when it is very extensive. If there are several dead pieces of bone, situated at a distance from each other, each of them is generally accompanied with a distinct swelling, and sinuses. Frequently, these fragments are so concealed, that they cannot be felt with a probe; but, their existence may then be suspected from the ulcers not healing, which can be ascribed to nothing else.

It is also necessary to distinguish with the greatest attention the different stages of the disease. The *first stage* may be considered as existing, when the attack is yet recent, and the inflammation and its concomitant symptoms, the pain, swelling, and symptomatic fever, prevail in a high degree, and when no suppuration has taken place, or at least no discharge of matter. The *second period*, in which the dead bone is undergoing the process of separation, is indicated by a diminution of the inflammation, a partial subsidence of the swelling, and the discharge of purulent matter. When a probe is passed into the ulcers, the bone is felt bare, and dry, and, towards the limits of the swelling, it is rough, where, as will be afterwards noticed, an excavation is formed. Every part of the bone, however, which is to be detached, still continues adherent to the rest of the living bone. At length, the surgeon knows, that the disease has reached its *last stage*, or that in which the dead portion of bone is entirely separated, when sufficient time for the completion of this separation has transpired, and when the dead bone can be distinguished with the finger, probe, or even the eye, to be loose, and free from all connexions.

Although a necrosis must generally be classed with diseases which are serious and of long duration; yet, the character of the disorder is not essentially bad, since it is often cured by nature, or with the assistance of surgery. Confident hopes of a cure may be entertained when the necrosis is confined to the external part of a bone; when it is simple and of moderate extent; when it is not situated in a bone, destined for important uses, or near any viscus, or organ, that may be injured by it; and when it proceeds from an external cause, and the general health is good. On the contrary, the cure is difficult, and the prognosis doubtful, when the disease is extensive, and complicated with other affections, either of the same, or different bones; when it attacks bones, which are of high importance on account of their functions, or situation; when it is situated in the interior of the bone, and affects several parts of it; when it arises from an internal cause, for which there is no certain and quick-acting specific; when the patient is weakened by age, or disease; and especially, when the sinuses extend into the neighbouring articulations. (*Weidmann de Necrosi Ossium, p.* 22.)

The process of cure is said to take place with more celerity in the lower jaw, than any other bone, and may be completed in three months. Mr. Russell has never known a necrosis of the tibia get well in less than a year; but, in general, nearly two years elapse first; and sometimes, the case is protracted to a much greater length of time.

Necrosis of the lower jaw and clavicle never proves fatal: that of the lower extremities, which is the worst case, does so very seldom, and only from the violence of the first inflammatory symptoms, which rapidly bring on hectic fever, which proves incurable, unless its local cause be removed by timely recourse to amputation. When the violence of the first stage, however, has abated, the irritation ceases, and the hectic symptoms, if there are any, are generally moderate. Nor is this state of tranquillity disturbed, till the sequestrum, in making its way outward, again produces irritation. At this second period of urgency, extensive inflammation may originate, ulcerations spread all over the surface of the limb, assume an unhealthy appearance, violent fever succeed, and the patient either perish, or sink into a state, in which he must consent to amputation, as the only means of saving his life. This is the last crisis of imminent danger; but, in general, it is less perilous, than when the inflammation comes on in the incipient stage of necrosis. (*Russell.*)

In the treatment of necrosis, the first grand object of the surgeon should be to aid nature in her endeavours to effect a cure, and not to disturb her operations by any superfluous, or unseasonable interference. The second should be to assist her sometimes by the boldest proceedings, when she loses her way, and cannot by herself accomplish what is necessary.

But, in order not to attempt any thing wrong, the surgeon must understand correctly, what nature does in this disease, what it is in her power to perform; what she either cannot accomplish at all, or not with any degree of certainty; and, lastly, the circumstances in which she may err, and endanger the patient's life.

When a portion of bone dies, nature uses all her endeavours to bring about its separation from the part of the bone, which still remains alive. Surgeons have denominated this process, *exfoliation*, (see *this word,*) which resembles the separation of parts affected with gangrene and sphacelus from the living flesh. The exfoliation of bone, however, happens much more slowly, than the separation of a slough of the soft parts. Neither are all exfoliations completed at a regular period; for they proceed most quickly during youth, when the constitution is usually more full of energy, the bones more vascular, and less replete with solid inorganic earthy matter. On the other hand, the process is slower, in old, debilitated subjects, whose vitality is less active. A thin small scale of bone separates sooner, than a large thick portion; and the most tedious exfoliation is that of a thick bone, from which a portion, including its entire diameter, is coming away. The separation of a necrosis takes place more expeditiously in bones of a light texture, than in those of a solid structure; and sooner, in the less compact parts of bones, such as the epiphyses and spongy substance, than in those of greater density.

When a necrosis has originated from the scurvy, syphilis, &c. and appropriate remedies are not administered, nature cannot effectually accomplish the process, by which the dead bone is separated; the case becomes worse; and life endangered.

The separation happens precisely at the different points where the living and dead parts of the bone come into contact; and it is obvious, that the particles of the dead bone, which are at a distance from the part, that retains its vitality, cannot be acted upon by it.

A variety of opinions have been entertained, concerning the means employed by nature in effecting this separation. Hippocrates believed, that the dead part was pushed away by a fleshy substance, which grew underneath it. (*De Cap. vuln. Cap.* xxiv.) Ludwig, Aitken, Bonn, and many others, adopted the same idea. (See *Adversaria Med. Pract. Vol.* 3, *p.* 63; *Systematic Elements of Surgery, p.* 287. *Thesaur. Oss. Morb. p.* 1.)

Van Swieten conceived, that the dead part was forced away by the incessant beating of the arteries. (*Comment, in Aphor. Boerrhavii*, § 252.) M. Fabre ascribed the separation to the extension and expansion of the vessels. (*Mém. de l'Acad. de Chir. Tom.* 4, *p.* 91.) Others supposed, that the exfoliating piece of bone became loosened partly by the suppuration, and partly by the rising of the new granulations. (See *B. Bell on Ulcers.*)

As Weidmann observes, there is unquestionably a reddish fleshy substance formed between the dead and living bone, and which Celsus has noticed under the appellation of caruncula. (*De Medicina, lib.* 8, *cap.* 3.) But, it would be erroneous to refer the expulsion of the dead portion of bone to it, since it can never be produced, before a change has taken place in the structure of bone, there being in fact no space for it to grow in; and hence, it is never seen before the disunion of the parts has considerably advanced. There must consequently be some other power, which destroys the cohesion between the dead and living bone, and produces the groove, or interspace, in which the soft granulations arise. Besides, amongst other facts proving the falsity of the idea, that the granulations push off the dead bone, Weidmann particularly adverts to the occasional exfoliations of the whole circumference of a cylindrical bone. Here, if the granulations had the power of causing a disunion on one side, they could not have the same effect on the opposite one; but would tend to make the contact more intimate.

The separation also cannot be made by the pulsation of the small arteries, nor by the weak expansive motion of the vessels of the bone. Weidmann knows not what motives have induced certain writers to impute the effect to suppuration, and observes, that, as the doctrine is not founded upon reasoning, it is superfluous to offer any arguments against it. If the least attention be paid to what nature really tries and accomplishes in this operation, nothing will be more manifest, than that it is completed in a very different manner. Swelling first affects the periosteum and bone, which by degrees softens. (*Vid. Troja, passim*; *Bonn. Thesaur. Oss. Morbos. p.* 122, *and Weidmann de Necrosi Ossium, Tab.* 4, *Figs.* 1 *and* 3.) At the margins of the necrosis, the bony surfaces, which were smooth, become rough, and irregular. A fissure is there produced, which extends in every direction under the piece of bone, that is about to be detached. The bony texture is also daily rendered less solid, so that the number of adhesions between the dead and living parts diminish, and in the end are totally destroyed. Weidmann then explains, that the true mode, by which the separation is effected, consists in the absorption of the particles, situated betwixt the living and dead parts of the bone, in such a way, however, that the first loses a great deal of its substance; the last, scarcely any thing. (*P.* 25.) After the dead bone has come away, the swelling of the periosteum subsides, and the living bone recovers its original hardness and solidity. (*Troja, p.* 67.)

For a further account of the process, by which dead portions of bone are separated from the living, see *Exfoliation.*

When dead portions of bone are separated and loose, they still lodge in the cavities of the ulcers, and, like all other extraneous bodies, occasion irritation of the soft parts, and keep up a discharge of matter. Sometimes, however, nature of herself succeeds in expelling them. This happens in cases, where the size and shape of the ulcer are calculated to facilitate the issue of the dead bone, which does not lie too deeply, and is propelled outward by its own weight. In necroses of trivial size, indeed, it is asserted, that the small fragments of bone may be dissolved in the pus, and come away with it; (*David; Bousselin, Hist. de la Société Royale de Médecine, Tom.* 4, *p.* 308; *Weidmann de Necrosi Ossium, p.* 26;) but, such an event can never be expected when the dead portion of bone is at all extensive.

The last thing, which nature does, is to restore the loss of substance which the bone has suffered. Although this operation is so extraordinary, and wonderful, that one might be disposed to doubt its reality, numerous examples, recorded in the annals of surgery, prove not only its possibility, but, also, its frequency.

In works referred to at the conclusion of this article, the following authors speak of the regeneration of a part, or the whole of the lower jawbone: viz. Bonetus, Bayer, Guernery, Belmain, Acrel, Van Wy, Trioen, Bonn, Reiplein, Desault, Henkel, and Dussaussoir. A student showed Weidmann a lower jaw-bone, which had been thus regenerated, and taken from the body of a man, whom the latter distinguished writer had been well acquainted with. The bone could not be freely depressed; yet it performed its functions tolerably well.

Moreau saw a case, in which the clavicle was regenerated, and the new bone was presented by Dangerville, after the patient's decease, to the Academy of Surgery at Paris. (*De Necrosi Ossium Theses, Præs. F. Chopart, resp. P. G. Robert, Parisiis,* 1776.)

Chopart had an opportunity of witnessing the death and reproduction of a scapula.

Weidmann saw an instance, in which nearly the whole cylindrical shaft of the humerus perished, and was afterwards regenerated; a phenomenon, that had been observed at earlier periods by Job of Mekren, Cajetano Taconi, E. Blancard, Duhamel, David, Acrel, Boehmer, Cheselden, and Vigaroux, whose respective works are cited at the end of this article.

Morand, Cheselden, and Bromfield published engravings, respecting a reproduction of the upper part of the humerus, where the old dead bone was included in a sort of bony tube.

Regenerations of the ulna have been observed by Ruysch, Duverney, and Fowles. (See *Thesaur. X. No.* 176. *Traité des Mal. des Os. Paris,* 1751; and *Phil. Trans. No.* 312.)

A similar reproduction of the lower ends of the radius and ulna was witnessed by Acrel. (*Chirurgische Vorfälle von Murray, Vol.* 1, *p.* 194.)

Similar reproductions of the thigh-bone are recorded by Wedel, Battus, Koschius, Hofmann, Scultetus, Diemerbroeck, Wright, Fabricius Hildanus, Raw, Dobyns, M'Kenzie, Ludwig, David, Rousselin, Larrey, Hutchison, &c. in publications specified at the conclusion of this subject.

The following case of necrosis of the thighbone is related by Dr. M'Kenzie. William Baxter, a boy thirteen years old, received a blow on his thigh at school, of which he at first hardly complained; but, in a few months, he began to have pain in the thigh, which inflamed, swelled, and appeared to have matter in it. The parents being poor, no surgeon was called, and the boy was allowed to linger for a great while. At length the matter made its way through the skin, by a small opening, on the interior part of the thigh, about three inches above the knee, and a thin sanies continued to be discharged for eighteen, or twenty months. At length, the hole in the skin enlarged, and the point of a bone began to protrude, and give a good deal of pain, when the clothes rubbed against it. After suffering in this manner for two years and a half, the boy, as he lay in bed one morning, felt the bone looser, and projecting more than ordinary. He gave it a strong pull, and brought the piece away entirely, which proved to be seven inches and a half of the thigh-bone. A good deal of bleeding followed; but, the wound soon healed, and he had never afterwards the least inconvenience. Dr. M'Kenzie, hearing of this singular case, sent for the boy, carefully examined his thigh, and found it as firm as the other. The only difference was, that it was somewhat thicker, and a little more curved. The muscles retained their natural softness, and looseness on the bone. The detached piece of bone was a portion of its whole circumference. (See *Med. Obs. and Inquiries, Vol.* 2.)

We may infer, that the occurrence is more frequent in the tibia than any other bone, from the accumulated facts, mentioned by Albucasis, La Marche, Muralto, De La Motte, Ellinchuys, Ruysch, Tacconi, Laing, Johnson, Hunter, David, Boehmer, Sigwart, Th. Bartholine, Hofmann, Saviard, Le Dran, Duverney, Trioen, Gunther, Ludwig, Michael, Bousselin, Weidmann, Russell, Whately, Desault, &c. See the works cited at the end.

Dr. Hunter describes a tibia, which had been amputated. On examination the case at first sight seemed to be a swelling of the whole bone, with a loose internal exfoliation. However, it proved to be a remarkable instance of the separation of the greatest part of the original bone, whose place was supplied by a callus. The external surface of the inclosed loose piece of bone was smooth. A small part of the surrounding bony substance being removed the contained piece was taken out, and found to be the whole body of the tibia. It had separated from the epiphysis at each extremity. The middle part of the bone had perished, consequently had lost its connexion with the periosteum, and was gradually thrown off from the living parts of the bone at each end. A callus, extending from end to end, united the two extremities of the original tibia, preserved the length, and gave firmness and inflexibility to the part. The exfoliation was so encompassed by the new bony case, that, though quite loose, it could not be thrown out. (*Med. Obs. and Inq. Vol.* 2.)

Weidmann saw a shoemaker who, after much suffering, extracted, with his own hands, the greatest part of the diaphysis of the tibia; yet, the loss was so well repaired, that the man could walk afterwards nearly as ably as ever. (*De Necrosi Ossium, p.* 29.)

"We are not to imagine, (says Weidmann,) that these regenerations happen by chance: experiments made upon living animals by Troja, Blumenbach, Koehler, Desault, and myself, prove, that they invariably follow certain laws."

In fact, whenever the medullary structure of the long bones of pigeons, or dogs, is destroyed, these bones become affected with necrosis, and are afterwards reproduced to the full extent of their destruction.

The observations and experiments, cited by Weidmann, also prove, that it is the long bones which are usually reproduced; though the flat ones are not entirely destitute of the power of regeneration, since experience fully evinces, that, when a portion of the skull is removed, either by a wound, by disease, or by the trepan, nature always endeavours to cover the deficiency, the edges of the aperture extending themselves by means of a bony substance, furnished by the periosteum, the dura mater, and cranium itself.—(*Tenon, Mém. de l'Acad. des Sciences,* 1758, *p.* 412, 413, 415, 416, 418.) But, still the reproduction is imperfect, as an unossified place is always left, even when the bone has lost only a small piece, like what is taken out by the trephine; and when the destruction of the cranium is very extensive, no reproduction at all happens. This fact, which is proved by the observations of Saviard, Pott, Sabatier, &c. is particularly noticed by Sir A. Cooper.

When, in a case of necrosis, says Weidmann, a scale, or table of either a long, or flat bone, is separated, no regeneration follows, because the granulations, which rise up under the sequestrum, then serve as a periosteum, and as soon as the dead bone is removed, they become united to the adjacent parts.

It is likewise ascertained, that the power of reproduction in the bones is particularly active in the early periods of life, and in healthy subjects; and that it is languid and even annihilated in old persons, pregnant women, (*Bonn's Thesaur. p.* 174,) and in venereal, cancerous, and ricketty patients. (*Callisen, Syst. Chir. Hodiernæ, Pars* 1, *p.* 636.)

In order that a new bone may form, Weidmann thought that the periosteum and other membranes, concerned in the nutrition of the original bone, must have been spared from destruction. In fact, says he, we observe, that, in cases where the tube of a long bone has suffered necrosis, the bone is never reproduced, when the periosteum has been destroyed by inflammation, or other causes. Surgeons ought also to understand, that it is not always a reproduction which has happened, when a part of the bone perishes; not even when a tubular portion of a long bone dies, and is contained in the medullary canal. For, according to Weidmann, if the innermost layers of a long bone perish, while those which compose, as it were the bark, are preserved, the latter swell and soften, as if they were actually a new bone. Several round apertures are observable upon their surface, which serve for the transmission of vessels, and are larger than those which perform this office in the natural state. There are likewise formed large openings, or fistulæ, which, as in a new bone, lead to the medullary canal. Here it would be erroneous to conclude, that a new bone has been produced, and a very little attention will discover, that all is limited to some changes in the external part of the bone, which the necrosis has not affected.

When, therefore, the interior of the canal of a long bone is destroyed by a necrosis, which does not extend to the external layers, the case is not a reproduction of the bone.

When, however, we find the tube of any long bone included in a sort of osseous shell, and the surface of this tube smooth, like that of a bone in the natural state, we may be certain, that it has been detached directly from the periosteum, and that the bony shell, which contains it, is a new production. On the contrary, if the surface of the dead tube is rough, we may infer, that the separation has taken place between the innermost layers of the bone, and those which are superficial, the latter composing now the osseous shell, in which the sequestrum is included. (*Weidmann de Necrosi Ossium, p.* 31.)

This last theory, concerning the production of the osseous shell in necroses of the long cylindrical bones, is adopted by Richerand as the true one, not only in the instances specified by Weidmann, but, in every other example, where the old bone seems to be included in another, which has the appearance of being a new production, and which was supposed by Troja, David, &c. to be formed by the vessels of the periosteum. (See *Nosographie Chir. T.* 3, *p.* 158, 161, *Edit.* 4.)

As far as Weidmann's information reached, the short or cuboid bones are not capable of reproduction. (*P.* 31.) Duverney mentions an astragalus, which was destroyed by necrosis; but, does not state, that any substitute for it was afterwards formed. (*Maladies des Os, p.* 458.)

Weidmann also never witnessed a reproduction of the spongy substance, such as it was before its destruction, round the medulla. He always found the substituted matter dense and compact, at least, for some time after its formation.

It is now admitted, however, that in process of time, the inner surface of the new bone becomes cellular, and is lined with a membrane containing medulla. The regeneration of the medulla was first observed by Koehler, and afterwards by Dr. J. Thomson, in an extensive series of experiments, which he made with Dr. Alexander M'Donald, and which were published in the latter gentleman's inaugural dissertation in 1799. (See *Thomson's Lectures on Inflammation, p.* 393.) Mr. Russell was not aware of the regeneration of the medulla; for, he states, that, after the absorption, or removal of the sequestrum, the cavity of the new bone becomes filled up with granulations, which are at length converted into bony matter. Thus, he says, the new bone differs from the original one, in being solid, instead of hollow. Authorities, however, are decidedly against Mr. Russell on this point: in the 5th vol. of the *Mém. de l'Acad. de Chir.* is the history of a man, the whole of whose clavicle came away, without his being deprived of any of the motions of the arm. The death of this patient, which happened shortly afterwards, afforded an opportunity of examining how nature had repaired the loss. Another clavicle was found regenerated, which neither differed from the original one in length, nor solidity; but only in shape, being flatter, and not so round. It was connected with the acromion and sternum, just like the primitive bone.

The power, which thus reproduces bones, is only a modification of that which unites fractures. Indeed, what consolidates broken bones, and is known by the name of *callus*, presents all the characters of new bone, begins and grows in the same way, and may be impeded and retarded in its formation by the same causes. (*See Callus* and *Fractures.*) It is further highly probable, as Weidmann remarks, that the power, which effects the reproduction of bones, is the same as that, which, in the sound state, nourishes and supports these parts. But to what organ appertains the function of reproducing bones?

Many able men have ascribed the whole work to the periosteum. (*C. Havers; Duhamel, Mém. de l'Acad. des Sciences*, 1739, 1741, 1742, 1747. *Fougeroux, Mém. sur les Os; Paris*, 1760. *Swencke, Harlemer Abhandlungen*, 1 *th. p.* 39. *Bertin, Ostéologie. Marigues, Abhandlung von der Natur und Erzengung des Callus, p.* 199.)

Haller (*Elem. Physiol. T.* 8, *p.* 352), Callisen, (*Collect. Hafn. T.* 2, *p.* 187.) Tenon, (*Mém. de l'Acad. des Sciences*, 1758, *p.* 415,) Bordenave (*Mém. sur les Os, p.* 227), and many others, have seen a part of the new production spring up from the substance of the old bone; a thing, says Wiedmann, which one is also led to believe by the fact, that, when the whole tube of a long bone is affected with necrosis, the epiphyses, which remain sound and untouched, unite and grow to the new tube, though no periosteum exists in the situation of the union.

Nor does Weidmann think, that the specimen of a fractured thigh, of which Blumenbach has published an engraving, proves the contrary.—(*Geschichte und Berschreibung der Knocher; Göttingen*, 1786, *Tab.* 1, *fig.* 1.) This preparation exhibits a union, which had taken place by means of a very broad osseous ring, encompassing the ends of the fracture, which lie far asunder. The event appears to Wiedmann to have been the result of rachitis, or lues venerea, with which the young patient, according to Blumenbach himself, had been affected, and by which the nutrition of this bone had been disordered. For, says Wiedmann, in other examples of united fractures, the ends of the bone are so connected together by the callus, that there does not exist a single point between them, where this substance is not effused, and the medullary canal itself is obstructed and filled with it. In the *Journ. Complém. du Dict. des Sciences Méd. T.* 8, may be found some considerations offered by Larrey, against the doctrine, that the periosteum is the organ of ossification.

Paletta records a case, in which five inches of the tibia were regenerated, and he concludes, that the new osseous substance was not formed from the periosteum, which had been destroyed, but from the remaining portion of healthy bone. (See *Exercitationes Pathologicæ 4to, Mediolani.*) Dr. R. Knox has also seen an instance of caries of the trochanter major, where nature had attempted to repair the injury by a secretion of new bony matter, round the ulcerated part of the bone, and where the new osseous substance was evidently formed by the vessels of the old bone, the periosteum remaining perfectly sound and unchanged. His remarks, are all in favour of the doctrine, which refers the production of new bone to the vessels of the remaining portion of living bone. (See *Edinb. Med. Surg. Journ. Vol.* 18.) The concurring opinion of Mr. Liston on the same point, I have mentioned in another place. (See *Fracture.*)

That, however, the periosteum is frequently the organ of the reproduction of the bones, seems proved by the experiments of Troja, Blumenbach, Desault, and Koehler, since in these the bones were invariably regenerated, though there was nothing left of the old bone, that could furnish the new reproduction, except the periosteum.

If we examine the new bone, at different periods of its development, it appears in the earliest state in the form of a reddish fluid, as has been observed by Duhamel, Fougeroux, Bordenave, Haller, Callisen, and others. If we also attend to the progressive changes which this fluid undergoes, we cannot but believe, that, as in the embryo, an organic and fixed arrangement of parts takes place. Indeed, it would be erroneous to consider such fluid as destitute of organization and extravasated at random. Thin and little in quantity on its first appearance, its consistence and quantity afterwards gradually increase (*Troja, p.* 42, 44,) so that what at first appeared like a liquid, soon becomes a gelatinous substance, in which are developed, especially at its inner surface and towards its lower part, bony fibres, which incessantly become more and more numerous. These fibres in a short time form little layers and cells, and extend themselves every where, so that at length all which was fluid disappears, and the new bone is produced. While young, however, it is still spongy and reddish, (*Troja, p.* 44;) but soon becomes denser, harder, and more solid, than that was for which it is a substitute, and it acquires the ordinary colour of the rest of the bones.

The external surface of the new bone, which, during the period of its formation, was irregular, and studded with several excrescences of various sizes, and pierced with apertures of different dimensions, becomes in the course of time smooth and regular, especially after the expulsion of the sequestrum.

The sides, or walls of the new bone, which at first were of considerable thickness, in time also grow thinner. (*Troja, p.* 21.) When the entire dead bony cylinder continues in its cavity, the new bone is neither shorter, nor longer, than the original. But, should one of the ends of the dead tube protrude from the cavity, while by the side of the affected bone, there is not another one capable of resisting the action of the muscles, the new bone will be shortened, and undergo some change in its shape and direction. Indeed, says Weidmann, the new bone in its early state, from want of consistence, must yield to the efforts of the muscles.

Its shape is not exactly like that of the original bone: the sides are flatter; the usual angles, depressions, and eminences are not observable, and sometimes others are formed.

How admirable is the process, by which the muscles, detached from a bone affected with necrosis, have other insertions given to them, and are thus rendered capable of performing their functions! (*Troja, p.* 27.)

The periosteum, which swells as soon as the exfoliation of the old bone commences, shrinks, and is not at all thickened, when the exfoliation is finished. Troja, having destroyed the medullary structure of a long bone, found the periosteum swelled at the end of 36 hours; but he observed, that the whole of such swelling disappeared before the 25th day. (*P.* 43, 67.)

The periosteum, which thus survives, adheres to the new bone, as it did to the old one; its vessels, which are now increased in diameter, and convey a larger quantity of blood, dive into large apertures in the regenerated bone, ramify every where in its substance, and nourish it.

Dr. Macartney's observations nearly agree with those of Troja and Weidmann, respecting the formation of the new bone by the periosteum, with this difference, however, that he does not describe the original periosteum as becoming afterwards attached to the new bone, but as disappearing. Dr. Macartney remarks, "that the first and most important circumstance is the change, which takes place in the organization of the periosteum; this membrane acquires the highest degree of vascularity, becomes considerably thickened, soft, spongy, and loosely adherent to the bone. The cellular substance, also, which is immediately connected with the periosteum, suffers a similar alteration: it puts on the appearance of being inflamed, its vessels enlarge, lymph is shed into its interstices, and it becomes consolidated with the periosteum. These changes are preparatory to the absorption of the old bone, and the secretion of the new osseous matter, and even previous to the death of the bone, which is to be removed. In one instance, I found the periosteum vascular and pulpy, when the only affection was a small abscess of the medulla, the bone still retaining its connexion with the neighbouring parts, as it readily received injection. The newly organized periosteum, &c. separates entirely from the bone, after which it begins to remove the latter by absorption;" and while this is going on, its inner surface becomes covered with little eminences, resembling granulations. "In proportion as the old bone is removed, new osseous matter is dispersed in the substance of the granulations, whilst they continue to grow upon the old bone, until the whole, or a part of it, is completely absorbed, according to the circumstances of the case. What remains of the investment, after the absorption of the old bone, and the formation of the osseous tube, which is to replace it, degenerates, loses its vascularity, and appears like a lacerated membrane. I have never had an opportunity of examining a limb, a sufficient time after the termination of the disease, to ascertain, whether the investment be at last totally absorbed, but in some instances, I have seen very little remaining. During the progress of the disease, the thickened cellular substance, which surrounded the original periosteum, becomes gradually thinner; its vessels diminish, and it adheres strictly to the new-formed bone, to which it ultimately serves as a periosteum." Dr. Macartney states, that the anatomical preparations, which authenticate the above observations, were preserved at St. Bartholomew's Hospital. (See *Crowther on White Swelling, p.* 183, *Ed.* 2.)

Mr. Stanley, however, lately showed me in the same museum, a preparation, which tends to confirm the accuracy of Troja's account of the old periosteum becoming adherent to the new bone. In this example, the periosteum is perfectly continuous with that covering the epiphyses. If this were not the fact, we should have to explain in what way the periosteum of the new bone is formed. We know that the vessels of the original periosteum enter the new bone, in order to complete its formation, and it seems more consonant with the uniform simplicity of nature's operations, to suppose that this connexion is kept up, than that the old periosteum should be totally removed, after the production of the new bone, and another membrane of the same kind be then generated.

An interesting example of necrosis of the thigh-bone, published some time ago by Mr. C. Hutchison, tends also to prove, that the new osseous shell is commonly formed by the periosteum, as in this case, the medullary bags, or cells, were found completely ossified, (*Practical Obs. in Surgery, p.* 135,) and could not therefore be supposed to be capable of the work. Amongst the moderns, also, Dr. M'Donald deserves to be mentioned as one of the most distinguished advocates for the truth of Troja's explanation of this subject. (See *M'Donald's Thesis de Necrosi ac Callo; Edinb.* 1799.) Another late writer has adduced many arguments to prove that the pulpy mass, which extends from one epiphysis to the other, and is itself at last converted into bone, is formed quite independently of the original bone, or the periosteum. (See *Russell's Practical Essay on Necrosis, p.* 27, *Edinb.* 1795.) This account, however, is contrary to the observations of Troja, David, Weidmann, M'Donald, Macartney, and numerous other observers. Indeed, Mr. Hutchison seems to think the periosteum so essential to ossification, or the production of a new bone, that he attempts to explain the cause of fractures of the patella not becoming united by a bony substance, by adverting to the deficiency of periosteum upon it; a circumstance which he deems also a strong argument against Mr. Russell's doctrine. (See *Practical Observ. in Surgery*, *p.* 141, 142.)

These very same cases, however, fractures of the patella, do sometimes unite by bone, and, therefore, while Mr. Hutchison is urging them as facts against Mr. Russell's opinion, Baron Larrey is actually adducing them in its support. (See *Journ. Complém. du Dict. des Sciences Méd. T.* 8.) The experiments of Breschet and Villermé (see *Fracture*) are decidedly against the periosteum being exclusively the organ of ossification.

Boyer does not refer all the work of reproducing bones exclusively to the periosteum in every instance; but joins Weidmann in believing, that what seems a new bone is sometimes only a separation and thickening of the external layers of the original bone, which have escaped destruction. He notices the modifications, to which the phenomena of necrosis are subject when the disorder affects the whole thickness, and the whole, or the greater part, of the circumference of a long cylindrical bone. When the periosteum is destroyed together with the bone, and the medullary membrane, which does the office of an internal periosteum, is preserved, Boyer represents the latter membrane as undergoing similar changes to those which we have mentioned as taking place, under other circumstances, in the external periosteum, and he describes it as becoming the organ by which the new bone is formed. (See *Traité des Maladies Chir. T.* 3, *p.* 432.) But when the whole thickness and circumference of a long bone are destroyed, together with the medullary membrane, while the periosteum survives, Boyer agrees with Troja, &c. in believing the latter membrane to be the means by which the new bone is generated.

The internal surface of the new bone is lined by a new membrane, which serves as a periosteum, and is at first hardly distinguishable. (*Troja, p.* 56.) In the early state, it is soft and pulpy; (*ibid. p.* 22); but, by degrees, it grows thicker and firmer, and is at length converted into a true membrane, which sends a great number of vessels into the substance of the bone. When this membrane is torn off, the surface, which it covered, is found somewhat smooth, the edges of the bony layers, and projections of the fibres being blunt and rounded.

The cavity of the new bone includes, and almost entirely conceals, the dead fragments. Sometimes, however, the new bone forms a sort of bridge over the sequestrum, in such a manner that the cavity is open above and below, in both which situations the sequestrum can be felt. (*Hunter, in Med. Obs. and Inquiries, Vol.* 2, *p.* 418.)

Sometimes, it is only a narrow cross piece, which forms the bridge retaining the sequestrum. (*Weidmann, vid. Tab.* 5, *Fig.* 1, *a.*)

The new bone may also have an opening in it, out of which the dead portion protrudes. (*Ib. p.* 35.)

Sometimes the cavity of the new bone is single; while, in other instances, there are several successive cavities in the direction of the length of the bone, with transverse interspaces between them; or else the cavities are situated laterally with respect to each other, and divided by partitions. (*Weidmann, Tab.* 7, *Fig.* 2.)

These cavities are proportioned in size and shape to the fragments of dead bone, which lodge in them. It occasionally happens, that they open into some neighbouring joint, and bring on suppuration there: a very unfavourable complication. (*Ibid. p.* 34, *and Tab.* 6, *Fig.* 3; *also, Boyer, Traité des Mal. Chir. Tom.* 3, *p.* 435.)

Let us next follow Weidmann, and take notice of the holes, by which the cavities, including the dead pieces of bone, open externally, which Troja denominated the large foramina, and which the preceding excellent writer preferred calling the *cloacæ*, because they serve to convey outward the matter and any separated pieces of bone. In the beginning of the disorder, they are not observable, a certain space of time appearing to be requisite for their formation. They are noticed in long cylindrical bones, whether original, or of new production, whose cavities contain dead fragments.

These openings vary in number; when the sequestrum is small, only one is found; but, when the piece of dead bone is extensive, there may be two, three, or four. Weidmann never saw more than five. But Troja met with eight. (*P.* 58.) Weidmann possessed a small portion of the diploe of the os innominatum, which was affected with necrosis, and contained in a bony cavity, that had no external opening whatever.

When there are several distinct cavities in the same bone, containing dead fragments, each cavity has at least one external opening.

These *cloacæ*, or apertures, are commonly situated at the lower and lateral parts of the cavities; pass obliquely outwards; and communicate with fistulous ulcers, which open on the surface of the skin. (*David, p.* 186.) Some of the cloacæ, however, form at the middle, or (what is exceedingly rare) at the upper part of the cavities, and proceeding outward, without any oblique track, go to the front, back, or lateral parts of the limb.

They are of a round, or oval, shape, or nearly so. Their usual size is such, that it will just admit a quill, and they vary very little from this dimension.

They terminate internally by converging approaching edges, in the manner of a funnel; while, on the contrary, the margins of their outer extremity expand. The canal, between these two orifices, is sometimes long, sometimes short, and, in certain cases, of no extent at all.

Different opinions have been broached, respecting the causes which produce the apertures in the new bone, termed by Wiedmann the *cloacæ*.

M. David says that the pus, collecting in an early stage of the disease between the bone and the periosteum, distends and corrodes this membrane, and that the openings which form in it become afterwards a cause of fistulæ in the new bone. (*P.* 186.) But, it is observed by Weidmann, that this explanation is inadmissible, since the existence of the collection of pus, mentioned by M. David, is not proved by observation: in fact, it was never met with by Troja, Blumenbach, Desault, Koehler, and many others, in repeated experiments made on the subject. (*Troja, p.* 56 *and* 66; *Weidmann, p.* 36.)

Koehler thought he had seen the new bone itself destroyed by the pus, and *cloacæ* thus produced. (*P.* 68—72.)

Weidmann, however, deems this opinion quite as improbable as the preceding, for the fact of the surface of these bony apertures being always smooth, always formed in one manner, and constantly lined by the periosteum, decidedly proves, that they cannot arise from erosion.

Troja, in his third experiment upon the regeneration of bones, remarked, that forty-two hours after the destruction of the medulla, there took place, between the bone and the periosteum, an effusion of lymph, which was at first thin and little in quantity, but afterwards became thicker. He noticed, in the midst of this gelatinous substance, *some small spaces, where it was deficient, and which had, instead of it, a subtle, whitish, dry incrustation, which, though tolerably adherent, could be rubbed off. These small spaces, according to Troja, produce the apertures, called the cloacæ.* (*Troja, p.* 45.)

In another experiment, he had an opportunity of examining the above little spaces at the end of forty-eight hours; he affirms, that they were replaced by the large apertures, or cloacæ, of the new bone (*P.* 47); and that such openings were invariably formed in the place of the small incrusted spaces already described. (*P.* 58.) As Troja took notice, that no lymph was effused at these particular points, he was inclined to impute the circumstance to a defect in the ossification, and, *perhaps, to the death of some parts of the periosteum.* Weidmann acknowledges, that the mode, in which the formation of the cloacæ happens, is exceedingly obscure; and expresses his belief, that Troja's account of it approaches the nearest to the truth. But, says he, one thing is certain, namely, that these openings have no other use, but that of conveying outward the pus, which collects in the cavity, and the small bony fragments, since, as soon as every atom of dead bone has passed out, they diminish, and, at length, are totally obliterated. (*Weidmann De Necrosi Ossium, p.* 36.)

It is a remarkable circumstance, in the history of necrosis, that, in favourable instances of the disease, the inflexibility and firmness of the limb are preserved, during the whole of the process, by which the new bone is formed. Consequently, the new bone must have begun to grow, and have acquired firmness before the old bone separates, or is absorbed. Were this not the case, the limb must become flexible and useless, the moment the dead bone is removed. Another consequence of the new bone being formed, before the removal of the old one, is that the former must surround and include the latter. For, since the lifeless portion of bone completely occupies the space between the two living ends, these cannot be immediately connected by the new bony matter. The connexion can alone be completed by the new bone being deposited on the outside of the old one, from one end to the other, and attaching itself to the portions which still remain alive. The new bone must also be necessarily larger than the old one, because externally situated, and hence the affected limb, after the cure is complete, will always continue larger, clumsier, and less shapely than the other. The length of it, however, remains unaltered, because the old bone retains its attachment, while the rudiments of the new bone are lying on its outside, and connect the living ends of the old one, by an inflexible mass, equal in length to the portion which is destroyed.

Thus we see, that in the process, which nature follows in the formation of the new osseous shell, the old bone serves as a mould for the new one, and the first step of the process is to surround the old bone with an effusion of coagulating lymph. (See *Russell on Necrosis, p.* 2—7.)

When the sequestrum is thrown off slowly, the inflammation is moderate; but when it separates quickly, while the new bone is in a soft state, the detachment is always preceded by severe inflammatory symptoms, and followed by a temporary loss of the natural firmness of the limb. This premature separation of the sequestrum often occurs in necrosis of the lower jaw, and the chin consequently falls down on the neck. In certain cases, the sequestrum separates at each end from the living portions of the old bone, before the new osseous shell has acquired firmness, so that the limb feels as if it were broken in two places. (*Russell.*)

Let us next consider the states and circumstances of necrosis, in which the art of surgery may be advantageously exerted in the assistance of nature, and the means which may be employed for this purpose.

A common error of medical and surgical practitioners is always to impute the cure of every disease to whatever remedies happen to be employed, and successes are too often boasted of, the merit of which belongs entirely to nature. It is, indeed, not very unfrequent to hear remedies panegyrically spoken of, which counteract the salutary efforts of nature, who, in this case, is obliged to overcome both the disease, and the irrational treatment, which is applied to it. As Weidmann observes, this erroneous mode of considering things has happened particularly often amongst surgeons who have had cases of necrosis under their care, all of whom boast of the cures which they have accomplished, although some employed absorbent earths, others, aromatics; some spirituous applications; others, balsams; some, acids; others, caustics; and some, armed with a wimble, made numerous perforations in the dead bone; while many others rasped the part, or attacked it with the trepan, cutting forceps, the gouge and mallet, or even the actual cautery; and a certain number did nothing more, than apply dry lint. Nature, who was favourable to all, did her own work in silence, whatever were the remedies employed for her assistance, whether mild and inert; acrid and corrosive; or hurtful and improper.

We have already noticed, that a dead portion of bone separates from the living exactly in the same way, as gangrenous soft parts spontaneously drop off, without the interference of art. The separation happens precisely at the points, to which death has extended; limits, which are well understood only by nature, and of course can be measured only by her. Art would incur great risk of either going beyond them, or else of not reaching them at all. Perhaps, it may be deemed unsafe to confide the process of separation, or exfoliation, to nature. But, in what other manner could it be more safely accomplished, without hemorrhage, or pain to the patient—without any risk of a recurrence of inflammation, or of a fresh necrosis?

Is there reason to fear, that, when every thing is left to nature, the separation cannot be finished till after a very long period of time? It is true, says Weidmann, that the process frequently requires a considerable time; but, as the vitality of the bones is not possessed of much energy, and their component parts strongly cohere, slowness is inevitable in an operation, which depends entirely upon the vital power. What is it then which surgery can do to accelerate the process?

Will any of the above-mentioned topical applications have this effect? They are put upon the inert surface of a dead piece of bone, in which no vital power or action, can be again excited. When acrid, they prove irritating, inflaming, and destructive of the neighbouring flesh, without any utility—and cause pain to the patient, which is compensated by no good. Would the perforations recommended by Celsus, Belloste, and many others, have the desired effect? If, says Weidmann, they are confined to the dead bone, they cannot have more effect, than the scarifications, which were formerly practised by ignorant surgeons in cases of gangrene; and, if they extend to the living bone, this will be injured, or at least run the risk of being so. Lastly; Weidmann demands, if the separation can be accelerated by the actual cautery, which cannot act upon every point of the necrosis, and which, unless applied with the greatest precautions, will burn the subjacent parts, and bring on a new attack of inflammation, without forwarding the exfoliation in the smallest degree?

Of what use can rasping and scraping instruments be, which act merely upon the dead part? Or will the gouge, and other cutting instruments do more good? They cannot take away the whole of the dead portion, without injuring the adjacent living bone, and causing a risk of another necrosis. And, if they leave any pieces of the old dead bone behind, nature will be as long in effecting the separation of these, as she would have been in detaching the entire necrosis.

Weidmann mentions a case, which occurred in the hospital of St. Roch at Mentz. A man's legs were seized with mortification, in consequence of exposure to cold; the whole of the dead parts separated; and the bones were sawn through on a level with the living flesh. A portion of the end of each bone, however, was afterwards thrown off altogether by nature, and Weidmann thence concludes, that the previous use of the saw had been fruitless. Weidmann then cites another case of mortification of the leg and half of the thigh, which was the consequence of a putrid fever. The leg sloughed away, leaving the lower portion of the thigh-bone uncovered and projecting. Under a tonic plan of treatment, this part of the bone spontaneously separated. As, however, a considerable quantity of integuments had been destroyed, the ulcer was slow in healing; but, it cicatrized at last, and the young woman continued well long afterwards.

Weidmann has quoted the memorable case, in which Mr. C. White first sawed off the upper part of a diseased humerus. (See *Amputation.*) As in this instance, nature accomplished of herself the separation of another dead portion of the same bone, two months after the operation, Weidmann seems disposed to think the cure would have happened equally well without it.

In cases of slight superficial necrosis, surgeons have frequent opportunities of trying every kind of topical application; and when the cure takes place, during the use of any of them, the benefit is ascribed to whatever happens to be in use. But, says Weidmann, in numerous more serious examples of necrosis, it is impossible to make these applications reach the whole surface of the dead bone; but notwithstanding this circumstance, the separation is not impeded. Some exfoliations happen, without our knowing of their occurrence, and without a thought having been entertained of promoting them by any vaunted applications. We even see necroses separate, whose situation rendered them inaccessible to our remedies; such are the necroses, which occur within the long bones, and comprehend the whole of their cylindrical shaft or body. What surgeon can boast of having effected by topical applications, the separation of the whole lower jaw-bone; a thing, which nature has very frequently accomplished? And, when, as often happens, the entire diaphysis of the thigh-bone, tibia, or other long bone, comes away; or, split longitudinally, such bone loses a half of its cylinder; how is it possible for any topical applications to reach every point, at which the separation occurs?

The internal remedies, such as assafœtida, madder, sarsaparilla, hemlock, belladonna, onopordum, lime-water, &c. recommended by numerous practitioners, have in reality no direct efficacy in promoting the separation of necroses: if, says Weidmann, they do any good, it can only be by their tonic and alterative qualities, or rather by keeping the patient amused, so as to gain the requisite time for the completion of the process of exfoliation. The employment of all these ineffectual means, Weidmann conceives, must have originated from ignorance of the process followed by nature in separating dead portions of bone, and from ascribing to the arterial pulsations, or the power of the granulations, what certainly depends upon the action of the absorbent vessels.

A question here naturally presents itself—Would there be any utility in exciting by stimulants the action of the lymphatic vessels, in order to accelerate the separation, of which it is the efficient cause?

Weidmann thinks, that very beneficial effects might result from the plan. But, he asks, what means should be used for this object? Cold? Purgative medicines? Repeated vomits? Squills? Camphor? Neutral Salts? Issues? (*Vid. Wrisberg*, *Comment. Soc. Reg. Gott. Vol* 9, *p.* 136, 1789.) The internal and external employment of the preparations of iodine, a medicine which has extraordinary power in increasing the activity of the absorbents, might here well deserve a trial.

The reasons already detailed, and a variety of experiments successfully made by Weidmann, lead him to set it down as an established principle, that the separation of a necrosis is almost entirely the work of nature, and that surgery can do very little in the business.

Ignorance of this important fact paved the way to the wrong practice of making incisions, for the purpose of exposing the whole surface of a necrosis, immediately the existence of the disorder was known. As such incisions very soon closed up again, so as to leave only a small outlet for the matter, they were in many cases repeatedly practised before the dead bone became loose.

The avowed design of the incisions was to make room for the topical remedies, which were to render the exfoliation quicker; but, as these remedies possess no real efficacy, it follows, that making incisions, before the dead bone is loose, only torments the patient, without producing the least benefit.

The orifices of the ulcers, then, which allow the discharge to escape freely, are, says Weidmann, sufficient as long as the fragments of bone are not entirely detached, and the surgeon should all this period abstain from the use of the knife.

Although Weidmann condemns every mode of treatment, which is inefficacious, painful, and sometimes even hurtful, he would not have it supposed, that he altogether rejects all assistance from medicine. On the contrary, he approves of all those means, which are consistent with the views of nature, which really assist her, and do not tease the patient to no purpose. In short, says he, *the indications are limited to removing the original cause of the disease ; to alleviating the symptoms ; to supporting the patient's strength, and improving the state of the constitution, in whatever respect it may be bad ; and, lastly, removing the dead portions of bone, when they become loose.*

Above all things (continues this sensible practitioner) the surgeon must not regard every piece of exposed bone, as necessarily affected with necrosis, and, in consequence of such idea, have recourse to acrid, drying, caustic applications. Such means are not only useless, but absolutely pernicious ; because they may actually cause a necrosis, which did not exist, before they were used, and which would not have taken place at all, if only mild simple dressings had been employed.

When the disease presents itself with violent symptoms, the inflammation and fever being intense, the severity of the case is to be assuaged by low diet, antiphlogistic remedies, emollient applications, and venesection in moderation, the disease being one which is of long duration, and apt to wear out the patient's strength. Here, perhaps, topical bleeding ought always to be preferred to venesection. When the necrosis has arisen from syphilis, scrophula, or scurvy, &c. the medicines, calculated for the cure of these affections, must be exhibited, ere any favourable changes can be expected in the state of the diseased bone.

Lastly, it is the duty of the practitioner to extract the fragments of dead bone, in order that the deficiencies produced by them may be filled up, and the ulcers of the soft parts heal.

Nature, who succeeds by herself in detaching the dead pieces of bone, can do very little in promoting their passage outward. Frequently, indeed, she has no power at all in this process, and it is only from surgery that assistance can be derived. When a dead piece of bone is still adherent at some points, its extraction should be postponed, until it has become completely loose. If it were forcibly pulled away, there would be danger of leaving a part of it behind, which must have time to separate, ere the cure can be accomplished.

But, when a fragment is entirely detached, and the orifices of the sores are sufficiently large, it is to be taken hold of with a pair of forceps, and extracted.

When the ulcer has only a very narrow opening, suitable incisions must be practised, in order to facilitate the removal of the loose dead bone.

Sometimes, the dead fragment protrudes from the ulcer, and projects externally, so that, if loose, it admits of being taken hold of with the fingers and removed. In this way, Weidmann took away a large dead piece of the humerus, which protruded nearly two inches out of an ulcer in the middle of the arm. The patient was a young lad, 14 years of age; and the limb concave within, convex externally, thicker, and one inch shorter than its fellow. He got quite well three weeks after the removal of the dead bone.

We have already adverted to the example, recorded by Weidmann, in which a shoemaker removed by himself nearly the whole body of the tibia. Doubtless, the projection of the bone, and its looseness, enabled the man to do this easily with his fingers. But there are cases, which present more difficulty ; such are those, in which the sequestrum is included in a cavity, either of the original, or new bone.

The old surgeons were in the habit of amputating limbs, which were in this state ; although instances were not wanting in their days to prove the possibility of relieving the disease, without amputation. This blameable custom of removing every limb, thus affected, is justly exploded from modern surgery. Albucasis was the first, who attempted to cure such a necrosis, by the judicious employment of the knife and saw. (*Lib.* 2, *cap.* 88.) The same kind of practice was successfully adopted in two instances by the celebrated Scultetus. (See *Armament. Chirurg. Tab.* 46, *and Obs.* 81.) This commendable method, however, afterwards fell into disuse, until M. David, by twenty examples of success, refuted all the objections which had been urged against it. (*P.* 197.) Since the period of this distinguished author, the practice has been imitated by all enlightened surgeons, so that the case is no longer regarded, as a disease necessarily requiring amputation. M. Bousselin cut out the sequestrum eight times from the tibia, and four times from the thigh-bone, with perfect success. (*Vid. Mém. de la Societé Royale de Médecine, T.* 4.)

The method consists in exposing the bone, and making in it an opening of sufficient size for the removal of the loose dead fragments.

Experience has proved, not only that patients, affected with necrosis, easily bear this operation, but also, that, after its performance, the ulcers commonly heal very favourably, the health becomes re-established, and the functions of the part affected are hardly at all impaired.

Surgeons, however, are not indiscriminately to choose any period for doing the operation. If they are too hasty, they will run a risk of finding the dead portion of bone still adherent to the adjacent parts: and if they delay too long, the patient may be irrecoverably reduced, while the new bone, on account of the hardness which it has now acquired, cannot be so easily perforated.

Patients are met with, who have been afflicted with necrosis several years. In such cases, great circumspection is necessary, and the practitioner should carefully endeavour to ascertain, that the dead pieces of bone have not been absorbed, or come away piecemeal in the discharge, lest a useless operation should be done, as once happened in the practice of M. Bousselin. (*Mém. de la Société Royale de Médecine*, *T.* 4, *p.* 304.) Therefore, when the disease is of long continuance; when the discharge is much less than it was at the commencement; when small pieces of bone have at times been voided; and the sequestrum cannot be felt with a probe; it is doubtless, says Weidmann, most prudent to abandon all idea of operating, and allow nature to finish what she has so well begun. In short, when the sequestra are undergoing a gradual absorption, without ever making their appearance externally, or giving any considerable disturbance to the constitution; or, when the dead bone is making its way outward without occasioning urgent inconveniences; the surgeon should interfere very little with the natural progress of the case. When the dead bone does not tend to make its way through the skin, but lies quietly concealed in the new osseous shell, extensive suppurations may be prevented, by occasionally applying leeches, and keeping open a blister with the savine cerate, as recommended by Mr. Abernethy in his lectures, and Mr. Crowther, in his work on the White Swelling. The blister will, at the same time, have great effect in promoting the absorption of the sequestrum, and of course, in accelerating the process of cure.

If the surgeon operate as soon as the sequestrum becomes loose, he will find the new bone so soft, that it can be divided with a knife; a circumstance, which materially facilitates and shortens the operation.

Keeping in mind the foregoing precepts, the surgeon is to begin with exposing the bone, in which the sequestrum is contained. When the bone lies immediately under the skin, Weidmann recommends making such incisions as will lay bare the whole of its surface, and when its situation is deeper beneath the muscles, he even sanctions cutting away as much of the flesh, as may be necessary to allow the instruments to be freely worked upon the bone. I cannot, however, see the propriety of this advice: exposing the whole surface of the bone in the first instance, before it is known, whether the saw need be so extensively used as to require such a denudation, certainly appears irrational. And, as for cutting away any portions of muscle, this can be no more necessary here, than it is in the operation of trephining. But, it is unquestionably proper to make with the bistoury sufficient space for the use of whatever instrument is employed for the division of the bone. Yet, it is only necessary to make this exposure in the first instance in one place. The surgeon can afterwards enlarge the incision, or practise others, as circumstances may indicate. The surface of the bone being brought into view, if the cavities, in which the dead fragments lodge, present apertures, which are too narrow, these apertures must be rendered larger by means of small trephines, or saws constructed on the principles of those described by Mr. Hey, of Leeds. The perpendicularly acting wheel-like saw, turned by machinery, and invented by Mr. Machell, here promises also to be of important assistance. It has been used by Sir A. Cooper, who has given an engraving of it in his Surgical Essays, Part 1, Pl. 8. Fig. 7. And another saw, constructed on somewhat similar principles, has been employed by Graefe of Berlin with great advantage for several years. A tract by Schwalb (*De Serra Orbiculari*, *4to. Berol.* 1819) giving an account of it, was sent to me by the late Dr. Albers, a little before his death: it is turned by means of a handle, which projects horizontally from the cutting part of the instrument, and it has a frame or fulcrum, on which it works. Professor Thal's rotation saw, and Mr. Liston's bone-forceps may also prove of essential service. (See *Edinb. Med. Journ. No.* 78.)

With such instruments the pieces of bone extending across the above openings, and impeding the extraction of the sequestra, may likewise be removed.

But, when the preceding cavities are closed on every side, and it is impossible to reach into them in any other way, than through the cloacæ, a trephine is to be applied, which must comprise within its circle a half of the fistulous opening. The crown of the trephine, however, must not be broader than the cavity of the bone, nor yet narrower than the sequestrum.

If, after making a perforation in this manner, the sequestrum should be found too large to pass through the opening, a small saw must be employed for enlarging the aperture. When the bone is so hard and thick, that it cannot be well cut with a saw, the surgeon has the sanction of authority and experience, for using a gouge and mallet.

When the sequestrum is found to be very large, it will be necessary to expose more of the surface of the bone by incisions. In this sort of case, Weidmann recommends applying the trephine to the upper and lower parts of the cavity, and then cutting away the intervening portion of bone with the saw, or gouge. But, there can be no doubt, that a more prudent way would be to go on with the enlargement of the aperture in the bone, at the place where the first perforation took place, if the sequestrum presented itself equally well there, because, by proceeding in this manner, the surgeon might discover, that the dead fragment could be taken out, without so great a destruction of bone, as is caused in the other mode; and, if this were not to be the case, no harm is done, as the necessary removal of bone can be continued.

When the bone, which includes the sequestrum, is a new production, and the operation is not too long deferred, the soft state of the bone will enable the operator to perform the needful excisions with the bistoury alone.

When the sides of the cavity, in the original bone, are thin, fragile, and pierced with numerous holes, the surgeon can break away a sufficient portion with a pair of forceps.

When several sinuses exist in the bone, each may be dilated, in the manner which seems most advantageous.

Sufficient openings having been made into the cavities including the sequestra, the next object is to extract these dead portions of bone. In accomplishing this part of the operation, Weidmann particularly advises two things; first, that no piece of the sequestrum be left behind; secondly, that no injury be done to the membrane, which lines the cavity, in which the dead bone is lodged.

This author observes, that there are examples, in which the vicinity of certain parts impedes the surgeon from making an opening in the bone, large enough for the extraction of a voluminous sequestrum in an entire state. In this circumstance, he recommends the sequestrum to be broken into pieces by any convenient means, and the fragments to be separately removed.

Weidmann has recorded an extremely interesting case to prove how much may sometimes be effected by taking away the sequestrum. A man, 34 years of age, who had an internal necrosis of the tibia, with abscesses and œdema of the whole limb, and who was reduced to the lowest ebb of weakness, was put under this excellent surgeon's care. A perforation was made with a trephine in the upper head of the tibia; but, this opening not proving ample enough, it was enlarged with a small saw, and a gouge and mallet. The sequestrum was then extracted. The patient's state afterwards gradually improved, and in nine months he was completely well.

It is not to be dissembled, however, that cases do exist, in which amputation affords the only chance of saving the patient's life. In fact, it sometimes happens, that the cavities, in which the sequestra are contained, communicate with those of the neighbouring joints, which then become filled with matter, and caries attacks parts of the bones, to which the necrosis does not extend. On some occasions, the dead pieces of bone are very numerous, and each has a separate cavity; while, in other instances, the sequestra lie so deeply, that a passage for their extraction cannot be prudently attempted. Sometimes, also, a necrosis is complicated with another disease in its vicinity. Lastly, such may be the reduced state of the patient's health, and the particular condition of the necrosis itself, that the constitution cannot hold out during the whole time, which would be requisite for the detachment of the sequestrum. Under circumstances like these, amputation is necessary, and ought not to be delayed.

For the authorities of many of the observations and cases in the foregoing article, and for additional information on the subject, see *Albucasis, lib.* 2, *cap.* 88. *Scultetus, Armament. Chir. Tab.* 46, *and Obs.* 81. *Belloste, Le Chirurgien d'Hôpital, part* 1, *chap.* 12. *J. Louis Petit, Traité des Maladies des Os, Tom.* 2, *chap.* 16. *Monro's Works by his Son. Tenon in Mém. de l'Acad. des Sciences*, 1758. *Aitken, Systematic Elements of the Theory and Practice of Surgery, Edinb.* 1779, *p.* 288. *Some interesting cases and remarks, chiefly about the question of amputation, are contained in Schmucker's Vermischte Chir. Schriften. B.* 1, *p.* 17, *&c. Ed.* 2, *Callisen, Systema Chirurgiæ Hodiernæ, Vol.* 2, *p.* 893, *Gott.* 1800. *C. White, Cases in Surgery, London*, 1770, *p.* 57, *&c. Wrisberg, Comment. Soc. Reg. Gott. Vol.* 9, *p.* 136, *&c. 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NEPHROTOMY. (from νεφρος, a kidney; and τεμνω, to cut.) The operation of cutting a stone out of the kidney; a proceeding which, perhaps, has never been actually put in practice. In the *Abrégé Chronologique de l'Histoire de France, par Mézerai,* and in the Phil. Trans. for 1696, two cases of what is called nephrotomy are mentioned; but several circumstances in the accounts led Haller and others to conclude, that the operation alluded to in the first work was nothing more than the high operation for the stone. With respect to the example in the latter work, the particulars are not detailed enough to prove that an incision was really made into the kidney. There is no doubt that stones have often been extracted from abscesses about the region of the kidney, after being touched with a probe. But, with regard to cutting into the kidney, the deep situation of this viscus, and the want of symptoms, by which the lodgment of a stone in it can be certainly discovered, will always be strong objections to the practice. When a stone, from its size, cannot pass from the kidney, and excites inflammation and suppuration, no doubt, the surgeon may make an incision into the tumor, and extract the calculus. In this sense, nephrotomy is certainly a practicable operation. Warner contends, that it can only be practised in such circumstances, notwithstanding whatever may have been said by Marchetti, or others, upon the subject. In such a case, the operation would not be attended with any greater difficulty, than the opening an abscess in any other part of the body. (See *Warner's Cases in Surgery, p.* 241, *Edit.* 4.)

NITRIC and NITROUS ACIDS. As these are medicines of considerable importance in surgery, they claim particular notice. Nitrous acid is a yellow, or orange-coloured fluid, emitting when exposed to the air, deep orange coloured extremely suffocating fumes. It consists of nitrous gas, loosely combined with nitric acid and water; and the colour varies according to the proportion of nitrous gas which is present.

Nitric acid is a colourless, or very pale yellow, limpid fluid, emitting when exposed to the air, white suffocating vapours. It is highly corrosive, and tinges the skin yellow, the tint remaining till the epidermis peels off The constituents of nitric acid, independent of the water, which gives it the fluid form, are 25.97 azote, and 74.03 oxygen, in 100 parts. (See *Thomson's Dispensatory, p.* 438, 439, *Ed.* 2.)

Both these acids, in a diluted state, have been extensively tried, as a substitute for quicksilver in the cure of lues venerea; and really upon looking over the mass of evidence brought forward in proof of the power, which they seem to possess over this disease, it is at first difficult to entertain the slightest doubt of their efficacy. The cases adduced are numerous, some of them minutely detailed, the gentlemen, who have published them, men of reputation and abilities, and (what especially claims attention) these examples of successful treatment are generally allowed to have been syphilitic, or, at all events, complaints, the differences of which from the venereal disease have not been, and could not be, specified. Whoever impartially considers the immense body of facts published by Dr. Rollo, Mr. Cruickshank, Dr. Beddoes, Dr. P. G. Prioleau, of Charleston, South Carolina, and others, exemplifying the success, with which the venereal disease may be treated by the nitrous, or nitric, acid, must be surprised to find, that the accounts delivered by these gentlemen by no means correspond to those of some other eminent practitioners. How to reconcile these seemingly discordant statements, whether by supposing some undefined differences in the nature of the cases adduced, or some variation in the goodness of the medicine itself, is indeed perplexing. Nor is a solution of the question at all facilitated, by the results of later investigations, tending to prove the general curability of syphilis without mercury, or any medicine whatever; because, if we admit this as a fact, the circumstance of a considerable proportion of cases not yielding, or being radically cured, when the nitric and nitrous acids are exhibited, as asserted by Mr. Pearson and others, would argue, that giving such acids is worse, than leaving the disease entirely to itself. The more I reflect upon all that we know about the venereal disease, however, the more I am inclined to adopt the sentiment, that it is not one disorder, but probably many, which go under this name, their exact shades of difference not having yet been detected, nor described. If this supposition be admissible, the contradictory statements given by various authors about what their experience has taught them of this, or that mode of treating the disease, may all be immediately reconciled.

The practice of exhibiting nitric acid, in lieu of quicksilver, began with Mr. Wm. Scott, a surgeon at Bombay, who is said to have been led to the experiment by a suggestion thrown out by Girtanner, that the efficacy of the various preparations of quicksilver probably depended upon the quantity of oxygen combined with them. *(Grens. Jour. d. Physick. B.* 3, *p.* 31, 1790.) In August 1793, Mr. Scott being himself afflicted with chronic hepatitis, resolved to take a quantity of oxygen, united to some substance, for which it has no great attraction, and after some reflection, nothing appeared to him better than nitric acid. September 11th, he took at different times about a dram of the strong nitric acid diluted with water. Soon after drinking it, he felt a sense of warmth in his stomach and chest; but no disagreeable sensation, nor any other material effect. The two following days the medicine was continued, the gums beginning to be somewhat red, and enlarged. He slept ill; but could lie for a length of time on his left side, which the disease of the liver had prevented him from doing during many months previous to this period. He also felt a pain in the back of his head, resembling what he had commonly experienced when taking mercury. On the fourth day his gums were a little tender; the headach and pain about his jaws still troubled him; but the symptoms of his liver complaint had already left him. The acid was continued on the 4th, 5th, and 6th days; the soreness of the mouth increasing, and a salivation taking place. On the 7th day, he felt his mouth so troublesome that he took no more acid. His mouth got gradually well, and he found his health considerably improved.

Mr. Scott likewise administered the nitric acid in several cases of tedious intermittents, in two cases of diabetes, and in many syphilitic cases with the happiest effect.

This gentleman's account of the nitrous acid was first published in the Bombay Courier of April 30th, 1796, and soon afterwards republished in this country. (See "*An Account of the Effects of the Nitrous Acid on the Human Body,*" *by W. Scott, in Duncan's Annals of Medicine for* 1796, *Vol.* 1, *p.* 375—383.) The hypothesis suggested by Girtanner, in 1790, that the efficacy of mercury in the treatment of the venereal disease depended upon the oxygen combined with this mineral, required but little extension to lead to the discovery of the antisyphilitic virtues of the acids. Yet, Girtanner had all his attention so fixed on mercury, that it never struck him, that the principle on which he explained the efficacy of this medicine might apply to other substances, which abound with oxygen, and are readily separable from it. This was the idea which made Mr. Wm. Scott begin to suspect that the nitric acid might be as efficacious as mercury in venereal cases; and, as he had already observed a great analogy, between the effects of this acid and mercury in the experiments, which he made with the first of these medicines in his own case of chronic hepatitis, and other diseases, he ventured to recommend the trial of it in syphilis. The result was, that the acid was found not only to equal the preparations of mercury, but sometimes to surpass them; for it had the best effect, in some cases, where mercury had been tried in vain, and it was observed to remove the disease in less time, than the common remedy. Nor were any of the inconveniences, usually known under the names of *mercurial symptoms, mercurial fever,* found to be the consequence of its employment, however long continued. With it alone many syphilitic cases are stated to have been cured, the disease not having returned at the end of two years. (See *Duncan's Annals of Medicine, &c. Vol.* 1, 1796, *p.* 383, *&c.*)

The letter from Mr. Scott to Sir Joseph Banks, describing these effects of the nitric acid in India, soon excited the attention of medical practitioners both in Europe and America, the inquiry being taken up with all the zeal, which the preceding accounts were calculated to inspire. In 1797, Mr. G. Kellie, a surgeon of the navy, gave the nitric acid to five sailors, affected with gonorrhœa, venereal sores, and buboes. Three of them were perfectly cured. A fourth, who had sores on the glans, and who had been much debilitated by the long use of mercury, recovered nearly his original strength, while taking the acid; but, the sores were not healed, before mercury had been repeatedly exhibited. In the fifth patient, who was also scrophulous, the nitric acid contributed very essentially to heal the sores. On the whole, Mr. Kellie seems to regard this medicine, as possessing very efficient power of stopping and eradicating the venereal disease. (See *Letters from G. Kellie, respecting the Effects of Nitrous Acid in the Cure of Syphilis, Duncan's Annals of Medicine for* 1797, *p.* 254, 277.)

In the same year appeared a letter, in a German periodical work (*Hufeland's Journ. der Prakt. Heilk.* 4 *Bd. p.* 356—359), written by Albers, giving the history of a venereal ulcer on the breast, successfully treated by the nitric acid.

The reports of Dr. Prioleau, who tried the nitric acid in the autumn of 1797, are particularly favourable to the practice. "We have seen (says he) every stage and form of syphilis cured by this medicine, and even in habits broken down by the antecedent use of mercury, under which the disorder had gained ground. The patients recovered their health and strength in a short time, without the use of diet-drinks, bark, or any other tonic medicine whatever." (See *Caldwell's Medical Theses, p.* 103, *8vo. Philadelphia,* 1805.)

The praise of the nitric acid from numerous quarters induced Dr. Rollo to try it in the military hospital at Woolwich, and in conjunction with Mr. Cruickshank to examine further into the antisyphilitic virtues of oxygenated substances. The results of Mr. Cruickshank's investigations constitute the second part of Rollo's work on diabetes, published in 1797. The medicines, which were selected for the experiments, were the nitric, citric, and muriatic acids, and oxygenated muriate of potash. Of these, the nitric acid and the oxygenated muriate of potash, were found to possess the greatest efficacy; the first acting in many cases with remarkable mildness; the second, with greater expedition and certainty. The new plan was tried upon young persons, affected with primary venereal complaints, who had never used mercury, and no other internal medicine was given except opium when required for diarrhœa, or colic. The liquor plumbi acetatis dilutus was used as a wash for chancres. In debilitated subjects, sure and speedy good effects were observed uniformly to follow, and hence, previously to giving the acid to strong, plethoric patients, the method of preparing them for this treatment by purging and bleeding was adopted, as is alleged, with great success. In some cases, after the nitric acid had been continued a good while without producing a salivation, the exhibition of mercury for a short time completed the cure. Mr. Cruickshank's opinion in favour of the new remedies was on the whole extremely sanguine, as he ventures to express his conviction, that they would render the employment of mercury in the cure of the venereal disease unnecessary. (See *An Account of two Cases of Diabetes Mellitus, with Remarks, &c. by John Rollo, M. D. Vol.* 2, *8vo. Lond.* 1797.)

In the same year, Dr. Beddoes published a valuable work, comprising all the information, which had then transpired respecting the antisyphilitic virtues of the nitric acid, with additional communications from his medical friends. (See *Reports principally concerning the Effects of Nitrous Acid in the Venereal Disease, by Thom. Beddoes, Bristol,* 1797.) And two years afterwards, the same author finished a still more comprehensive volume on the subject. (*A Collection of Testimonies respecting the Treatment of the Venereal Disease by Nitrous Acid. Lond.* 1799.)

From the preceding work, we learn, that, in the Plymouth hospital, Mr. Hammick gave the nitric acid to between sixty and seventy venereal patients, and that the cures were generally more speedily accomplished, than with mercury, no ill effects being produced on the system, similar to those usually remaining after the use of the latter mineral. He assures us, that, after the removal of the symptoms, the disease never returned, and that for debilitated, scorbutic, or scrophulous patients, affected with venereal complaints, the acid was found a most valuable means of relief.

Dr. Geach of the same hospital is also stated to have employed the nitric acid with such effect, that he rarely had occasion for mercury, the livid colour of the countenance, sordid fetid excoriations of the scrotum, and other symptoms, which had long resisted the latter mineral, all quickly giving way to the new medicine. Another practitioner of the name of Giedlestone, however, had not equal success in his experiments, for, in several cases, the acid did not bring about a cure, and, after being continued eight or ten days, and inducing a salivation, it even rendered the condition of some patients worse. On the other hand, Mr. Sandford, a surgeon at Worcester, found the acid a very useful and effectual medicine in venereal cases, where mercurials had been long exhibited in vain. The trials of the nitric acid, made by Professor Rutherford at Edinburgh, had various results; the medicine sometimes proving completely ineffectual; and, in other instances, appearing to be a perfect antidote for the worst syphilitic complaints.

Dr. Beddoes concludes with some observations, in answer to Mr. Blair, who had become averse to the new practice.

In 1798, Dr. Ferriar published some remarks on the nitrous acid. (See *Medical Histories and Reflections, Vol.* 3, *p.* 290—310.) He tried this medicine in various ways, either alone, or after, or in conjunction with, the exhibition of mercury. His inferences are, that, in the treatment of the venereal disease, the nitrous acid is useful only in protracted cases. He corroborates, however, the generally received opinion, that, where the patient has been considerably reduced by the long, or injudicious employment of mercury, the nitrous acid is a most beneficial medicine.

In the same year, Mr. Blair wrote some observations on the venereal disease, and the new method of treating it. (*Essays on the Venereal Disease, and its concomitant Affections, Lond.* 1797.) In this work, the new remedies are generally condemned, as ineffectual, and hence originated a paper-war between this writer and Dr. Beddoes, "literarium certamen, non sine bile gestum," as Dr. Holst has expressed it. (*De Acidi Nitrici Uso Medico. p.* 73, *8vo. Christianæ,* 1816.) In this controversy, numerous other practitioners readily joined, as for instance, Macartney, Rowley, Philips, Hooper, Lidderdale, &c. all of whom adduced cases, in proof of the frequent inefficacy of nitrous acid, and these were collected and published by Mr. Blair, who suspecting the cases of failure with this medicine to be more numerous, than those of success, considers himself unjustified in regarding it as an antisyphilitic to be depended upon. At the same time, he bears testimony to the virtues of the acids exhibited in venereal cases either singly, or alternately with mercury where the patient's strength had been much reduced; and he confesses, that venereal buboes, indurated glands, nocturnal pains in the bones, and gonorrhœa, yielded to these remedies.

Seven years after the appearance of Mr. Blair's work, Mr. Pearson delivered his sentiments in a book of considerable merit. (*Obs. on the Effects of various Articles of the Materia Medica in the Cure of Lues Venerea, 2d Ed. Lond.* 1807, *p.* 198, *&c.*) He relates a very few examples, in which the nitrous acid appeared effectual in curing chancres, and one of its virtues in gonorrhœa; the only one, which this gentleman had ever seen. The rest of his observations are unfavourable to the character of the medicine, as an antisyphilitic meriting confidence. The first trials, which Mr. Pearson made, were of the nitric acid; but, as he did not remark any of its effects to be different from those produced by the nitrous acid, he commonly employed the latter in the following form. Nitrous acid, two drams, pure water, a pint and a half, syrup four ounces. This mixture was usually taken in the space of twenty-four hours. As local applications, he employed a saturnine lotion to the sores; and emollient poultices to tumors and inflamed parts. All mercurial applications were absolutely prohibited. (*P.* 200.) In making his inferences, in a subsequent page, he says, "The nitric and nitrous acids have removed both primary and secondary symptoms of syphilis; and, in some instances, it seems that the former have not recurred, nor have secondary symptoms appeared at the period they commonly show themselves, when the cure has been imperfect. But, as far as my own experience extends, and that of many respectable friends, who are connected with large hospitals, a permanent cure has never been accomplished by these acids, where secondary symptoms have been present. The same acids, when exhibited with the utmost care and attention to many patients, labouring under the primary symptoms of the venereal disease, and where they have agreed perfectly well with the stomach, have been nevertheless found inadequate to the cure of those symptoms. Indeed, the failures, which have occurred, both in my own practice, and that of many of my surgical friends, have been so numerous, that I do not think it eligible to rely on the nitrous acid in the treatment of any one form of the lues venerea." However, Mr. Pearson joins several other writers in bearing witness to the good effects of this medicine, where impairment of the constitution renders the employment of mercury inconvenient, or improper. Here, he says, it will restrain the progress of the disease, and improve the health and strength. On some occasions, he thinks, that it may be given, in conjunction with a course of mercurial inunction, and he agrees with other practitioners about its supporting the tone of the stomach, acting as a diuretic, and counteracting the effects of mercury on the mouth and fauces. (*P.* 236—238.)

While these inquiries were going on in England, numerous experiments on the same subject were undertaken in France. In a work, published in 1797, Alyon positively declares, that mercury ought to be entirely relinquished in the cure of the venereal disease. (*Essai sur les Propriétés Médecinales de l'Oxygène, et sur l'application de ce principe dans les maladies vénériennes, psoriques, et dartreuses; Paris, an.* 5, *8vo.*) Here we find a relation of many cases, successfully treated in the hospitals of Val-de-Grace and St. Dennis, by the oxygenated muriate of potash, the nitric, oxymuriatic, and citric acids, an ointment of the author's own invention, called the unguentum oxygenatum, being applied to the sores. (See *Unguentum.*) In a second edition of the above book, which came out in 1799, the same doctrine and practice are corroborated by further observations.

In 1798, Dr. Swediaur brought out the third edition of his treatise on the venereal disease, (*Traité Complet sur les Symptômes, les Effêts, la Nature, et le Traitement des Maladies Syphilitiques,*) in which he highly commended the virtues of the nitrous acid, and oxygenated acid, as expediting the cure, with very few exceptions. But, in the fourth edition, he retracts, and details the results of the new practice, as tried upon twenty-six venereal patients in the *Hospice d'Humanité;* of these only seven cases remained permanently cured; the issue of seven others was doubtful; and, in twelve, no amendment was observed.

Nor were the statements of Lagneau much more favourable to the reputation of the nitrous acid as an antisyphilitic; for, from the trials which he had seen made of it, he concluded, that it was not unfrequently ineffectual, while it was apt to excite an obstinate cough and hæmoptysis. (*Exposé des Symptômes de la Maladie Vénérienne, des diverses Méthodes de Traitement, &c. 3me Ed. Paris,* 1812.)

The reports of Dr. Odier, of Geneva, however, were rather more propitious, as he says, the nitrous acid increases the efficacy of mercury, and lessens or removes the inconveniences arising from its unskilful administration. But he candidly acknowledged, that his experience had not been great enough to enable him to pronounce, what degree of confidence ought to be put in the acid as a remedy for syphilis. (*Man. de Méd. Pratique; Génève, p.* 249.)

The practice of exhibiting the nitric acid for the cure of syphilitic affections was not tried in Germany so soon as in England and France. Albers, however, in 1797, gave an account of Scott's successful experiments, and of the efficacy which they evinced in some cases seen by that gentleman in the Infirmary at Edinburgh (*Hufeland. Journ. d. Prakt. Heilk. Vol.* 20, *p.* 68); while Behn, who had visited Paris in the winters of 1797 and 1798, briefly noticed the various results of the trials, which he had seen made of this acid, in the "Clinique de Perfectionnement," for the cure of obstinate syphilitic cases. (*Erinnerungen an Paris, zunächst für Aerzte geschrieben von G. H. Behn Erst. Heft. Berl.* 1799, *p.* 110.) At length, in 1799, Struve, who translated Mr. Blair's first publication into German, communicated to the profession the particulars of some experiments made by himself with the acid; he declares, that he had very often found it an excellent remedy for inveterate pains in the bones, and derangement of the constitution, produced either by the syphilitic virus, or the injudicious employment of mercury. However, in common cases, mercury is represented as the best antisyphilitic medicine.

Afterwards Professor Würzer was induced to try the nitrous acid in a case, that had resisted mercury for six months, the patient having got rid of some chancres and a sore throat, but being left with violent nocturnal pains, blotches and sores all over his body, and in a very reduced condition, without the least appetite. Here, in 27 days the acid, together with sarsaparilla and the warm bath, not only removed all the complaints, but actually restored the patient's original strength, and healthy appearance. In a short note annexed to this case, Hufeland gives it as his opinion, derived from experience, that the nitrous acid is effectual in obviating the sequelæ and anomalous diseases induced by lues venerea, but that it does not permanently cure the latter affection itself. (*Etwas über die Keilkraft der Salpetersaüre in venerischen Krankheiten, Hufel. Journ. d. Prukt. Heilk.* 8 *Bd.* 4 *St. p.* 139—143.)

These vague and endless contradictions induced Schmidt, an eminent professor at Vienna, to make a series of experiments with the nitric acid, for the purpose of ascertaining its power in cases of syphilis. (See *Beobacht, der Kaiserl. Königl. Med. Chir. Josephs Academie zu Wien.* 1 *Bd. Wien.* 1807, *p.* 147—189.) Under his directions, the acid was given in the winter of 1799 to five soldiers, affected with the venereal disease in various degrees and forms. In every one of these cases, the medicine was found efficacious; but the degree of efficacy was remarked to vary considerably according to the nature of the constitution, and the kind of local complaints. Thus, in robust patients, moderate doses of the acid soon produced benefit; while, in weak persons, disposed to scurvy or scrofula, a larger quantity of the medicine, and more time were requisite. This assertion we see is exactly the reverse of what appeared to happen in the cases treated by Mr. Cruickshank. However, Professor Schmidt entertains strong doubts, whether the nitric acid is adequate to the cure of all the forms of syphilis, and he thinks, that neither this nor any similar medicines will ever supersede the necessity for mercury.

Ontyd, a Dutch practitioner, approves of the use of the nitric acid, with some limitation: while he admits its efficacy in removing local symptoms, he is strongly against its employment in cases of confirmed lues, as they used formerly to be termed. The latter assertion, I conceive, is exactly contrary to the results of modern experience, most of these protracted bad cases being those, which are particularly benefited by this acid. (*Nieuwe scheidekundige Bibl. te Amsterdam; by Doll,* 6*de St.* 1799, *p.* 166.) The tracts of Boetticher, (*Bemerk. über Medicinal-verfass. Hospit, u. Curarten,* 2*tes Hefr. Königsb.* 1800, 8.) of Ritter (*Erfahr über die innerl u. aüsserl. Anwendung d. Salpeters. Hufel. Journ.* 10 *B.* 3 *St. p.* 191—197), and of Frankenfeld (*Hufeland's Journ. der Prakt. Heilk.* 22 *Bd.* 4 *St. p.* 96—98), need only be specified here, as decidedly unfavourable to the character of the nitrous acid, as a remedy for syphilis.

The following German practitioners are to be classed with the moderate approvers of the medicine, though, as Holst observes, (*De Acidi Nitrici Usu Medico, p.* 88; *Christianæ,* 1816,) they do not appear to have made any new experiments of their own with it, viz. Munchmeyer (*Comm. de Viribus Oxygenii in procreandis et sanandis Morbis; Goett.* 1801, *p.* 54); Burdach, (*Hdb. d. neuest Entdeck. in d. Heilmittellehre; Leipz.* 1806, *p.* 11, 12); Aronsson (*Vollst. Abhdl. aller venerischen Krankh. Berl.* 1808, *p.* 211); Horn (*Hdb. der Prakt. Arzneymittellehre,* 2*te. Aufl. Berl.* 1805, *p.* 95); Consbruch (*Tasch. d. Arzneymittelhehre,* 2*te. Aufl. Leipz.* 1810, *p.* 283); Toepelmann (*Neuere Erfahr. über zweckem. Behdl. venerisch. Schleim ausflüsse, &c. Leipz.* 1809, *p.* 151); and Wollkopfs (*Pharmac. extemp. Leipz.* 1811, *p.* 92).

Another German author, who has entered into the present inquiry, is F. A. Walch, whose statements are very unfavourable to the use of the nitrous acid, as he absolutely denies, that it ever accomplishes a lasting cure. (*Ausführl. Darstell. d. Urspr. &c. d. Venerisch. Krankh. Jena,* 1811, *p.* 197, 198.)

In a periodical work mention is made of one case, which, after resisting a long course of mercury, and also the nitric acid, was ultimately cured by restricting the patient for a few weeks to a very reduced diet. (*Hufel. Journ. d. Prakt. Heilk.* 34 *Bd.* 2 *St. p.* 56.)

For much of the foregoing historical account, I am indebted to *Holst's Diss. de Acidi Nitrici Usu Medico, 8vo. Christ.* 1816; in which an explanation of the results of further trials of the medicine in Denmark and Sweden may be perused. From these countries, the reports are mostly less favourable to the reputation of the medicine, than the accounts already delivered.

According to Holst the following are the chief circumstances, under which the employment of nitrous, or nitric acid is generally sanctioned.

1. Where the disease is complicated with scurvy.

2. Where it is attended with scrofulous enlargement of the glands, and other strumous symptoms. I may remark, however, that these complaints are often as undefinable, as some of the forms of syphilis, and therefore the rule is frequently difficult of application.

3. Where the disease is accompanied with considerable debility, either brought on by mercury, or febrile indisposition.

4. Where from idiosyncrasy, mercury cannot be safely exhibited. Experience fully proves, that there are some patients, more especially females, in whom a few grains of mercury taken inwardly, or mercurial frictions on the most limited scale, bring on vomiting, rheumatic pains, nervous febrile symptoms, colic, spasms, severe headach, and a rapid immoderate salivation.

5. Where pregnant women are the subjects of the disease, several practitioners forbid the use of mercury, during the latter months of pregnancy. (*Bangii, Prax. Med. Hafn.* 1789, *p.* 570; *Swediaur; Aronsonn Vollst. Abhdl. aller Ven Krkht. Berlin,* 1811, *p.* 211.) Holst observes, that the reason of this advice is not stated, though no doubt it must proceed from an apprehension of mercury exciting a miscarriage.

Mr. Pearson's mode of exhibiting the nitrous acid has been already mentioned. Some practitioners give it as follows: ℞. Gum. Arab. ʒiv. aquæ menth. ℥viij. acid. nitrosi, vel nitrici ʒij. ʒiij. F. M. Of this mixture, a table spoonful is to be taken every hour mixed with some sweetened water. Should the acid occasion colic or diarrhœa, its quantity must be lessened, and opium added to the mixture.

As the nitrous and nitric acids decompose and destroy the teeth, some care must be taken to prevent so serious an effect. Their being properly diluted, and blended with sugar, syrup, or mucilage, will materially tend to hinder the evil. But the safest way is always to drink the mixture through a glass tube, and wash the mouth well immediately after every dose.

Strong nitrous acid, extricated in the form of vapour, is often employed as a means of purifying the air of large crowded hospitals and sick-rooms; a subject, on which the observations of Dr. J. C. Smyth and G. de Morveau are particularly interesting. The nitrous acid is sometimes taken by accident, or design, as a poison. Here, according to the observations of

Tartra, Orfila, &c., the best antidote is calcined magnesia, or soap. If the first of these articles be at hand, a dram of it, suspended in a glass of water, is to be instantly given, followed by copious draughts of some mucilaginous drink, the design of which is to fill the stomach, and excite it to reject the diluted poison. While the vomiting is going on, the doses of magnesia are to be repeated, and followed as in the first instance by draughts of linseed tea, solution of gum arabic, milk, or broth.

The nitrous acid has also been extensively tried as a means of curing syphilitic complaints, in the form of what is termed the *nitro muriatic bath*, of which a description will be given in speaking of the *Venereal Disease*.

When reiterated courses of mercury induce dropsy, as not unfrequently happens in very impaired constitutions, Mr. Carmichael prescribes the nitrous acid, in as large doses as the stomach will bear, conjoined with digitalis. (*Essays on Venereal Diseases, &c.*) Taken in doses of eight, ten, or fifteen drops, two or three times a day, it is alleged to be efficacious in the cure of some eruptive complaints, especially of the lower extremities, connected with disorder of the liver. (*Wilson's Pharm. Chir. p.* 6.) Another well informed writer also bears testimony to its good effects when used together with mercury, for old obstinate ulcerations of the legs, though no venereal taint can be suspected; and, he says, it may be applied with benefit as a local stimulant to fetid ulcers, attended with a thin ichorous discharge, and in some examples of caries. In such cases, ʒij. of the diluted acid is to be mixed with ℥j. of water. (See *A. T. Thomson's Dispensatory, p.* 441, *Ed.* 2.) With respect to caries, in the sense of *necrosis*, however, the reader will understand from what is stated in the article on that subject, that it can rarely be advisable to apply this, or any other acid either to the exfoliating portion of bone, or to that which is yet alive. The nitrous acid has sometimes been used for destroying warts, condylomata, and other excrescences, and the nitric acid, applied to the skin, has been proposed as a means of producing an immediate vesication of the part. By Sir E. Home, it is praised as a local application for certain ulcers, when properly diluted. (See *Ulcers.*) It is likewise commended by some writers as a very useful local application in cases of hospital gangrene: and, an interesting paper was lately published by Mr. R. Welbank, detailing the excellent effects of the undiluted nitric acid, as an application to diseases, which he has described under the name of sloughing phagedœna, and which he considers as identical with hospital gangrene. (See *Med. Chir. Trans. Vol.* 11, *p.* 369, *and the article Hospital Gangrene.*) The cases, reported by this gentleman, are highly favourable to the practice, which, as may be seen by reference to the article *Hospital Gangrene*, is not entirely new, with respect to this disease, and in speaking of *Mortification*, I have mentioned, that it was Dr. Kirkland's practice sometimes even to dress certain sloughing diseases with a solution of mercury in nitrous acid. But, notwithstanding these facts, and the well known custom of Sir A. Cooper to apply to sloughing phagedenic ulcers the nitric acid lotion, composed of 50 drops of the acid, and a pint of distilled water, I feel that Mr. Welbank has rendered a service to the profession by drawing their attention still more particularly to the use of undiluted nitric acid in the forms of phagedœna, which he has so well described.

NITRO-MURIATIC BATH. (See *Venereal Disease.*)

NODE. A swelling of a bone, or a thickening of the periosteum, from a venereal cause. See *Exostosis*, and *Venereal Disease.*

NOLI ME TANGERE. A species of *lupus*, under which term Dr. Willan intended to comprise, together with the *noli me tangere* affecting the nose and lips, other slow tubercular affections, especially about the face, commonly ending in ragged ulcerations of the cheeks, forehead, eyelids and lips, and sometimes occurring in other parts of the body, where they gradually destroy the skin and muscular parts to a considerable depth. (*Bateman's Synopsis of Cutaneous Diseases, p.* 296, *Ed.* 3.)

Sir E. Home says, that the ulcers, for which he has been led to employ arsenic, are named, from the virulence of their disposition *noli me tangere*, and are very nearly allied to cancer; differing from it in not contaminating the neighbouring parts by absorption, but only spreading by immediate contact. Ulcers of this kind differ exceedingly from one another in their degree of virulence; but they are all so far of the same nature, that arsenic in general agrees with them, and puts a stop to their progress, while they are aggravated by milder dressings. (*Home on Ulcers, Edit.* 2, *p.* 267.)

The disease generally commences with small tubercles, which change after a time into superficial, spreading ulcerations on the alæ of the nose, more or less concealed beneath furfuraceous scabs. Sir A. Cooper believes, that the disease consists in ulceration of the sebaceous glands, or follicles of the nose. (*Lancet, Vol.* 1, *p.* 264.) The cartilages and even the whole nose are frequently destroyed by the progressive ravages of this peculiar disorder, which sometimes cannot be stopped or retarded by any treatment, external or internal.

The specific ulcerations do not generally extend to the parts far within the nostrils; but, at the time that I am writing this article, there is, in St. Bartholomew's Hospital, a curious example, in which the greatest part of the nose is destroyed, and the ulceration proceeds even through the front part of the palate into the mouth. The morbid process sometimes stops for a considerable time, and then is renewed with increased violence. The following case illustrates the nature of *noli me tangere*, and one mode of treatment, to which it yielded. Jane Chatillon, 45 years of age, was attacked, in the course of September, 1788, with an inflammation on the left ala of the nose. Some time afterwards the part ulcerated, which occasioned a troublesome and sometimes a painful itching; different means were unsuccessfully employed; and the case remained nearly in the same situation till the month of September in the following year. At this period, the ulcer spread very fast; the septum nasi, the muscles, and cartilages of both sides, were, in a short space of time, destroyed. The ulceration extended on the left side, along the loose edge of the upper-lip. This was the state of her case on her admission into the Hospital of St. Louis, in the month of October, 1789.

A poultice moistened with aq. veg. was applied twice a day to the ulcer; a sudorific ptisan prescribed, and a pill, composed of one grain of calomel, and one grain of sulph. aurat. antimonii, ordered to be taken every day. From the fifth day, the inflammation lessened. No other sensible alteration took place till the 21st. The suppuration, which, till this time, had been black and putrid, now became white and inodorous.

On the 37th, the discharge was trifling, and the part was dressed with pledgets, dipped in a solution of verdigris and corrosive sublimate, in the proportion of six grains of each to a pint of water. On the 40th day, cicatrization began to take place, and was finished by the 60th.

Some time before the disease was completely cicatrized, an issue was made in the arm, which was healed up, without any inconvenience to the patient, six months after the cure. (*Parisian Chirurgical Journal, Vol.* 1.)

One of the best external applications to *noli me tangere* is the following lotion: ℞. potassæ arseniatis, gr. iv. Aq. menthæ sativæ, ℥iv. Spiritus vini tenuioris, ℥j. Misce et cola. I have seen several cases in St. Bartholomew's Hospital, which were either cured or seemed disposed to get well with this useful application. The solution of arsenic, which Sir E. Home has always used, is made by boiling white arsenic in water for several hours, in a sand heat. When given internally, the dose is from three to ten drops; when for external application, a dram is to be diluted with ℔ij. of water; and this solution is gradually made stronger, as the parts become accustomed to it, till it is of double strength. However, this mode of using arsenic is by no means a well regulated one; and Plunket's caustic (see *Arsenic*) for outward employment is not nearly so neat an application as the above-mentioned lotion. Sir A. Cooper applies the following ointment: ℞. Arsen. Oxydi Sulph. Flor. ā ā ʒj. Ung. Cetacei, ℥ji M. In 24 hours it produces a slough, which, being covered with any simple dressing, separates, and the part then frequently heals. (See *Lancet, Vol.* 1, *p.* 264.) At St. Bartholomew's Hospital, arsenic is administered internally in the following formula: ℞. Potassæ arseniatis, gr. ij. Aquæ menthæ sativæ, ℥iv. Spiritus vin. ten. ℥j. Misce et cola. Dosis ʒij. ter quotidie. In this way, the quantity of arsenic is nicely determined. We shall only just add, with regard to this medicine, that, both as an external application and an inward remedy in cases of *noli me tangere*, it perhaps deserves the highest rank. One scruple of the argentum nitratum, dissolved in half an ounce of distilled water, makes a very good application which, although generally inferior, in point of efficacy to arsenical ones, in the present disease, occasionally does good, when nothing else seems to produce any benefit. The above case makes us acquainted with another lotion, which deserves further trial. All fluid remedies must be applied to the part, by dipping little bits of lint in them, placing these on the ulcerations, and covering the whole with a pledget.

The ointments, which seem most likely to prove useful applications to *noli me tangere*, are the unguentum hydrargyri nitrati, the unguentum picis, and unguentum sulphuris. As far as my experience extends, they are generally less efficacious than lotions in the present cases; but, in particular instances, they prove superiorly useful, and it deserves especial notice, that surgeons can often make no progress against this inveterate disease, unless they apply a different sort of dressing every day; sometimes a lotion; at other times, an ointment. The little ulcers may occasionally be touched with the argentum nitratum, or a strong solution of it. The small furfuraceous scabs, which are continually forming on the part affected, should be softened with a little of the unguentum spermatis ceti, and removed with as much tenderness as possible.

We have already remarked, that arsenic is a good medicine to be given internally, and the best mode of exhibiting it has been already explained. Another medicine, which is often useful in these cases, is what is known by the name of Plummer's pill, or the compound calomel pill. ℞. Hydrargyri submuriatis, sulphuris antimonii præcipitati singulorum, gr. xii. Guaiaci gummi resinæ, gr. xxiv. Saponis quod satis sit. Misce; fiant pilulæ duodecim. Dosis una bis quotidie. —In other instances, we may try the decoctum ulmi, or sarsaparillæ, with one of the following pills thrice a day: ℞. Hydrargyri submuriatis gr. vj. Succi spissati cicutæ ʒj. Misce; fiant pilulæ duodecim. The hydrargyrus sulphuratus has occasionally been given, as an alterative medicine, for the relief of *noli me tangere*; with what good effect I cannot pretend to say.

In three or four less severe cases of lupous tubercles on the face, which had made no progress towards ulceration, Dr. Bateman saw the solution of muriate of barytes, taken internally, materially amend the complaint. Sometimes, also, a separation of the diseased parts from the sound has been effected with the knife, or caustic, and the progress of the complaint been stopped. (*Synopsis of Cutaneous Diseases, p.* 296, *Edit.* 3.)

NYCTALOPIA. (from νυξ, night; and ωψ, the eye; or οπτω, to see.) An affection of the sight, in which the patient is blind in the day-light, but sees very well at night.

Nyctalopia, *visus nocturnus*, or day-blindness, vulgarly called owl-sight, (says M. Lassus) is an affection, in which the patient either cannot see at all, or sees but very feebly, objects, which are in the open day-light, or situations where there is a strong light; but discerns them very well, when they are in a darkish place, or at sunset, or in the night-time, if not immoderately dark. (See *Pathologie Chir. T.* 2, *p.* 539, 540.)

The Greek physicians are divided in their opinions concerning the now uncommon disease nyctalopia. Hippocrates expressly says, "we call those nyctalopes who see by night." The author of *Defin. Medic.* "that they see nothing in the day-time, but have their sight by night." On the contrary, Paulus Ægineta and Actuarius are as explicit in asserting, that they have their sight perfect in the day-time, but are blind by night. Ætius is of the same mind, though he is thought to favour the contrary opinion, when he says, "they see better by night than in the day, and if the moon shines they are blind." The author of Isagoge embraces both opinions, when he says, "they call those nyctalopes who, in the day-time, see more obscurely, at the setting of the sun more clearly, but, when it is night, much better; or, on the contrary, by day they see a little, but, in the evening, or at night, they are blind." Galen explains the word by a night-blindness. Pliny, Varro, Nonius, Festus, Celsus, and other writers, give equally opposite definitions of the disorder. Dr. Pye questions, whether these two descriptions of nyctalopia, so diametrically opposite to each other, may not be reconciled by considering the disorder as an intermittent one. The difference then will only consist in the different times of the approach of the disease; that of Hippocrates came on in the morning; that of Ægineta, in the evening; both were expressly periodical, and the distance of time between the paroxysms, in both, was respectively the same; a whole day, or a whole night. The various shapes, in which intermittents appear, very much favour, says Dr. Pye, such an opinion; and the apparent success of bark in the case, which he has related, notwithstanding the unfavourable circumstances of the evacuations his patient laboured under, and the consequent necessity of its disuse, seem to confirm it in this gentleman's mind. (*Med. Obs. and Inq. Vol.* 1.)

In this work I shall follow Callisen, Richter, and the best modern surgical writers, in calling day-blindness, *nyctalopia*, and night-blindness, *hemeralopia*. (See *Callisen, Syst. Chir. Hodiernæ, Vol.* 2, *p.* 392; and *Richter, Anfangsgr. der Wundarzn. B.* 3, *p.* 479.)

Nyctalopia, in the sense of day-blindness, is a very rare disease, in comparison with hemeralopia, which is a very common disorder in warm climates. According to Dr. Hillary, there are a people in Siam, in the East Indies, and also in Africa, who are all of this cat-eyed species, or subject to the disease of being blind in the day-time, and seeing well by night. (*Mod. Univ. Hist. Vol.* 7.) The same author notices the general rarity of the disorder, and mentions his having met with but two examples of it.

With respect to the causes of the complaint, Dr. Hillary observes, that it proceeds from too great a tenderness and sensibility of the iris and retina. M. Lassus thinks the causes may be of different kinds. "If, for instance, (says he) there were a very small opacity, like a point, exactly opposite the pupil, or centre of the crystalline lens, the pupil, contracting in the open day-light, would stop the entrance of the rays of light into the eye, and a day-blindness arise, which would be diminished by the expansion of the pupil in the shade. Here, the cure would depend upon the removal of the opacity.

"Persons, whose pupils do not move freely, but remain much dilated, and do not sufficiently contract in light situations, are also affected with nyctalopia; for, so large a quantity of the rays of light pass into their eyes, that it serves rather to destroy, than assist vision. Such persons see tolerably well, and better than the preceding class of patients, in a darkish place, and they ought to wear green spectacles in the day-time, in order to weaken the impression of the rays of light. When a person is shut up a long while in a dark place, the pupils become habitually dilated, and if he exposes himself suddenly and incautiously to a strong light, the eyesight may be destroyed. There are other individuals, who, from excessive sensibility of the iris, cannot bear much light; their pupils instantly contract, and close. This case (continues M. Lassus) may be brought on by too great indulgence in venereal pleasures, and in persons, who have debilitated their constitutions during their youth." The same author mentions other cases, which seem to depend upon a species of irritability of the iris. In one instance, an issue in the arm effected a cure, and he mentions the utility of blisters. He admits likewise with Dr. Pye cases of intermittent or periodical nyctalopia, which begin regularly in the morning, and go off in the evening, the patient continuing blind, whether he keep himself in a dark or a light place. The cause of these instances, which, he observes, are very uncommon, is generally seated in the primæ viæ, and requires emetics, resolvents, purgatives, and bark. (See *Pathologie Chir. T.* 2, *p.* 540—542. Also *Richter, Anfangsgr. der Wundarzn. B.* 2, *p.* 481.) In 1787, Baron Larrey met with a case of day-blindness in an old man, one of the galley-slaves at Brest, who had been shut up incessantly for thirty-three years in a subterraneous dungeon. His long residence in darkness had had such an effect on the organs of vision, that he could only see in the dark, and was completely blind in the day-time. (See *Mém. de Chir. Militaire, T.* 1. *p.* 6.)

Nyctalopia may sometimes depend on a peculiarity in the structure and organization of the eye; by reason of which, the quantity of light, which only suffices for vision in an eye of natural formation, proves too abundant for a nyctalops, and absolutely prevents him from seeing at all. We know, that in the eye there is a black substance, named the *pigmentum nigrum;* one supposed use of which is to absorb the redundant rays of light, which enter the pupil. A deficiency of it might perhaps account for a nyctalops being blinded with day-light, and seeing best at night.

For an account of nyctalopia, in the sense of night-blindness, refer to *Hemeralopia.*

O

ŒDEMA. (from οιδεω, to swell.) The ancients understood, by this term, all kinds of tumors; but it is now restricted to a swelling, arising from the effusion of a serous fluid in the cellular substance of a part; the affection, when more extensive, and accompanied with a general dropsical tendency, becoming a medical case, and receiving the name of *anasarca.* An œdematous part is usually cold, and of a pale colour; and, as it is little, or not at all elastic, it *pits,* as surgeons express themselves, or, in other words, it retains, for some time, the mark of the finger, after being handled or pressed. Œdematous swellings are often connected with constitutional causes. In many cases, however, they seem to be entirely local affections, arising from such causes as only act upon the parts, in which the swelling is situated. Thus we observe, that after violent sprains of the wrist, or ankle-joint, the hands and feet often become œdematous; and limbs are frequently affected with œdema, in consequence of the return of blood through the veins being obstructed by the pressure of tumors on them, or that of splints, bandages, &c. Pregnant women are known to be particularly subject to œdema of the legs, owing to the pressure of the gravid uterus on the iliac veins. Persons who have been confined in bed, with fractured thighs, or legs, generally have more or less œdema in their feet and ankles, on first getting up again; and the affection in these cases is probably quite dependent on loss of tone in the vessels of the limb.

In the treatment of œdema, great attention must always be paid to the nature of the cause, in order to determine whether the disease originates from a mere local, or a general constitutional affection. When it depends on the pressure of a tumor on the veins, as we often see happen in cases of aneurisms, the effect cannot be got rid of till the cause is removed; and the aneurismal swelling must be lessened, before the œdematous one can admit of the same beneficial change. When œdema is the effect of vascular weakness in a limb, in consequence of sprains, contusions, &c. the best means of relief is, to support the parts affected, with a laced stocking, or a flannel roller, while they are also to be rubbed with liniments, and bathed with cold spring water, till they have perfectly recovered their tone.

With regard to the œdema, attendant on the advanced stage of pregnancy, a complete cure cannot be expected till after delivery. The affection is generally more considerable in the afternoon than the morning, owing to the different effects of an erect and a recumbent position. Some relief may be obtained by the patient's keeping as much as possible in a horizontal posture; and, when great inconvenience and pain are felt, the parts may be fomented with any aromatic or spirituous application.

Frequently, œdema is one of the symptoms of suppuration, and, when the collection of matter is very deeply situated, sometimes leads to its discovery, as is exemplified in cases of empyema.

There is a species of œdema, accompanied with a degree of heat, pain, &c. in the part, and which, in short, seems combined with phlegmon. In this case, cold evaporating lotions, the application of leeches, and the exhibition of saline purgatives are proper. An erysipelatous œdema is also met with, in which the treatment should very much resemble what is explained in the article *Erysipelas.*

ŒSOPHAGOTOMY. (from *œsophagus* and τεμνω, to cut.) The operation of cutting into the œsophagus, in order to take out of this tube any foreign body which lodges in it, and can neither be extracted through the mouth, nor pushed down into the stomach, though its removal is absolutely necessary for the preservation of the patient's life. A substance, above a certain size, lodged in the upper part of the œsophagus not only obstructs deglutition, but by its pressure against the trachea, produces the most urgent symptoms of suffocation. In this circumstance, if relief cannot be expeditiously afforded in any other manner, and *the situation of the foreign body is denoted by a prominence distinguishable in the neck*, œsophagotomy should be practised without delay. However, when the symptoms are pressing, yet unattended with any possibility of feeling the foreign body, either externally or with a probang, desperate as the situation of the patient may be, modern surgeons do not sanction the practice. And this difference from the opinion of the first proposers of œsophagotomy, does not arise so much from any reflections upon the greater difficulty of the operation in this circumstance, as from the consideration of its being unlikely to answer the only purpose, which makes its performance at any time proper, viz. enabling the practitioner to extract with reasonable certainty the substance, whose continuance and pressure in the œsophagus are the immediate cause of the patient's danger. Hence, when the symptoms of suffocation are extremely urgent, but the foreign body produces no external prominence in the neck, the surgeon should in the first instance perform tracheotomy, so as to obviate the imminent peril arising from the impeded state of respiration, and afterwards try such measures for the removal of the substance lodged in the œsophagus, as experience points out as most likely to prove successful. Though œsophagotomy was cursorily mentioned by Verdue in his "Pathologie Chirurgicale," Guattani, formerly a distinguished surgeon at Rome, is entitled to the honour of having published the first valuable observations on the subject. (*Mém. de l'Acad. de Chir. T.* 3, *4to.*) Guattani proved by experiments, that the operation might be safely performed upon dogs, which recovered after it very well, and he demonstrated on the dead body, that it was equally practicable on the human subject. Nay, what is still more to the point, he brought forward two instances, in which the practice had been successfully adopted on living patients. "In May 1738, Goursauld, a surgeon at Coussat-Bonneval, in Limousin, was called to a man, in whose œsophagus a bone was lodged, an inch long and half an inch broad. Various ineffectual endeavours were made to force it down into the stomach, and, *as it was perceptible on the left side of the neck*, Goursauld ventured to make an incision for its extraction. The bone was thus easily taken out, no bad symptoms followed, and the wound healed up favourably with the aid of an uniting bandage. For six days the patient was not allowed to swallow any kind of food, but was nourished entirely with clysters. According to Morand, a similar operation was performed, with equal success, by Roland, surgeon-major of the regiment of Mailly." (*Mém. de l'Acad. de Chir. T.* 3.)

Although the deep situation of the œsophagus, amongst the most important parts in the neck, makes œsophagotomy an operation of considerable delicacy in the hands even of a skilful surgeon, and one of great danger in those of a man, deficient in anatomical knowledge, and ignorant of the right way of proceeding, yet the propriety of performing it, under the circumstances, which have been specified, is universally admitted.

When, however, I refer to the delicacy and difficulty of the operation, I am meaning a case, in which a deliberate dissection is made down to the œsophagus, without any guidance from the projection of the foreign body within it; a case, in which my views of the subject lead me to think, contrarily to Guattani, that the experiment would generally be attended with no practical benefit; which is also the sentiment of Baron Boyer. For, with respect to opening the œsophagus, with the view of tracing a substance in it, not externally perceptible, and either of taking hold of the same substance with forceps, or pushing it down into the stomach with other instruments, introduced through the incision, as suggested by Guattani, the chances of success must be too small to justify a practice, in which it is above all things of consequence to have the guidance afforded by the prominence in the throat, as a test of the foreign body being actually lodged in the œsophagus, and capable of being removed from it by the proposed operation. Indeed, the uncertainty of being able to reach and extract the foreign body, when its precise situation is not indicated by any external swelling, appears to me an objection of greater validity, than any consideration either of the increased difficulty of cutting into the œsophagus under these circumstances, or of the usual consequences of such an incision, after it has been accomplished; because the practicable nature of the operation, and the tendency of wounds of the œsophagus to heal favourably, when not complicated with other mischief of too serious a description, are facts proved beyond the possibility of dispute. In attempts at suicide and murder, and in cases of gunshot injury, the œsophagus is sometimes wounded, together with other parts in the neck, and yet the patients frequently recover; and, when they die, their fate seems to depend rather upon other unfavourable circumstances in their cases, than upon the accidental injury of the gullet. The cures of wounds of the neck, involving the latter tube, as well as the trachea, are reported by numerous writers, B. Bell, Desault, Bohnius, &c. and some have fallen under my own observation. If it were necessary to substantiate this point further, I might cite the instance, recorded on the authority of Dr. James Johnson, where a man recovered after the larynx had been completely severed between the thyroid and cricoid cartilages, and one half of the calibre of the œsophagus divided. (See *Hennen's Military Surgery, p.* 364, *Ed.* 2.) But, supposing a wound of the œsophagus, abstractedly considered, were more dangerous, than it really is, the question of the propriety of œsophagotomy would not be materially affected by it, because the operation is never recommended, except as a matter of necessity, and without which the patient would have no chance of preservation.

As the œsophagus does not descend exactly in a straight line, between the trachea and vertebræ, but inclines rather to the left side of the spine, Guattani directs the left side of the neck to be preferred for the performance of œsophagotomy. But, Boyer has justly remarked that, as the operation should never be attempted, unless there be projection of the foreign body, the place for the incision is always to be determined by the situation of the projection, the left side being chosen only when the prominence is either most distinguishable there, or at all events not less, than on the opposite side of the neck. (*Traité des Mal. Chir. T.* 7, *p.* 192.)

The parts which cover the œsophagus, from the middle and external part of the neck to the upper part of the sternum, are the skin, fat, cellular substance, muscles proceeding from the sternum to the larynx, the thyroid gland, the thyroid arteries and veins, the trachea, the recurrent nerve, &c. Guattani, who preferred the left side of the neck, recommended the following mode of operating. The patient is to sit on a chair, with his head inclined backward, and steadily supported by an assistant. The skin having been pinched up into a transverse fold, an incision is to be made in the integuments from the upper part of the sternum. The cellular substance, between the sterno-hyoideus and sterno-thyroideus muscles and trachea, is next to be divided. With two blunt hooks, the lips of the wound are to be kept open; and, on separating the cellular substance at the side of the trachea with the aid of the finger and a few strokes of the knife, the œsophagus will be seen. The lower part of this tube is then to be opened, and the wound in it enlarged with a pair of curved blunt-pointed scissars, a director being employed, if any difficulty arise. With a small pair of curved forceps, similar to those used for the extraction of polypi, the foreign body may then be removed. According to Guattani, the wound will serve for the extraction of the foreign body, whether this be situated above, or below it, and he asserts, that the opening will even be useful, when the extraneous substance has passed so far down, that it cannot be taken out, as it can now be easily pushed into the stomach. Guattani lays great stress on the usefulness of endeavouring to unite the wound, and adverts to his experiments, proving that, in animals, wounds of the œsophagus heal very favourably. If, says he, the vein, which brings back the blood from the inferior parts of the thyroid gland, and runs into the subclavian, happen to be cut, the hemorrhage may be stopped with a dossil of lint held upon the aperture in the vein during the operation, and afterwards if the bleeding continue, compression, or a ligature, is to be employed. The recurrent nerve, if at all likely to be touched with the knife, is to be cautiously drawn a little out of the way with the blunt tenaculum. Guattani also particularly insists upon opening the œsophagus as near as possible to the trachea, especially at its upper part, where the artery, which goes from the subclavian to the thyroid gland, sometimes runs. When the foreign body requires an ample opening, and particularly when the thyroid gland is enlarged, Guattani approves of separating this part a little from the side of the trachea. (See *Mém. de l'Acad. Chir. T.* 3, *4to.*)

There can be no doubt that Guattani's directions for finding the œsophagus are very good; but his chief defect is representing the place for the incision as being always the same, whereas it ought to be partly regulated by the situation of the foreign body itself. However, his advice to make the incisions close to the trachea appears to me more judicious, than that recently delivered by Boyer, who directs them to be made through the cellular substance between the sterno-hyoideus and sterno-thyroideus muscles, and the omo-hyoideus, (see *Traité des Mal. Chir. T. 7, p.* 193, *8vo. Paris,* 1821,) in which method he quits the trachea, which is the best guide to the œsophagus, and approaches unnecessarily the large blood vessels of the neck. Yet, I agree with Boyer, respecting the general impropriety of attempting œsophagotomy, when the situation of the foreign body is not indicated by any prominence in the neck, and the prudence of determining the place of the incision in a great measure by such projection. Boyer also cautions the operator to let his incisions always be made in such manner, as to leave unhurt the trachea and recurrent nerve at the inner edge of the wound; the carotid and internal jugular vein at its outer edge; the superior thyroideal vessels, above; and the inferior ones below. With this view, the cellular substance is to be slowly divided layer by layer, and the blood repeatedly absorbed with a sponge; but, if any vessel bleed freely, it is to be immediately tied.

After the operation, an elastic gum catheter should be passed from one of the nostrils down the pharynx and œsophagus, by which means, the requisite food and medicines may be injected into the stomach, without any risk of their passing through the incision, and retarding the cure. But, a still stronger motive for this practice is the avoidance of the convulsive action of the muscles in deglutition; a source of very hurtful disturbance to the parts. Before the advantages of this contrivance were duly appreciated, the patient, for the first week, was allowed to swallow scarcely any thing, and was kept alive with broths injected up the rectum.

ŒSOPHAGUS, *Foreign Bodies in the.* There are few situations, in which foreign bodies lodge more frequently, than in the œsophagus; a fact, explicable by the consideration of the function of this tube, the nearness of part of which to the windpipe at the same time accounts for the frequent danger of suffocation, when a substance, above a certain size, is lodged in it. The lodgment often takes place at the lower part of the pharynx, or beginning of the œsophagus, and sometimes just above the diaphragm; but very rarely in the intervening portion of that canal.

Foreign bodies, liable to lodge in the œsophagus, are not only articles of food, such as pieces of crust, or meat imperfectly chewed, the yolk of an egg, boiled very hard, and not masticated, a chesnut, or small apple, &c.; but also various substances, which are accidentally swallowed either alone, or together with the food, such as pieces of bone, stones, pins, needles, buttons, pieces of money, knives, forks, scissars, spoons, keys, &c. These latter articles, by lodging in the pharynx, or œsophagus, may occasion very bad and fatal symptoms, and, if forced down into the stomach, may produce effects of a not less serious description. Hence, an immediate attempt should always be made to extract them. For this purpose, the fingers may be employed, and, if they will not reach far enough, a pair of long curved forceps should be used. But, no instrument seems better calculated for cases, in which the body lodged in the œsophagus is not too wide, than the urethra-forceps, invented by Mr. Weiss, of the Strand, and used by Sir A. Cooper for the removal of calculi, under a certain size, from the bladder. (See *Med. Chir. Trans. Vol.* 11.) Nooses of wire, and bunches of thread with a multitude of nooses, fastened upon the end of a probang, and a piece of sponge, fixed on the extremity of the same instrument, or on that of the strong wire stilet of a long elastic gum catheter, and various other contrivances have been made with the view of extracting different articles from the œsophagus. The bunch of thread seems well calculated for catching hold of small substances, like fish-bones, needles, &c.; and the sponge, when expanded with moisture and withdrawn, will sometimes bring up articles, which on its introduction, it had passed in its dry and diminished state. When the stomach is full, the excitement of vomiting has sometimes answered; but, if the foreign body be sharp and pointed, the method is not free from danger, and, instead of relieving the patient, may put him to great pain, and bring on violent inflammation of the passage, and the most distressing symptoms.

When the substances are not of a very hurtful kind, and cannot be extracted, they must be pushed down into the stomach with a large bougie, or a whalebone probang, fifteen or sixteen inches long, and, on the end of which a piece of fine sponge is securely fastened. But such practice is not advisable, when the foreign bodies have a sharp, pointed form, so as to be likely to prove a source of at least equal danger and suffering, if placed in contact with the inner surface of the stomach. Experience proves, that hard, angular substances, and pointed bodies, like nails, pins, needles, &c. which surgeons have not ventured, or not been able, to force down into the stomach, have often made their way, after a time, to the surface of the body, where an abscess has formed, out of which they have been discharged.

When very hard, irritating bodies have either passed of themselves, or been pushed with a probang into the stomach, their ill effects should be counteracted, and their passage through the bowels promoted, with mucilaginous draughts, containing the oleum amygdalarum, or oleum ricini. When the substances, lodged in the œsophagus, can neither be extracted, nor pushed down into the stomach, if respiration be not dangerously obstructed, and liquids can yet be swallowed, the wisest plan is to avoid irritating the passage with the further use of instruments, and leave the case to nature, that is to say, as far as manual interference is concernd; for, bleeding, and mucilaginous oily draughts, may be in some cases useful. But, when the lodgment of a foreign body in the œsophagus dangerously obstructs respiration, and the substance itself cannot be felt externally, the patient would perish, if some means of facilitating the breathing were not immediately adopted; and, under these circumstances, perhaps, the most prudent plan would be to make an opening in the trachea. (See *Bronchotomy.*) The subsequent treatment, with reference to the foreign body itself, might be determined by the circumstances of the case.

In this part of surgery, one fact deserves to be particularly remembered, which is, that after a sharp, hard substance has been either ejected, or propelled into the stomach by nature, or art, the same painful sensations in the throat frequently continue a certain time afterwards, which were experienced while the foreign body was actually lodged in the passage. These sensations, however, are only owing to the manner, in which the œsophagus has been irritated, and, consequently, would be seriously aggravated by the further unnecessary introduction of probangs, and other instruments.

There may be cases, in which the patient would lose his life by suffocation, if a foreign body of considerable size were not taken out of the œsophagus, so as to remove the compression of the trachea. Here, if it could neither be extracted, nor pushed into the stomach by common means, and its situation were indicated by any hardness, or prominence in the neck, an operation would be necessary for its removal. (See *Œsophagotomy.*)

A foreign body, not large enough to cause danger of suffocation by pressure on the trachea, may yet bring on fatal symptoms, as is exemplified in a case, which fell under the notice of Guattani. As a man was throwing up a boiled chesnut in the air, and catching it in his mouth, it passed down his throat, and he was immediately seized with a difficulty of swallowing, and sent to the hospital. However, as he breathed and spoke with facility, and had vomited since the accident, which happened when he was tipsy, the story of his having swallowed the chesnut was disbelieved. His symptoms grew worse, and he died on the 19th day. Guattani made an incision in the left side of the neck, below the larynx and thyroid gland, which was considerably swelled, and soon came to a large abscess, formed around the portion of the œsophagus, inclosing the chesnut.

When the extraneous body is sharp and pointed, so as to stick in the mucous membrane of the passage, and it cannot be removed, nature will sometimes expel it herself, without any dangerous symptoms being the consequence. The foreign body is gradually loosened by ulceration, and is then either ejected by vomiting, or descends into the stomach, whence it is voided either through the bowels with the feces, or, as is more common, by making its way through some part of the alimentary canal, and approaching the surface of the body, where an abscess forms, out of which it is discharged. In other instances, foreign bodies, like pins and needles, which cannot be removed, pierce the œsophagus itself, gradually pass completely out of this canal, and afterwards travel to remote parts of the body, without exciting much inconvenience, until, perhaps, at the end of some years, they come near the surface of the body, in a very remote situation from the throat; and an abscess is produced, in which they are unexpectedly found. However, this transport of sharp-pointed substances from one part of the body to another, which is effected by a process, in which the absorbents have a principal share in the work, is not conducted in every instance with so little disturbance, and, when foreign bodies of this description come into contact with particular organs, symptoms of a dangerous and fatal kind may be excited.

The great art of passing any instrument down the œsophagus, for surgical purposes, consists in putting its extremity at once directly against the posterior part of the pharynx, and keeping it closely against the vertebræ so as to avoid touching the epiglottis. The knowledge of this circumstance will be found extremely useful in passing probangs and bougies. When elastic gum-catheters are intended to be left in the passage, they are introduced down the pharynx from one of the nostrils, and, being secured, they serve for the conveyance of liquid food and medicines into the stomach with great advantage, in many cases, either where the patient cannot swallow at all, or where the disturbance of swallowing would be attended with considerable harm. When, however, the plan is not to leave the instruments introduced, as Boyer observes, they may be passed through the mouth.

ŒSOPHAGUS, *Strictures, and other Diseases of the.* Properly speaking, a difficulty, or impossibility, of swallowing should not be regarded as a disease itself; but only as a symptom of different affections, to which the organs of deglutition are liable, or of other diseases in the vicinity of the pharynx and œsophagus. The object of the present article is not the consideration of all the diseases, which may produce dysphagia, as a symptom, but chiefly to notice this effect, as depending upon spasm, paralysis, or some morbid change of structure affecting the pharynx or œsophagus.

Spasmodic dysphagia, as Baron Boyer has remarked, principally occurs in nervous individuals, hysterical females, and hypochondriacal men. It is sometimes an attendant on fevers; it is declared to be constant in hydrophobia, and epilepsy, and occasionally present in particular forms of mania. (*Traité des Mal. Chir. T.* 7, *p.* 151.) However, with respect to hydrophobia, the foregoing assertion should be received with some qualification, for reasons so fully detailed in another part of this work (see *Hydrophobia*), that it is unnecessary here to dwell upon the subject. Spasmodic dysphagia is said also to be sometimes a consequence of taking cold drink, after a violent fit of anger; of strong impressions on the imagination; of worms in the stomach, &c.

When the spasm is situated in the pharynx and upper part of the œsophagus, and is considerable, neither solids nor liquids can be swallowed, and the patient has great pain and a sense of constriction in his throat. When he tries to swallow any thing soft, or even fluid, he is seized with acute pain, insufferable nausea, and violent agitation of the whole frame. In this case, the spasm is never restricted to the pharynx and upper portion of the œsophagus, but extends to other organs, the inability of swallowing coming on in the midst of numerous other spasmodic symptoms, exceedingly complicated, and sometimes of a very alarming nature. When it is the middle, or lower part of the œsophagus, which is concerned, as is frequently the case in hysterical women, the food passes through the pharynx and unaffected portion of the œsophagus with tolerable facility; but, as soon as it reaches the seat of the spasm, it is either stopped, or descends further with great difficulty and effort. Liquids, especially when warm, and swallowed slowly in small quantities at a time, usually pass down with more ease, than solid substances. When the matter to be conveyed into the stomach reaches the point of obstruction, the generality of patients are attacked with pain extending along the spine between the shoulders, and sometimes shooting to the stomach, which is considerably disturbed, and often discharges its contents. In some cases, however, no such pain is experienced, and whatever the patients try to convey into their stomachs, regurgitates quietly into their mouths. Although spasmodic dysphagia is mostly complicated with other marks of disorder of the nervous system, it is sometimes unattended with any particular impairment of the health. (*Boyer*, *T.* 7, *p.* 152.)

As the treatment of spasmodic affections of the pharynx and œsophagus belongs rather to the physician than the surgeon, I shall be very brief on the subject. The removal of the cause of the infirmity, that is to say, of the particular state of the mind, or constitution, giving rise to the spasm, is the principal thing, at which the practitioner should first aim. Thus, Boyer cured an hysterical woman of a difficulty and dread of swallowing solid food by attending her, at her meals twice every day for a month, and gradually convincing her of the absurdity of her apprehension of being suffocated by attempting to swallow solid aliment. (*Vol. cit. p.* 154.) Sauvages makes mention of an hysterical female, whose difficulty of swallowing was cured by a regimen consisting of regular exercise, cold bathing, and milk-diet. The most successful remedies, however, are said to have been camphor in large doses, and opium taken in draughts, or pills, or administered in clysters: blisters and cupping-glasses applied to the nape of the neck, or to the epigastrium. Anodyne embrocations are also stated to have been useful. At the present day, the common idea, that many anomalous affections depend upon disorder of the liver and digestive organs, leads to the frequent employment of the compound calomel pill, and decoct. sarsaparillæ, with draughts of senna, rhubarb, and gentian *pro rê natâ*.

Dysphagia may originate from a weakened, or paralytic state of the muscular fibres, which enter into the structure of the pharynx and œsophagus. The affection may be either symptomatic, or idiopathic. The first case frequently occurs in febrile diseases, and is generally set down by writers, as a very unfavourable omen. The idiopathic form of the complaint may be complete, or incomplete, and is chiefly seen in persons of advanced age, though occasionally the patients are young and in the prime of life. The causes may be said to be little, or not at all understood, and the only remark, which can be safely made respecting them, is, that they are usually connected with constitutional derangement.

With regard to the symptoms of paralysis of the œsophagus, when the disorder is complete, deglutition is absolutely prevented, and, if the patient tries to swallow, the food lodges in the pharynx, and sometimes produces violent fits of coughing. Some patients eat solid substances with moderate facility; but, find more or less difficulty in taking liquids. Others can swallow hastily a large quantity of fluid at a time, yet, cannot drink slowly and a little at once. Morgagni relates an instance of still greater singularity, which was an ability to swallow all kinds of food very well, except the last mouthful, which always remained in the œsophagus until the next repast. (*De Sed. et Caus. Morb. Epist.* 28, *art.* 14.) In cases of dysphagia from paralysis the patient suffers no pain, nor sense of choking; if the neck be examined, no hardness, nor swelling can be felt; and a probang descends down the gullet without the slightest impediment. (*Boyer*, *T.* 7, *p.* 158.)

In its duration and termination, dysphagia from paralysis presents considerable variety; the complete paralysis sometimes proves rapidly fatal, not however, as I conceive, on account of the affection of the œsophagus alone, but other complications, and the exhaustion arising from inadequate nutrition. Thus, Tulpius relates an instance, in which a woman died on the seventh day from the commencement of the inability to swallow, notwithstanding every endeavour was made to support her with nourishment thrown up the rectum, which was the only thing that could be done, as she would not allow a tube to be passed down the œsophagus. In other cases, the patients live a considerable time, and afterwards perfectly recover, and this sometimes, under the disadvantage of having been entirely supported for several weeks with broth-clysters, as we find exemplified in a case recorded by Ramazzini. Certain examples are also reported, in which the patients had their food forced into the stomach by means of probangs, for years, and either ultimately recovered their power of swallowing, or in this manner prolonged their days, without any cure taking place. (*Stalpart van der Weil*, *Vol.* 2, *Obs.* 28; *Willis*, *Pharm. Rat. Sect.* 2, *cap.* 1, *p.* 45.)

Paralysis of the œsophagus is to be treated on the same principles, as other paralytic affections; a subject, which I shall not be expected to discuss; but, it is of importance that practitioners recollect, in these cases, the very essential service, derived from the use of elastic gum-catheters, with which the requisite food and medicines may be injected into the stomach.

Dysphagia from organic disease, or morbid change of structure, is the most frequent case, and generally the most difficult of cure. In dissections, the parietes of the œsophagus are often found considerably thickened, indurated, and scirrhous, or sometimes almost cartilaginous, and even ossified. The parts, where the pharynx terminates in the œsophagus and where the latter tube joins the stomach, are occasionally converted into thick scirrhous rings, with or without ulceration, exactly in the same manner as the pylorus. In one fatal case of dysphagia from disease of the cardiac orifice of the stomach, the œsophagus was found distended into a sac, reaching from two inches below the pharynx down to the diseased part, and capable of holding two quarts. (*T. Purton, in Med. Phys. Journ. Dec.* 1821.) But, such diseases are not restricted to the above-mentioned parts of the œsophagus, but sometimes occupy other points of the passage. Neither is the organic disease, producing a difficulty, or impossibility, of deglutition, always situated in the coats of the œsophagus itself: for, the surrounding parts, are subject to various diseases, which may have the same effect. Thus, dysphagia may depend upon enlargement of the thyroid gland; tumors formed between the trachea and œsophagus, or at some other point near the latter tube; swelling and induration of the thymus gland; aneurism of the aorta; enormous enlargement of the liver; and diseased lymphatic glands in the vicinity of that portion of the œsophagus, which is covered by the peritoneum, and the largest of which glands are situated near the fifth dorsal vertebra, just at the point where the œsophagus inclines a little to the right side to make way for the aorta. (*Boyer*, *T.* 7, *p.* 162.)

This last author sets down every case of dysphagia, depending upon organic disease of the œsophagus, as incurable; and with respect to the cure of other examples, in which that tube is compressed by swellings in its vicinity, as these are almost always beyond the power of medicine and surgery, the prognosis is nearly as unfavourable, as where there is a change of structure in the œsophagus itself. There are no unequivocal symptoms, by which a case of dysphagia from enlargement of glands in the vicinity of the œsophagus can be known from several other forms of the complaint. Hence, it is difficult to estimate the correctness of certain cases, recorded by Ruysch (*Advers. Anat. Med. Chir. Dec.* 1, *art.* 10, *p.* 24), and Haller (*Opuscul. Pathol. Obs.* 71), where dysphagia stated to have been produced by enlarged lymphatic glands was cured by mercurial frictions, or pills composed of calomel, aloes, and camphor. As Boyer justly remarks, these accounts of the nature of the diseases, thus cured, are the more doubtful, inasmuch as the resolution of chronic swellings of lymphatic glands, even when externally situated, is very difficult, and frequently impracticable, notwithstanding the use of topical applications may here be combined with the exhibition of internal medicines. (*T.* 7, *p.* 169.) However, dismissing the question, whether the cases really arose from the pressure of enlarged lymphatic glands, or not, the facts of the cures having taken place, under the use of mercurial medicines, are of themselves interesting. Several writers consider, that there is a great analogy between certain forms of constriction of the œsophagus, and strictures of the urethra, and Mauchart recommended the two diseases to be treated, on the same principles, with bougies, and elastic gum-catheters. Baron Boyer, however, represents this doctrine as completely erroneous, declaring that the affection of the œsophagus is of the nature of scirrhus, and absolutely incurable. He relates one case, in which a woman's life was prolonged by the use of an elastic gum-catheter, though it proved of no service as a means of permanently dilating the diseased part; and, notwithstanding nourishing liquids were plentifully injected into the stomach, the patient suffered a good deal from hunger, and died exhausted about three years after the beginning of the disorder. This case, however, cannot be received, as a proof of the inefficacy of bougies for what is commonly implied by a stricture of the œsophagus, because the nature of the disease was not ascertained by an inspection of the œsophagus after death, and the case might have depended upon some organic disease either of this tube, or the parts in its vicinity, not classed by the generality of modern writers with strictures of the passage.

The following are some of Sir Everard Home's sentiments, respecting these last cases.

As the œsophagus is required to be wider at one time, and narrower at another, in order to be fitted for conveying the different kinds of food into the stomach, it is nearly under the same circumstances, with respect to the formation of stricture, as the urethra. For obvious reasons, strictures of the œsophagus are much less frequent than those of the urethra. However, they are by no means uncommon, and produce symptoms even much more distressing and dangerous, than those, which ordinarily arise from analogous obstructions in the passage for the urine.

Of course, the most remarkable symptom of a stricture in the œsophagus is the difficulty of swallowing, which must be greater or less, according as the obstruction is more or less complete. Sometimes no solid food whatever can pass down into the stomach, and fluids can only descend with great difficulty, and in very small quantities. This is, in some instances, attended with considerable pain, which extends along the fauces to the basis of the skull, and through the eustachian tube to the ear. The pain sometimes returns at intervals, and lasts a considerable time, even when no effort is made to swallow. If a bougie of proper size, be introduced down the pharynx, it will often be stopped by the stricture just behind the thyroid, or cricoid cartilage; for, from Sir Everard Home's remarks, it appears that the obstruction is generally as high up as this situation. However, there are other cases, in which the obstruction is only of a spasmodic nature, and in these a bougie may be passed quite down. It is curious, that strictures high up in the œsophagus, often occasion ulceration in this tube very low down towards the stomach, just as strictures in the urethra occasion ulceration in that passage towards the bladder. This is most apt to occur, when strictures of the œsophagus have been of long continuance, and may arise from the efforts in retching, which frequently come on, and must strain the parts already deprived of their natural actions, and of the benefit of the secretions, with which they are lubricated in a healthy state. When such ulceration takes place, the characters of the original disease are lost; and when the ulceration extends upwards, the stricture itself may be destroyed. A bougie, introduced under such circumstances, will, in general, have its point entangled in the ulcer; and when so skilfully directed as to go down into the œsophagus, it will meet with a difficulty while it is passing the commencement of the ulcerated part of the œsophagus, and another impediment where it leaves the ulcer, and enters the sound portion of the œsophagus below. These two resistances may lead to the supposition, that there are two strictures, while in fact there is not one, only ulceration as above described.

Strictures in the œsophagus are sometimes so complete, that swallowing even fluids is utterly prevented; the patient is obliged to have all nourishment injected *intra anum*, and in general, soon perishes in a most emaciated condition.

Though any part of the œsophagus is liable to the kind of contractions forming strictures, the part immediately behind the cricoid cartilage, where the pharynx ends, and the œsophagus begins, is the most frequent seat of the obstruction. Those which are situated further down do not so easily admit of being examined, and relieved by any surgical operation. Strictures of the œsophagus occupy very little extent of the passage, consist of a transverse fold of the internal membrane, and are attended with little thickening of the adjacent parts. These latter circumstances are such as render the disease capable of receiving relief either from simple or armed bougies.

There are two other diseases of the œsophagus which have symptoms similar to those of strictures. One is a thickening of the coats of the œsophagus, which extends to the surrounding parts, and generally ends in a cancer, or an incurable disease. The other affection is an ulcer of the lining of the passage, commonly situated a little below the seat of the stricture, on the back part of the tube. In the early state, these diseases can only be distinguished from a stricture, by an examination with a bougie; afterwards their nature becomes clear enough from other symptoms which arise. Strictures also take place more commonly in young subjects; the other two diseases in the more advanced periods of life.

Sir E. Home has found, that a bougie can be more easily introduced into the œsophagus, when the tongue is brought forwards out of the mouth. This gentleman remarks, that when a bougie is passed, with a view of learning the nature of the case, if it passes down to the distance of eight inches, measuring from the cutting edge of the front teeth in the upper jaw, its extremity has gone beyond the usual seat of stricture. If it be withdrawn without any resistance, the aperture in the œsophagus must then be larger than the bougie employed. But if the bougie stops at the distance of six inches and a half, or even lower, it must be retained there with a uniform pressure for half a minute, so as to receive on its point an impression of the surface by which it was opposed. If the end of the bougie retains its natural form, or nearly so, and there is an indentation on one side of it, or all around it, the surgeon may conclude there is a stricture. On the other hand, should the bougie descend without impediment, as far as seven inches and a half, and, when withdrawn, the surface of its point appear irregular, and jagged, the disease is an ulcer on the posterior part of the œsophagus.

The mode of treatment adopted by Sir E. Home, consists either in passing a common bougie occasionally through the stricture, and employing one of a larger size, in proportion as the dilatation of the obstruction is effected; or else in introducing an armed bougie at convenient intervals. The views, which I take of the disease, would lead me to prefer giving a full and fair trial to the employment of elastic gum-catheters. Consult *Practical Observations on the Treatment of Strictures in the Urethra and Œsophagus*, 3 *Vols. Edit.* 3, 1805, *Vol.* 2, 1803, *and Vol.* 3, 1821, *by Sir E. Home. Ph. H. Beuttel de Struma Œsophagi; hujusque coalitu difficili ac abolitæ deglutitionis Causis:* (*in Haller's Disp. Chir.* 2, 395) *Tubing.* 1742, *Manchart de Struma Œsophagi, Tubing.* 1742. *J. Warner, Cases in Surgery, p.* 130, *Ed.* 4. *P. A. J. Zinckernagel, de Clysterum Nutrientium Antiquitate, et Usu,* (*Trilleri Opusc.* I. 399) *A. Vater, et F. A. Zinckernagel de Deglutitionis difficilis et impeditæ causis abditis:* (*Halleri Disp. ad Morb.* 1, 577.) *E. F. Bulisius de Fame lethali ex callosa oris ventriculi angustia, J. M. Eccardus, de his qui diu vivunt sine alimento, 4to. Kiliæ Holsat.* 1711. *Boyer Traité de Mal. Chir. T.* 7, *8vo. Paris*, 1821.

OLEUM CAMPHORATUM. ℞. Olei olivæ, ℔j. Camphoræ ℥iv. Misce ut solvatur camphora. Sometimes employed for promoting the suppuration of indolent, particularly scrophulous swellings, which are to be rubbed with it once, twice, or thrice a day, according to circumstances.

OLEUM LINI. In surgery, linseed oil is sometimes used as an application to burns, either alone, or mixed with an equal quantity of the liquor calcis. It has also been applied to cancerous ulcers.

OLEUM ORIGANI. The oil of marjoram is often used for dispersing ganglions: the tumors are to be rubbed with it two or three times a day.

OLEUM PALMÆ CAMPHORATUM. ℞. Camphoræ ℥ij. Olei palmæ ℔j. The camphor is to be reduced to powder, and the palm oil, being melted, and suffered to become almost cold, is to be mixed with it. A mild topical stimulant, sometimes used for promoting indolent suppurations, especially those of a scrophulous nature, under the jaw.

OLEUM RICINI. In surgical cases, requiring the bowels to be opened with the slightest degree of irritation possible, the oleum ricini is the best and safest medicine. The usual dose is one large table-spoonful, which must be repeated, every two or three hours, till the desired effect is produced.

OLEUM TEREBINTHINÆ. Oil of turpentine is employed externally as a stimulating liniment, and a styptic. In the article *Liniment* may be seen some formulæ, in which turpentine is the most active ingredient. It is sometimes exhibited internally, for the cure of gleets.

OLEUM TEREBINTHINATUM. ℞. Olei amygdalæ ℥ss. Olei terebinthinæ gutt. XL. Misce. In deafness, occasioned by defective, or diseased action of the glandulæ ceruminеæ, Mr. Maule directs a little of this oil to be dropped into the patient's ear, or applied at the end of a small dossil of cotton. When a thin secretion takes place, the cure is also promoted by a small blister, which is placed as near the ear as convenient, and kept open with the savine cerate. The meatus auditorius externus must also be cleansed every day with a lengthened bit of soft cotton, affixed to a probe. (See *Pharmacop. Chirurgica.*)

OMPHALOCE'LE. (from ομφαλος, the navel, and κηλη, a rupture.) A rupture, or hernia at the navel. (See *Hernia.*)

ONYCHIA. (ονυξ, the nail.) An abscess near the nail of the finger. (See *Whitlow.*)

ONYX. (from ονυξ, the nail.) A small collection of matter, situated in the anterior chamber of the aqueous humour, and so named from its being shaped like a nail. It is of the same nature as *Hypopium.* Maître-Jean, Mauchart, and others, imply by the term *onyx*, a small abscess between the layers of the cornea.

OPHTHALMY. (from οφθαλμος, the eye.)

Ophthalmia. Ophthalmitis. Inflammation of the eye. This is not only a consequence of several affections of the eye, and adjacent parts, on the existence of which its continuance entirely depends, it is frequently the primary complaint, and too often the forerunner of such irreparable mischief as for ever bereaves the patient of vision. The determination of a preternatural quantity of blood into the organ, and fulness of its vessels, or a congestion, as several writers express themselves, is, according to Beer, the earliest change, which takes place in ophthalmy in general. The next symptom is said to be redness, which becomes more intense, as the disorder makes progress, and if the complaint be protracted, the red assumes a dark hue, then a brownish, and lastly, a blueish tinge. However when the arteries and veins affected soon return to their natural state, the redness of the textures of the eye may not attain the greatest intensity. Beer seems to adopt similar views of the nature of the process of inflammation to those, which are taken by Dr. W. Philip, and some other writers already mentioned, (see *Inflammation,*) for, in consequence of the small arteries and veins being deprived of their propelling power, he considers, that the blood in the texture, which is the immediate seat of inflammation, is in a state of actual stagnation. (*Lehre von den Augenkrankheiten, B.* 1, *p.* 30.) The third general symptom of ophthalmy, described by Beer, as closely following the redness, is a tense, hard, painful swelling of the texture, directly affected. Lastly, in proportion as the pain, redness, and swelling are considerable, the more obvious is another common effect of inflammation, viz. an increase of temperature, or heat. But although the disturbed intercourse between the arterial and venous systems is more obvious, than the effects of inflammation in other parts of the organization of the eye, yet, that the secreting and excreting vessels, and the absorbents, are also affected, is evinced by the augmented secretion and excretion in the early stage of the disorder, followed, when the inflammation has become more intense, by a suppression of these functions, and a dryness and want of pliancy in the inflamed textures of the eye. The disturbance of the connexion between the nerves and muscles also produces first various involuntary movements, which, as the inflammation makes progress, become more and more limited, and, at length, there is a complete loss of action in the textures of the eye, which are the seat of inflammation.

But, inasmuch as every disease of the eye presents some differences, depending upon the nature of the disorder itself, and others, arising from the peculiar organization of the texture, which happens to be principally affected, the characteristic appearances of ophthalmy must be subject to a vast number of modifications according to the particular structure which is inflamed; and hence, sometimes one symptom of inflammation, sometimes another, chiefly predominates, while others are less conspicuous, and often scarcely distinguishable. Yet, says Beer, none of the characteristic marks of inflammation are ever entirely absent. This author represents the degree of pain as being proportioned in a great measure to the tough unyielding nature of the parts, immediately around the inflamed texture of the eye, to the firm nature of the inflamed texture itself, and to the quantity of nerves, with which such texture, and the parts in its immediate vicinity, are supplied. In proof of the truth of this doctrine, he instances whitlows and internal ophthalmy, where the pain is very severe; while inflammations of the conjunctiva, not extending to the deeper textures of the eye, are described as cases, in which the pain is slight, because the structure affected is loose and yielding. But, without scrutinizing every reason, assigned by Beer, for the varieties observable in the symptoms according to the texture which happens to be most affected, I shall briefly state a few other examples quoted by the same author. That the degree of redness, as well as of pain, varies considerably in different states of ophthalmy, is a fact universally known. In the beginning of the complaint, such redness is generally less perceptible, than when the inflammation has attained its highest pitch; but it is not equally great in every individual nor in every species of ophthalmy, being sometimes more intense and diffused, sometimes less both in degree and extent. This diversity is referred by Beer, and probably with reason, to the texture, affected in the eye, being furnished with many considerable blood-vessels, obvious to the sight, or only containing vessels, more concealed and rather filled with a colourless fluid, than with red blood. The looseness or unyielding nature of the texture, is also represented as making a difference in the degree of redness. In inflammation, principally affecting the conjunctiva and sclerotica, says Beer, the redness is so intense, as to give the eye a frightful appearance, as is seen in chemosis; while in inflammations of the innermost textures of the organ, the redness is scarcely perceptible, and, in the erysipelatous inflammation of the eyelids, the redness is very faint. (*Lehre von den Augenkrankheiten, B.* 1. *p.* 34—36.)

Dr. Vetch remarks, that the conjunctiva is capable of being stretched to a great extent, owing to the loose structure of the cellular membrane, on which it lies, and consequently little resistance is made to the enlargement of its vessels. From slight irritation, they soon become distended with red blood, "but their tone, or power of reaction, is speedily exhausted, and, if the exciting cause is not kept up in an increasing ratio, they quickly fall into a chronic, or varicose enlargement, or again contract to the diameter of the serous vessels." On the other hand, (as the same experienced writer has pointed out,) inflammation of the sclerotic coat is slow in its commencement, and often insidious in its progress, even when its ultimate violence is great. *In the early stage of conjunctival ophthalmia, the inflammation is most observable at a distance from the cornea,* around which the membrane often preserves for a length of time its natural appearance. Precisely *the reverse takes place in the case of sclerotic inflammation, which invariably appears at the circumference of the cornea, forming a zone, more or less complete around it, and most conspicuous above it,* the form and colour of the vessels being at the same time, wholly different from those, which appear in the course of conjunctival inflammation. *Intolerance of light* (says Dr. Vetch,) *invariably accompanies sclerotic inflammation,* and is entirely unconnected with that of the conjunctiva. (*On the Diseases of the Eye, p.* 10.) If the latter observation be strictly correct, it is to be inferred that, in all common cases of acute ophthalmy, involving the conjunctiva on the front of the eyeball, the sclerotica is more or less affected, as in the beginning of the disorder, light may be said to be seriously annoying to every patient.

According to Mr. Travers, when the sclerotica partakes of the inflammation of the conjunctiva, the vessels, which pursue a straight course to the margin of the cornea, are strongly distinguished, and have a somewhat darker hue, than the areolar vessels upon the loose portion of the conjunctiva. (*Synopsis of the Diseases of the Eye, p.* 128.)

Diversified as the pain, redness, swelling, and heat, the four characteristic symptoms of inflammation, may be in cases of ophthalmy, the incidental appearances in the eye are not less subject to numerous modifications. Thus, sometimes an extraordinary involuntary action of the muscles of the eyeball and eyelids, or of the secreting and excreting lachrymal organs, and of the Meibomian glands may be noticed; and sometimes the action of all these parts is either diminished, or completely stopped. These differences Beer refers to the latter parts being either themselves inflamed, or sympathizing with the inflamed texture of the eye. In the first case, the action of the muscles, and the functions of the lachrymal organs, and Meibomian glands, are more and more interrupted in proportion as the inflammation increases, and must thus remain, while the inflammation lasts in its genuine form; but in the second case, they go on, and this even with greater activity, while the inflammation continues, and until it has ceased to become more violent. (*B.* 1, *p.* 39.)

Acute ophthalmy in general, when at all severe, and particularly when the inner textures of the eye are affected, produces a febrile disturbance of the whole constitution. This change from a local to a general indisposition takes place with greater certainty and quickness, in proportion as the inflammation is extensive, the constitution irritable, the disorder of the eye neglected, and the mischief considerable, which is actually produced in the organ, whether accidentally, or in consequence of unskilful treatment. (*Beer, Vol. cit. p.* 42.)

Many of the appearances and effects of ophthalmy are different, as the inflammation happens to be of an acute, or chronic nature. And, as Scarpa has taken particular pains to impress upon the minds of surgical practitioners, every acute ophthalmy, though treated in the best possible manner, is never so completely resolved as not to be followed by a certain period, at which all active disturbance ceases, in the place of which a degree of chronic ophthalmy remains in the conjunctiva, or lining of the eyelids; the effect, either of local weakness, in the vessels, or of the continuance of a morbid irritability in the eye after the removal of the acute stage of the inflammation. As it occasions a diseased secretion in the organ, and a slow accumulation of blood and coagulating lymph, the inexperienced are apt to suppose, that the acute stage is not yet entirely subdued, while it is completely so. Now, if the inculcations of Richter and Scarpa be correct, immediately the critical moment arrives, when the acute stage changes into the chronic, attended with local weakness, it is of the highest importance to alter the treatment, without delay, and to substitute for emollient relaxing applications, such as partake of an astringent corroborant quality, as the former only protract the turgescence of the vessels, and the redness of the conjunctiva. "Quo major autem fuit inflammationis vehementia (says Richter,) eo major plerumque sequitur partium affectarum atonia, eoque major opus est adstringentium et roborantium longo usu, ut auferantur penitus reliquiæ morbi, &c." (*Fascicul. Obs. Chir.* 1, *p.* 109.)

It is on the accession of the second stage of ophthalmy, that one may remark the sudden increase of redness in the inflamed texture, with a brown and afterwards a blue tinge; actual extravasations of blood in the chambers of the aqueous humour; ecchymosis of the conjunctiva; a considerable increase of swelling; the decline and irregularity of the pain; the decrease of the inflammatory heat and throbbing; a sensation of cold and heaviness in the organ; and more or less œdematous swelling of the surrounding parts. It is also in the second stage, that suppuration is liable to happen. (*Beer, Lehre, &c. B.* 1, *p.* 46.) And, in another page, the same author observes, that the characteristic signs of the second stage of ophthalmy consist in the following appearances: while the redness and swelling undergo a sudden and striking increase, the hardness manifestly diminishes, and the pain becomes very unequal, and not continual; the secretions and excretions, also, which, during the first stage, were completely stopped, commence again, but more copiously, and are of a very different quality from what they were in the state of health. The disorder is now quite in its second stage, and this is the time, when purulent matter may begin to be formed. (*B.* 1, *p.* 50.) According to Beer, the duration of idiopathic opthalmy depends upon the circumstances of each individual case; first, the nature of the causes giving rise to the affection; secondly, the irritability of the patient, in relation to constitution, sex, and age; thirdly, what may be termed the constitution of the affected eye itself, and the texture in it immediately inflamed. Thus ophthalmy is likely to be attended with great severity, when it attacks plethoric individuals, in whom there has been for some time previously a great determination of blood to the head and eyes, or whose sight has been strained by looking at shining objects, or whose constitutions have been hurt by good living and hard drinking. Every severe ophthalmy runs through its first stage much more rapidly in weak, irritable subjects and children, than in robust individuals. It is also another remark, made by Beer, that every inflammation of the eye, at all considerable, is generally of shorter continuance in grey or blue-eyed, than in dark, or black-eyed persons; and, in the same manner, inflammation of the internal, sensible and tender textures of the eyeball always passes through its first stage more quickly, than inflammation of the eyelids.

With respect to the *causes of ophthalmy in general*, as the disorder frequently affects the innermost parts of the eye, and, when severe, is attended with some risk of the loss of the organ, the annihilation of its functions, or the spoiling of some of its textures; and, also, as inflammation is the most frequent complaint to which the eye is subject, it is important to learn, as far as possible, the causes, which either directly, or indirectly, give rise to it.

The atmospheric air and light have a direct and powerful operation upon the eyes; and, in order that the former may have no hurtful effect upon these organs, it should be pure, that is to say, its regular component parts should not be altered, nor blended with extraneous substances. The temperature of the air is likewise described by Beer, as making a good deal of difference in the susceptibility of the eyes for inflammation, either a very warm, or cold air, being, in this respect, hurtful. The observation, however, is qualified with the admission, that the terms *warm* and *cold* have only a relative signification to individual circumstances. The effect of a blast of cold air on the eye, in exciting inflammation, is universally known, and needs no comment. It is an opinion of Beer, that the eye is much affected by the quantity of electricity in the atmosphere, and, he says, that, on this account, no experienced practitioner would undertake the extraction of a cataract during, or on the approach of, a storm. (*B.* 1, *p.* 65.)

Passing over many interesting observations made by Beer, on the contamination of the atmospheric air by the admixture of other gases, and the injurious effect of this change upon the eyes, I come to his remarks on the operation of light upon these organs. Though light, he observes, is indispensable to the functions of the eye, it becomes pernicious, when suddenly increased beyond what the organ can bear, so as to be a source of irritation. As a proof of this fact, he cites an instance, in which a young, plethoric, strong man, whose eyes had been for some time unavoidably strained by immoderate exercise of them, was suddenly attacked with a violent ophthalmy, while looking at an optical representation of the rising sun, and carried home in great agony. But, with respect to the influence of light, Beer observes, that every statement is to be received only in a relative sense; for, the degree of light, which would answer very well for the eye of an African, would destroy many European eyes; and the same light, which is borne without inconvenience by the eye of an adult, would excite in the eye of a newborn infant the *ophthalmia neonatorum*, by which so many children are deprived of the most valuable of the senses in the first days of their existence. Beer further explains, that the same degree of light produces a stronger, or weaker effect, according to the greater or lesser irritability of the eye of the same person at different times, as we see exemplified in every individual in the tenderness of his eye to light when he first awakes in the morning. Light is also not hurtful to the eyes, merely according to its quantity; for, the direction of the rays makes a great deal of difference, the eye being less capable of bearing them with impunity the more they recede from a perpendicular line, and strike the organ slopingly, or horizontally. Much likewise depends upon the kind of light; that which is reflected from a scarlet surface, being even more prejudicial, than the sunshine, which is reflected from a country covered with snow; another convincing proof, that the bad effects are not always in proportion to the quantity of rays. The light of burning-glasses, concave mirrors, white-screens, the full moon, &c. and the shining of diamonds, are well known to render the eyes weak, and prone to inflammation. Amongst other occasional causes of ophthalmy, Beer enumerates the custom of washing the eyes immoderately with cold water, a remark in which I do not place much confidence myself; the application of various stimulating medicated substances to them; compresses and bandages; the badness of instruments employed in operations upon the eyes; the employment of spectacles unnecessarily, or of such as are not adapted to the eyes of the individual; and every immoderate exertion of the eyesight.

But, amongst the most important and frequent exciting causes of ophthalmy, are extraneous bodies, which insinuate themselves between the eyeball and eyelids, and every kind of wound or injury of the eye.

Foreign bodies, liable to enter under the eyelids, are of three kinds; first, such as are in themselves completely innoxious to the eye; or such as are likely to hurt the eye only when strongly pressed upon by the spasmodic closure of the eyelids, or by the patient's imprudently rubbing the eye; or they may be of a quality, which injures the eye the moment they come into contact with it. Foreign bodies of the first description lie loose under one of the eyelids, and, for the most part, either immediately behind its edge in the groove destined for the conveyance of the tears, or else in the fold, seen when the eyelid is everted, exactly at the line where the palpebra and sclerotic conjunctiva join together. They never actually lodge in the coats of the eye; but they irritate it mechanically, or chemically, or in both ways together, according to their size, shape, and chemical properties.

In the list of such extraneous substances are inverted eyelashes; particles of dust; snuff; pepper; minute insects; and other small things generally carried under the eyelids by the wind.

As these foreign bodies are all of them more or less irritating to the eye, they must be considered as a principal exciting cause of ophthalmy, which frequently follows their entrance under the eyelids with extraordinary rapidity. However, the redness and effusion of tears, sometimes instantly following the insinuation of extraneous substances under the palpebræ, and as suddenly ceasing on their removal, Beer considers rather as preliminaries to inflammation, than as this disorder itself. (*B.* 1, *p.* 92.)

Wounds and other injuries of the eye, regarded as causes of ophthalmy, Beer divides into three kinds; viz. *mechanical*, *chemical*, and *mixed*. A prick of the eye with a fine needle is an example of a simple mechanical injury; the action of quicklime upon the organ is an instance of one purely chemical; and the violent propulsion of a red-hot bit of iron against the eye is a lesion, which may be said to be both mechanical and chemical. The same author makes a variety of original reflections upon the differences, connected with the extent and intensity of such injuries. Their intensity, he views only as something relative; thus, either the force, with which the eye is injured, is of itself too great ever to be resisted, as is seen in a gunshot wound; or the organic powers of the patient are, from age, sex, or constitution, much too feeble for the eye to bear favourably any considerable injury, as is the case with children and weak unhealthy females; or the organization of the eye itself may be weak, and the effects of the violence therefore greater, as exemplified in the fact of a brown or black eye generally bearing a wound better than a grey, or blue one; or, lastly, the organic powers of the texture of the eye, immediately injured, may be too feeble to bear even a slight lesion, as is the case with the retina.—(*B.* 1, *p.* 95.)

Mechanical injuries of the eye may be made either with sharp, or obtuse bodies. Sharp-pointed and cutting instruments are capable of readily penetrating the eye, without occasioning at the moment of their entrance, any violent compression, or laceration of the neighbouring textures; and consequently the injury inflicted is a simple puncture, or an incision. Sabre-cuts of the eye, however, are to be excepted; for, though the weapon may be sharp, the blow is always attended with more or less concussion, and injury of the textures, adjoining the wound, which are very delicate and readily spoiled. Blunt weapons, or bodies, can only enter the texture of the eye by dint of great force, and, in this case, always cause a serious degree of compression, stretching, and laceration; but, sometimes when they do not penetrate the organ, the contusion is such as is productive of not less mischief.

In the case of a simple puncture, or incision of the eye, Beer seems to think, that the subsequent ophthalmy is generally more owing to the incapacity of the wounded organ to bear the effects of the light, air, &c. than to the injury itself abstractedly considered. He observes, that a proof of the truth of this opinion is seen in the extraction of the cataract; for, if the operator is careless in the operation itself, opening the flap of the cornea very wide, so as to let the atmospheric air have free access to the inner textures of the eye; or if after the operation is finished, he do not apply the dressings with caution, and properly darken the patient's chamber, he is letting the eye be subjected to some of the most active causes of inflammation. But though Beer is unquestionably correct, in regard to the injurious effects of light on the wounded eye, it may be doubted, whether his theories do not make him attribute too much to the irritation of the air, and too little to that of the mechanical division of the parts.

Passing over many of Beer's observations on injuries of the eye produced by blunt bodies, and substances acting chemically upon it, I leave the topic of the direct exciting causes of ophthalmy, and come to the consideration of those which he regards as *indirect*. And the first to which he adverts, is every thing that has a tendency to keep up a determination of a large quantity of blood into the small vessels of the head and eyes. Immoderate bodily exercise; violent emotions of the mind; injudicious clothing; and high living; are afterwards enumerated as having an indirect effect in the production of ophthalmy; but it does not appear to me, that Beer's sentiments upon these points are entitled to much attention. With respect to *infection* and *contagion*, as causes of inflammation of the eye. Beer understands by *infection*, what at first takes effect only upon a small point of the body, but never the whole animal economy directly, that is to say, before absorption has taken place. Hence, says he, infectious diseases are very seldom the cause of ophthalmy, unless some of their matter be applied immediately to the eye itself; but, he admits, that they often dispose this organ to inflame from slight causes, by the impairment, which they produce of the general health. On the other hand, he considers all *contagions* as very quickly affecting the whole of the constitution, directly through the medium of the skin, or the trachea, lungs, œsophagus, &c. Hence, contagion is set down as being much more frequently, than infection, the indirect cause of ophthalmy. Beer conceives, however, that as the contagious principle is blended with the atmosphere, it may also have an immediate operation upon the eyes, and thus he attempts to account for the organs not unfrequently exhibiting a tendency to inflammation at the very moment of the contagion taking effect. (*B.* 1, *p.* 121.) But, this is a difficult and obscure subject, which can be viewed to more advantage, when particular kinds of ophthalmy are considered.

In Beer's general observations on the treatment of inflammations of the eyes, the first indication specified, is *to remove immediately every thing, which is obviously producing an irritating effect upon the eye, and to take care that no fresh source of irritation to the organ incidentally take place.* And, as it frequently happens, even in healthy, strong individuals, that ophthalmy is occasioned by foreign bodies, either lodged under the eyelids, or inserted in some part of the eyeball, and not suspected to be there, the earliest attention should always be paid to their gentle and skilful removal. Easy as this object is of accomplishment, when not delayed, when the eye has not been seriously irritated by friction and pressure, and the patient is not of a weak, irritable constitution, it is often attended with great difficulty under one, or the other of these circumstances, especially the last. In this case, strong convulsive rotations of the eyeball, followed by a violent and obstinate spasmodic closure of the eyelids, render it impossible to separate them; and the spasm is the stronger and more lasting, the more the extraneous substances are calculated by their shape and chemical quality, to irritate the eye; and the greater the irritability of the patient is. In this state of things, every attempt forcibly to open the eye, or to examine it in the light, is not only useless, but increases and keeps up the spasm, which nothing will lessen and shorten, except darkness and perfect repose. But, as timid irritable persons are exceedingly apprehensive of the consequences of the lodgment of extraneous substances in the eye, the surgeon should endeavour to lessen their inquietude, by assuring them that every thing will be right again, which is strictly true, when the foreign bodies are of the first class. Then the spasmodic closure of the eyelids will cease, and the extraneous substance admit of being properly taken away.

Success, however, does not always attend this simple method; for, in very weak subjects, the spasm of the orbicularis palpebrarum is so violent and obstinate, especially when a foreign body lodges in the eye, and at the same time mechanically and chemically irritates it, (as is the case with particles of snuff,) that it becomes indispensable to have recourse to medicinal applications. For this purpose, Beer's experience has convinced him, that the best thing is a bread poultice, made either with milk or water, and containing some of the vinous tincture of opium. Care is to be taken, however, never to let it become quite cold, during its application; for then the spasm would only be aggravated by it; and, if such spasm has been of long continuance, when the surgeon is first sent for, the poultice, according to Beer, may be rendered more efficacious by the addition of hyosciamus to it. In very irritable hysterical and hypochondriacal persons, such local treatment alone is frequently insufficient, and recourse must be had to the internal exhibition of antispasmodic anodyne medicines. At length, when the spasm of the orbicular muscle is so far diminished, that the eyelids can be effectually opened without any force for the extraction of the foreign body, great caution and gentleness will yet be necessary, and, in particular, the eye should be kept in a very moderate light, as the spasm would be immediately excited again, either by sudden exposure of the eye to too much light, or rough handling of the eyelids.

Sometimes, a person rubs his eye at first awaking in the morning, and if the eyelashes are very numerous and rigid, one of them will lodge between the eyeball and lower eyelid: it may readily be taken away with the end of a fine moist sponge, or camel-hair pencil, the eyelid being depressed as much as possible, and the eye itself turned upward, so that the hair may not be concealed in the fold of the conjunctiva. When the hair is situated under the upper eyelid (which Beer says rarely happens,) it always lodges in the fold of the preceding membrane, whence it may be extracted in the manner above directed, with the difference that the eyelid must be raised or everted, and the eye rotated downwards.—(*Lehre von den Krankh. B.* 1, *p.* 128, 130.)

For directions respecting the treatment of redundant and inverted ciliæ, see *Distichiasis* and *Trichiasis*.

Small globular smooth extraneous bodies, lodged under the eyelids, are very easily extracted, when the eyelid is gently taken hold of both by its edge and the eyelashes, and lifted up from the eye, while the patient inclines his head forwards, and the eye is turned completely downwards: the effusion of tears, excited by these manœuvres, will now generally wash these extraneous substances out of the eye, as they are not at all fixed. When the fissure between the eyelids is wide and open, but the eyeball at the same time very prominent, the object may also be easily accomplished, when the upper eyelid is gently and repeatedly stroked with the finger from the outer towards the inner canthus; in which case, the round smooth foreign body soon makes its appearance above the caruncula lachrymalis, whence, it falls out of itself, or may be taken with the corner of a pocket handkerchief. The worst cases are those, in which the eyes are very prominent, and the fissure of the eyelids small, as all the above methods are then useless, and only productive of irritation. In this circumstance, therefore, Beer recommends the surgeon to take hold of the eyelid by the ciliæ and its edge with the thumb and forefinger, and separate it from the eyeball, which is to be turned downwards, while, with Daviel's small scoop, or the head of any large curved needle, introduced straight under the eyelid, at the outer canthus, as high as possible, the extraneous substance is to be extracted with a semicircular movement, directed towards the nose. Though this method will almost always succeed, Beer confesses, that it is not without the production of a great deal of mechanical irritation.

In consequence of the detention of such substances under the eyelids, the conjunctiva sometimes becomes thickened; this change, when slight, soon disappears of itself after the removal of the foreign bodies; but, in other cases, Beer recommends the diseased part of the membrane to be removed with a pair of scissars; and, after the bleeding has ceased, the frequent application of the lotio plumbi acetatis to the eye.

Particles of common dust, and of the sand and powders frequently thrown over letters, and very apt to get into the eyes of persons, who open their letters carelessly, or from short-sightedness, are obliged to bring them close to the nose, are generally more difficult of extraction. In the attempt, however, the eye must never be subjected to too much irritation. According to Beer, these extraneous particles of dust, or sand, may sometimes be removed by washing the eye well, or by dropping into it milk, or some other viscid fluid, while the patient lies upon his back, and the eyelid is lifted up from the eye. But, the most expeditious and certain plan is to employ a syringe, the pipe of which is to be introduced under the upper eyelid near the outer canthus, and the fluid thrown briskly in the direction towards the nose. If all the extraneous matter cannot be thus removed, the rest may sometimes be taken out with a camel-hair pencil, dipped in some viscid fluid, or fresh butter, and the eye is then to be washed again.

When particles of sugar, or other soluble, not very irritating substances, happen to insinuate themselves into the eye, professional aid is seldom requisite, as they generally dissolve in the tears, and are voided before a surgeon can arrive. Snuff, pepper, and other minute irritating bodies, as well as small winged insects, are to be removed in the same manner, as particles of dust and letter-sand; but, particular care is to be taken afterwards to wash the eye well with some lukewarm mucilaginous collyrium, until the irritation, caused by the chemical effect of such foreign bodies, has been completely obviated.

The removal of foreign bodies of the second class is usually attended with more difficulty, because they, as well as those of the third class, more frequently produce a violent and obstinate spasmodic closure of the eyelids, and are seldom loose, being generally fixed in the cornea. However, when they happen to be detached, they may be extracted in the same way, as small round smooth extraneous bodies, except that the stroking of the eyelid with the finger should be omitted, not only as useless, but likely to press any of these substances, which are of a pointed shape, into the loose conjunctiva, so as to injure the eye itself, which would otherwise not be hurt. The nibs of pens, the parings of the nails, and small hard-winged insects, when lodged in a depression of the cornea, or white of the eye, Beer says, may be easily dislodged by means of a small silver spatula. Other foreign bodies of the second class are not only fixed in a depression, but even penetrate more deeply than the conjunctiva; and, in old subjects in particular, they often insinuate themselves into the loose cellular membrane under the conjunctiva in the white of the eye, partly in consequence of the convulsive motions of the eyeball and eyelids, and partly by reason of the attempts made to loosen them. Hence, they frequently become situated a great way from the place of their entrance, and are completely covered by the conjunctiva. But, even when they lie immediately in the wound, they are so intimately connected with the subjacent loose cellular membrane of the conjunctiva, that every attempt to remove them with forceps is not only unavailing, but hurtful to the eye, inasmuch as the injury is thereby rendered deeper. They may be taken away with facility, however, when lifted up with a pair of small forceps, and cut away with a pair of scissars, together with the piece of cellular membrane, with which they are directly connected. If such extraneous substance should be actually underneath the sclerotic conjunctiva, Beer recommends the eyelids to be well opened, and the eye to be brought into a position, in which the part of the conjunctiva, covering the foreign body, is rendered tense, when an incision is to be made with a lancet down to the extraneous substance, which is to be taken hold of, and removed with a pair of scissars, the assistant being careful to keep hold of the eyelids during the operation. On the other hand, when the foreign body is actually lodged between the layers of the cornea, Beer considers that its extraction may be best accomplished with a lancet-pointed couching needle. But, whatever instrument is used, its point must be passed with great caution closely and obliquely under the foreign body; and care must be taken not to introduce it too deeply, lest the anterior chamber be opened, which may readily happen in young subjects; and when it does, the aqueous humour flows out, and the cornea becomes so flaccid, that the removal of the extraneous substance is quite impracticable, before the puncture has healed, and the anterior chamber is again distended.

The removal of foreign bodies of the third class mostly demands very great caution, first, because, as Beer observes, no particles of them should be allowed to remain in the eye, which, without the utmost vigilance, is apt to be the case; and secondly, because the wound of the eye, already considerable, should not be made larger than can be avoided. The extraction of small bits of glass is particularly difficult, as they cannot be seen, but must be found out entirely by the feelings of the patient, or the *tactus eruditus* of the surgeon, assisted with a probe. When in this way, a particle of glass is detected, Beer directs us to take hold of it with a pair of forceps, and cut it away with scissars. The place, from which it has been removed, must then be carefully probed, in order that no other fragment may be left in it. (*Beer.*)

According to the same author, pieces of iron and steel, which strike the eye so forcibly as to enter it, as well as all other fragments of metals, which are readily oxydated, should be as carefully removed, as bits of glass; for, the more easily they combine with oxygen, and the longer they remain, the more brittle they become, and the more apt are minute particles to be left in the eye, especially in the cornea. A speck on the part of this membrane, where the splinter has lodged, is the least serious consequence of such an event. When fragments of steel, which have quite a black appearance, remain fixed in the cornea several hours, it is found, after their removal, that the whole circumference of the depression, from which they have been extracted, is of a reddish-brown colour, produced by the rust left behind, and firmly adhering to the cornea. Every particle of rust must be carefully removed with a couching needle, or else a permanent speck will ensue; but, caution must be used not to puncture the anterior chamber. The extraction of particles of lead and gunpowder is generally difficult, as they have mostly been projected with great force against the eyelids, so as to produce not only a great deal of spasm, but instantaneous swelling of those parts. Hence, Beer says, that they should commonly be taken hold of with forceps, and cut away. Particles of cantharides are easily removed with a small silver spatula, or the end of an eye-probe; but, their violent chemical effect must be obviated, by frequently applying to the part a little fresh butter, touching it with a camel-hair pencil, dipped in diluted liquor ammoniæ, or dropping into the eye lukewarm mucilaginous collyria.

The attempt to wash particles of quicklime, mortar, &c. from the eye, Beer says, only has the effect of rendering their violent chemical operation more diffused, and he recommends them to be taken out by means of a fine hair-pencil, dipped in fresh butter, or oil. This is the only way of immediately counteracting their chemical effect, and, after their extraction, the application of unctuous substances to the part should still be continued.

The stings of small insects, when lodged in the sclerotic conjunctiva, are often very difficult of detection; but they are more readily seen on the skin of the eyelids. Beer directs us to remove them with a pair of forceps, or a couching needle, and then to have recourse to means calculated to diminish the ophthalmy, which, in these cases, always begins on the first occurrence of the accident. Small shots, lodged in the loose cellular texture of the conjunctiva, must be cut out. In general, says Beer, it is necessary to divide the conjunctiva, as they are mostly situated some distance from the place of their entrance, and of course are quite covered by that membrane.

As soon as a foreign body has been extracted from the eye, all precursors of ophthalmy diminish, as for instance, the redness, intolerance of light, and the increased secretion and effusion of tears. Even the inflammation itself, when already developed, subsides; but, this affection is slight, if the eye has not itself been injured by the extraneous body. On the other hand, when the eye has suffered more or less irritation from the nature of the substance itself, and the treatment requisite for its complete extraction, the inflammation may become more severe, unless the surgeon pay immediate attention to the injury left on the eye. (*Beer.*)

According to the principles laid down in the foregoing columns, the first indication in the treatment of wounds of the eye in general is to remove every kind of extraneous substance, which may impede the cure. Hence, the necessity of observing whether the instrument with which the wound has been inflicted, or any part of it, is lodged in the eye. When this is the case, the foreign body should be quickly extracted, or else no recovery of the organ can take place. But, says Beer, this is more easily said than done; for, in many instances, it is very difficult to find and remove the fragments of instruments, on account of the great delicacy of the organ, the irritability and alarm of the patient, and the bleeding from the part. However, the attempt must be made with the greatest gentleness possible; and Beer particularly advises a fine elastic whalebone probe to be used, instead of a silver one, for the purpose of detecting the fragment. He also sanctions making an incision, for facilitating the finding of the extraneous substance, provided it is certainly lodged, and cannot otherwise be traced. This author attaches great importance to the fulfilment of this first indication in all wounds of the eye, and relates a case, to which he was called, where a piece of tobacco pipe had been driven so forcibly and deeply at the external canthus between the eyeball and orbit of a young student, aged 19, and of delicate make, that the eye was immediately pushed out of its socket, and, on Beer's arrival, it lay with the cornea quite against the nose. Its very position led Beer to suspect, that some extraneous body was lodged in the orbit, and, notwithstanding the assurances of all the bystanders to the contrary, and the patient's being affected with violent spasms, the part was examined with a fine flexible whalebone probe, by which means, a piece of the pipe, nearly an inch in length, was felt, and immediately extracted with a pair of forceps. Scarcely had this substance been removed, when the eyeball was spontaneously drawn back into the orbit, though with the cornea still turned towards the nose, and the twitchings of the muscles also instantly ceased; but the eye was blind, and had but a very faint perception of light. By very careful treatment, the eyesight was restored in five weeks; but, the eye could not turn towards the temple, owing to the considerable injury, which the external straight muscle had sustained. With the aid of electricity, the power of rotating the eye about half its natural extent outwards was in the end regained, and the remaining infirmity resisted every method, deemed worthy of trial. (*Beer*, *B.* 1, *p.* 146. See *Exophthalmia.*)

Fragments of broken instruments are not the only kind of extraneous substances, which may lodge in the wounded eye; for, as Beer observes, when the injury is extensive, contused, and lacerated, there may be splinters of bone, or pieces of membrane, cellular substance, muscle, &c. so detached as to be quite incapable of reunion, on which account, this author sets them down as foreign bodies requiring to be taken away. However, I conceive, that, with respect to the soft parts, the advice here delivered should be received with much limitation.

Wounds of the eye, like those of most other parts of the body, may be healed either by direct union, or a slower process, in which suppuration, the filling up of the chasm by granulations, and the gradual, but not complete, approximation of its edges to each other, are the most conspicuous effects. Clean incised wounds may be cured in the first way, (see *Cataract*;) and lacerated, contused wounds, or such as are attended with loss of substance, in the second. But, whichever plan be attempted, the eye must be kept quiet, and excluded from the air and light, with a light suitable bandage. As in wounds and chemical injuries of the eyeball itself, not admitting of reunion, the eyelids, when closed, completely cover the wounded part, the application of dressings to it becomes both unnecessary and impracticable, and all that can be done is to drop frequently into the eye a mucilaginous collyrium, and cover the organ with a light bandage, which will not make any hurtful pressure. In simple contusions of the eye, unaccompanied with wound, Beer deems a bandage the only requisite application; but, when these accidents are conjoined with effusion of blood, he recommends the use of spirituous aromatic fomentations, with the view of promoting absorption.

In healthy individuals, small punctures of the eye, made with instruments like needles, and perforating only the conjunctiva, or cornea, but not reaching the deeper textures of the organ, are generally followed by no serious consequences, even when all the aqueous humour is voided. It is only necessary to keep the eye quiet, and the air and light excluded from it by means of a light compress, suspended over it from the forehead. Under this treatment, such punctures are so firmly closed in twenty-four hours, without any opacity, that the chambers are nearly filled again with aqueous humour, and the intolerance of light, which was only the effect of the loss of that fluid, is entirely removed.

In large clean cut wounds of the eye, whether accidental or made in the extraction of the cataract, the prognosis must be very cautious, and the treatment conducted with the utmost care; for, says Beer, it too readily happens, that, though the wound is not important in itself, its effects become from the least mismanagement highly dangerous to the eye. Hence, when the patient is known to be either an individual not likely to take proper care of himself, or one too much alarmed about the fate of his eye, the prognosis should be very guarded, even where the constitution is of the best description, because a violent and dangerous attack of ophthalmy is apt to ensue, and destroy the eye, sooner than effectual succour can be administered. On the other hand, when the patient is steady and intelligent, and the case is properly treated, the prognosis is very favourable.

In considerable cuts of the eye, it is only possible to promote their union with a suitable bandage, and by effectually preventing all motion of the eye and eyelids, which is best accomplished, when the sound, as well as the injured eye, is covered, and the patient kept quiet in bed until the sides of the wound have grown together.—(*Beer*, *B*. 1, *p*. 164.)

As cases of deeply penetrating wounds of the eyeball itself, Beer enumerates the punctures made in the depression and reclination of the cataract, and in every mode of forming artificial pupils; lacerations of the conjunctiva with ears of corn, pointed pieces of iron, splinters of wood, &c. In these cases, the prognosis, he says, is always very favourable, when the patient can put himself under all the conditions which the treatment requires, and his constitution is good. The first thing, here to be carefully fulfilled, is the removal of any fragments of the instrument, or body, with which the injury has been inflicted, and, it should be recollected, that, in these cases, minute splinters, which are scarcely discernible, frequently lodge in the conjunctiva, and, if not immediately traced and removed, produce the very worst consequences. By the weapon being suddenly withdrawn, pieces of the conjunctiva are sometimes nearly torn away, and hang from the eye; these Beer directs to be cut off with scissars. The best applications, he says, are either lukewarm mucilaginous lotions, or, (when blood is effused under the conjunctiva,) vinous, spirituous collyria. To these cases, he thinks, fomentations scarcely applicable. When the quantity of blood, effused in the loose cellular texture under the conjunctiva, is very considerable, he recommends scarifications; but, where this practice does not seem likely to answer, and vinous spirituous collyria are ineffectual, some of the liquor ammoniæ should be added to them. When any fragment of the instrument has been overlooked, and remains in the part, either a copious suppuration ensues, and the fragment is at length detached, or else in a patient of inferior sensibility, a soft, spongy, readily bleeding, pale-red excrescence is formed all round the extraneous body, and sometimes even projects between the eyelids. Here, according to Beer, the first requisite step is to cut away the fungus with a knife, so as to reach the irritating fragment under it, and then the rest of the excrescence may be removed by touching it with the tinctura thebaica, or vinous tincture of opium.

With respect to lacerated wounds of the cornea, they either penetrate the anterior chamber, or not. They are all of them attended with more or less concussion, laceration, stretching, and partial contusion, of the delicate anterior textures of the eyeball; a consideration, as Beer observes, materially affecting the prognosis. When, in such injuries of the cornea, inflammation and suppuration cannot be prevented, or the discharge is protracted, an obvious scar is always the consequence, which, when situated in the centre of the cornea, is a serious impediment to vision. Every endeavour should therefore be made to unite the wound by the first intention; and the best chance will be afforded by treating the eye precisely in the same manner as after the extraction of the cataract. (See *Cataract.*) And, when the plan fortunately succeeds, the flow of the aqueous humour out of the eye ceases in about 36 or 48 hours, and the anterior chamber becomes distended again; but, the site of the injury continues visible for some time afterwards. The speck, however, ultimately disappears, though much sooner in young, healthy subjects, than in the aged and feeble. When the opacity does not go off of itself, Beer finds a collyrium, containing some of the lapis divinus, (see *Lachrymal Organs,*) and the vinous tincture of opium, the most effectual means of dispersing it. Through large wounds, penetrating the cornea near its edge, a fold of the iris is apt to protrude, and, when it does, it should be replaced, which can only be effected without mischief to the eye by gently rubbing the upper eyelid, and then letting a strong light suddenly strike the organ. In this case, the employment of instruments is considered by Beer highly objectionable. When the iris is not immediately reduced, it as well as the cornea is attacked with inflammation, and soon becomes firmly adherent to the edges of the wound. (See *Iris, Prolapsus of the.*)

Large wounds penetrating the eyeball, and reaching the iris, are always of a very serious nature, even though the latter part may have received only a prick, or cut, because as the injury has been produced by accident, and not by art, the wound of the iris cannot be free from all laceration and contusion. It is incredible, says Beer, what extensive injuries the iris will bear in healthy individuals at its pupillary and ciliary edges, especially when produced by very sharp instruments; nay, rents may happen at both its edges, without any ill consequences, if the constitution be favourable; a proof of which fact is seen in the two common methods of forming an artificial pupil, viz. the excision of a piece of the iris, and the detachment of the iris from the ciliary ligament, as practised both by Schmidt and Scarpa. But, according to Beer, all violent pressure, or actual contusion, particularly when it affects the portion of this organ between its two circles, cannot be borne even in the best constitutions, and the least grievous consequence is inflammation, soon followed by a partial, or complete closure of the pupil, or suppuration in the eyeball. When the instrument, causing such injury, passes to the iris through the cornea, as is mostly the case, and the wound in the latter tunic is extensive, the torn iris is frequently pulled between the edges of the wound, at the moment when the weapon is withdrawn, and protrudes in a lacerated state. In this case, Beer recommends the torn projecting piece of the iris to be cut away with scissars close to the wound in the cornea, when, the rest, he says, is generally retracted within the eye. Thus, an adhesion of the iris to the cornea, termed *synechia anterior*, may often be prevented, which, when the lacerated iris is suffered to hang out of the cornea, is inevitable, surrounded by a large opaque cicatrix.

Some violent blows on the eye, though they cause no wound are attended with such a concussion of the anterior hemisphere of the organ, that more or less of the iris is instantaneously separated from the part of the ciliary ligament, where the force is most vehement. The consequence of this accident is either a double pupil, or the natural pupil closes, and the artificial one remains open. Such injuries may be produced by the lash of a whip, or a horse's tail, (a common accident in the narrow streets of Vienna,) or the thrust of any bluntish weapon against the outer part of the cornea; and they are purposely inflicted in the method of forming an artificial pupil, recommended both by Schmidt and Scarpa.

Wounds, which enter the eye through the sclerotica near the cornea, usually produce a considerable effusion of blood in the chambers of the aqueous humour; but, Beer thinks, that there is never any necessity for making an opening for its discharge at the lower part of the cornea, except when it is so considerable as completely to hide the iris, at the same time, that the eyeball is affected with very painful tension and hardness. In all wounds of the iris, it is likewise proper to follow the same treatment as applies to penetrating wounds of the cornea, with this difference, that when the effusion of blood in the chambers of the eye is considerable, the action of the absorbents should be promoted by the immediate employment of vinous aromatic collyria, and afterwards warm spirituous lotions.

Wounds of the eyeball, affecting the corpus ciliare, are set down by Beer as extremely dangerous, independently of the inflammation, which quickly follows. However, such injuries are most serious, when they consist in a real contusion, or laceration of the corpus ciliare, which can hardly take place without a severe concussion, or actual disorganization of the retina, and laceration of the principal ciliary nerves and vessels. Hence, besides an effusion of blood in the chambers of the aqueous humour, a partial, or complete amaurotic blindness is instantly produced, and the iris, in the vicinity of the place where the instrument entered, is so retracted towards the margin of the cornea, that neither of its circles can be seen. In cases of this description, it also frequently happens, says Beer, that the patient, or the person who inflicted the wound, suddenly and roughly pulls the weapon out of the eye again, and together with it a part of the corpus ciliare, which is then to be regarded as an extraneous substance, and immediately cut off. With respect to the prognosis and treatment, the observations already made on these topics, in reference to wounds of the iris, are here quite applicable, excepting that as the effused blood is less copious, than in the latter cases, there can never be here any necessity for letting it out by a depending opening in the cornea.

Wounds of the eye, affecting the crystalline lens, are not unfrequently followed by the formation of a cataract, and so are blows on the eye, which may be supposed to produce this effect by destroying some of the minute nutrient vessels naturally connecting the capsule with the lens. (*Beer*, *B.* 1, *p.* 218.) The treatment of these accidents resembles that of injuries of the iris, except, that the surgeon has rarely any extravasation of blood to deal with. However, when the lens has slipped into the anterior chamber, Beer recommends its immediate extraction through an incision in the cornea, in order to prevent the eye from being destroyed by a violent attack of traumatic inflammation and suppuration. Nor, when inflammation has come on, should this measure be postponed, as Beer has constantly found the disorder lessen, after the lens has been taken out.

Considerable wounds of the eye, attended with loss of the vitreous humour, are described by Beer, as of a very serious nature; but, they rarely take place accidentally, being almost always the consequence of a surgical operation. Accidental injuries of this kind are generally combined with so large, or complete a discharge of the vitreous humour, and with such mischief to the organization of the eye, that the consequence is a loss of the eyeball, or such a dwindling of it, that the fissure of the eyelids becomes nearly closed. According to Beer's experience, injuries of the foregoing kind, arising from accident, are mostly produced by the horns of cows. On the contrary, the effusion of the vitreous humour in operations upon the eye, he observes, is seldom followed by the loss of vision. Kortum, in his Manual on the Diseases of the Eye, adverts to some instances, which he had seen, or fancies that he had seen, where *the whole of the vitreous humour was lost*, and yet the eyesight afterwards became as strong as if no such accident had happened. On the other hand, Beer never met with any of these fortunate cases; but always found the sight seriously impaired, when the quantity of vitreous humour lost amounted to nearly its half, and complete blindness the result when the loss much exceeded that quantity. He conceives also, that Kortum had probably seen but few cases of this nature, and therefore might have been mistaken, as to the proportion of the vitreous humour discharged, which to the inexperienced seems larger, than it really is, and he cautions surgeons not to promise too much in cases of this description. (*B.* 1, *p.* 222.) See *Cataract.*

Considerable injuries of the eyeball, complicated with a concussion, bruise, or actual wound of the retina, produce either gradually, or immediately an amaurosis, which is almost always incurable. When the concussion of the retina is less violent, and does not affect every part of this texture, it may occasion only an amaurotic weakness of sight. In worse cases, the surgeon may think himself very successful, if he can prevent the figure of the eye from being destroyed by the subsequent inflammation, all idea of the recovery of the eyesight being out of the question. The treatment is the same as that commonly adopted, after operations for the removal of an opaque lens (see *Cataract*); but, there is one particular circumstance, sometimes attending injuries of the retina and ciliary nerves, claiming notice, viz. violent vomiting; a symptom which Beer says may even attend contusions of the sclerotica and of the ciliary nerves and retina, without any wound. Injuries of the ciliary nerves, he observes, are denoted by a very peculiar appearance; for, near the injured part, the iris is drawn up so close to the edge of the cornea, that its colour can scarcely be seen. When the surgeon is consulted in a case of this kind, though some inflammation may have commenced, the prognosis is yet favourable, in regard to the preservation of the eye; for a gentle opiate will relieve the vomiting, when merely a nervous effect, not depending upon the loaded state of the gastric organs; but, if the case be of this last description, the primæ viæ should first be emptied. However, when a traumatic inflammation is completely established, before the treatment is begun, the eye is generally destroyed, as the repeated and violent vomitings cause a great determination of blood to the head and eyes, and increase of the inflammation; an effect, which the opiates, given for the relief of the vomiting, also tend to produce.

Beer has seen two cases, in which the eye was pricked with a needle near the insertion of the external straight muscle into the sclerotica: in both instances, the punctures were so small, that they would scarcely have been found, had not the patients known their situation exactly by the pain, and they were then only perceptible with a magnifying glass. The punctures were soon followed by a convulsive rolling of the eyeball, and afterwards by trismus, which continued severe in one patient a day and a half, and in another, two days, but yielded to large doses of musk and opium given at short intervals, the warm bath, and the application of warm poultices containing hyosciamus.

As chemical injuries of the eye produce an actual loss of substance, they are even more serious, than common mechanical lesions. However, chemical injuries of little extent are generally repaired with tolerable facility and expedition. Quietude of the organ, and moderating the outward noxious effects by lukewarm mucilaginous applications, either in the form of fomentations, or eye-waters, are the only requisite measures. If the cornea itself be hurt, as frequently happens, when boiling hot fluids strike the eye, a kind of vesicle arises on the injured part, which becomes more and more white. The vesicle either bursts of itself, or subsides without breaking. In both cases, the production of the conjunctiva, of which the cyst of the vesicle is composed, shrivels up, and peels off, a new membrane of a similar nature being regenerated underneath. An opaque speck is frequently apprehended; but, says Beer, if the surgeon will merely avoid being too much in a hurry to open the vesicle, and not disturb the work of nature by applying various remedies to the eye, there will be no danger of such an occurrence.

More extensive chemical injuries of the eye, which at first are not in themselves very severe, frequently become dangerous, in consequence of care not being taken to prevent the influence of external stimuli. To this class of cases belongs the accidental sprinkling of the eye with boiling fluids, or strongish mineral acids. And, even in these examples, says Beer, the prognosis is not unfavourable, and a complete recovery may be effected, when the treatment is conducted according to the directions, already given with respect to such accidents in general. While this author approves of cutting away any substance, which is dead and partially detached, he strongly cautions surgeons not to remove the thin layer of the conjunctiva, nor to puncture any vesicle which may form.

When the burning, or corrosion, is not limited to the conjunctiva of the eyeball, but extends to the lining of one or both eyelids, Beer recommends covering the injured parts with mucilaginous applications, and mildly astringent ointments, containing tutty, or the white oxide of lead. In these cases, keeping the eye perfectly motionless must be hurtful, as it tends to promote the formation of adhesions, either between the eye and eyelids (Symblepharon), or between the eyelids themselves (Anchyloblepharon.)

Extensive, deeply penetrating, chemical injuries of the eyeball, Beer describes as being almost always followed by more or less impairment of the functions of the organ, or of some of its particular textures, because such accidents never happen without a loss of substance. Thus a part, or the whole, of the cornea may be entirely destroyed, as in injuries caused by quicklime; and, frequently, adhesions between the eye and eyelids, or between the two latter parts, cannot be prevented by any kind of skill. (*Beer.*) These serious degrees of mischief, as the same author observes, are mostly occasioned by slaked or unslaked lime, concentrated mineral acids, fire, &c. Unslaked lime, especially when extensively diffused over the eye by the immediate application of water, not unfrequently produces a sudden destruction of the whole of the cornea, which is changed into a greyish, pappy substance, capable of being removed from the subjacent iris with a camel-hair pencil. Such an annihilation of texture, however, is generally restricted to particular points, or the surface of the cornea. Wherever this membrane has been so much decomposed, that a manifest depression is directly perceptible in it, when inspected sideways, a snow-white shining speck must be expected to be the consequence. Slaked lime never operates upon the cornea with so much violence, usually causing (as Beer states) only a superficial corrosion, or a coagulation of the lymph between the layers of the cornea. Nor are mineral acids, even when concentrated, generally so destructive to the cornea, as quicklime; first, because, as fluids, they do not long remain in contact with the eye; and secondly, because the immediate mixture of the tears with them weakens their operation; whereas it only increases that of unslaked lime. The local treatment here consists in carefully removing every particle of the hurtful substance, afterwards dropping frequently into the eye lukewarm mucilaginous decoctions or collyria, or covering the injured place with a mild cerate, and excluding the air and light from the eye. Every endeavour must also be made to prevent the formation of adhesions between the injured surfaces.

In very severe burns of the eyeball, of course, all idea of restoring its functions is out of the question. The violence of the injury is the greater, the more numerous the vesicles are upon the conjunctiva, and the more the eyeball and the iris are incapable of motion. Here the only indication is to moderate the inflammation, and avert such additional mischief, as might otherwise be produced by it. With this view, the eye should be kept at rest, and excluded from the light and air. According to Beer, the most common injuries of the eye, partaking both of a mechanical and chemical nature, are those caused by mortar, or the accidental touching the eye with hot curling irons. When the mortar contains no particles of quicklime, it often occasions, at particular points of the cornea, very white specks, which Beer describes as being composed of coagulated lymph, and admitting of dispersion. He even declares, that when the whole of the cornea is in this state, its transparency may be restored by proper treatment, as has been frequently exemplified to the gentlemen attending his clinical lectures. (*B.* 1, *p.* 234.) The pricking of the eyeball with a red-hot needle, and the stinging of it by bees, wasps, and other insects, are also both chemical and mechanical injuries. Whether the sting be left in the skin of the eyelid, or in the conjunctiva, or not, a considerable inflammatory swelling immediately takes place; and, if the sting be lodged, and not now taken away, the inflammation spreads, and the eye itself is endangered. In two cases, where the stings of bees were left in the skin of the upper eyelid, Beer has known gangrene arise in the short space of a day and a half, and the patients were saved with great difficulty. The treatment of such cases consists in immediately extracting the sting, if lodged, and applying folds of linen over the eye, wet with cold water.

After noticing the destructive effects of burning substances, the explosion of gunpowder, and fulminating silver, on the eye (cases in which, when the functions of the organ are annihilated, the only indication is to diminish the subsequent inflammation and its consequences), Beer inquires, what is the reason why the slightest mechanical, or chemical, injuries of the eye, in an apparently healthy subject, are sometimes followed by an immoderate degree of inflammation, and even the loss of the organ from suppuration? It is, says he, an observation made by Schmidt, that there are some eyes, which the greatest bunglers may abuse for hours at a time, without being spoiled, their powerful organization defying all such unskilful disturbance; while other eyes are met with, which the most skilful operators can hardly touch, without inducing a destructive degree of inflammation and suppuration. It was to this peculiar idiosyncrasy that Schmidt applied the term *vulnerability.* (*Verwundbarkeit.*) Patients of this habit are said to possess an exceedingly fine soft skin, with a reddish polish upon it, and their cheeks are not only red, but exhibit a network of very minute vessels, which seem as if injected. Such individuals appear as if they were in the bloom of health; and, says Beer, in some respects they are really so. When their spirits are raised by the slightest causes, their complexion is universally reddened; but the least fear turns them as pale as a corpse. Their skin is described as being uncommonly irritable, sensible of every impression, and attacked with an erysipelatous redness, whenever any fatty substance touches it. In such habits, the utmost caution is necessary whenever the eyes have been injured, and the prognosis should be reserved. And, when an operation is to be done on their eyes, Beer recommends the previous exhibition of opium, and the application of a blister to some part of the skin, at a considerable distance from them. As a prophylactic measure, he also directs regular friction of the surface of the body.

In severe ophthalmies, particularly those which affect the eyeball itself, all mental emotions, anger, joy, &c. should be avoided. Hence, no talkative nor quarrelsome persons should be suffered to remain with the patient; and noisy children ought to be kept away from him. The apartment should be ventilated at least once a day, without the patient being exposed to any current of wind. All touching of the eye, or rubbing it with the bed-clothes during sleep, must be strictly prohibited. Stimulating, spicy food, spirituous drinks, and great bodily exercise are likewise to be forbidden. In the list of things which have a hurtful effect, Beer also includes all exertions of the lungs, every kind of disturbance, an atmosphere impregnated with tobacco-smoke, &c.

Having fulfilled the first general indication by removing, if possible, every kind of irritation acting upon the eye, the *second general indication* specified by Beer as proper in the first stage of ophthalmy, is to be observed, which is, *to moderate, according to the degree of inflammation, the agency of several things to the effect of which the organ is naturally subjected.* Thus, the inflamed eye should not be exercised, even though the eyeball itself may not be immediately inflamed; and the operation of the light and air should be diminished partly by green silk eye-shades, and partly by window-blinds. Attention to this rule is still more necessary, when the eyeball itself is affected. With respect to the exclusion of light, it is to be well remembered, that it is only advisable, as Dr. Vetch observes, in the very early stage of inflammation, the eye becoming more irritable and less manageable, when the access of a moderate degree of light is afterwards prevented. (*On Diseases of the Eye, p.* 16.)

The *third general indication,* mentioned by Beer, as proper in the first stage of ophthalmy, when the disorder threatens to extend to the whole organ, and to bring on a febrile disturbance of the system, is to counteract these effects by covering the eye with folded linen wet with simple cold water, or vinegar and water; and having recourse to leeches, or when the nature of the case allows, to scarifications. (*B.* 1, *p.* 242.) Here, however, it merits particular notice, that Beer, in expressing a general preference to cold lotions in the first stage of ophthalmy, differs from Richter, Scarpa, and Mr. Travers, (*Synopsis of the Diseases of the Eye, p.* 250,) all of whom, in the painfully acute stage, recommend tepid emollient applications.

With regard to leeches, also, the late Mr. Ware objected to their being put on, or very near, the eyelids, as they sometimes cause a considerable swelling of these parts, and increase, instead of lessening the irritation. In ordinary cases, his method was to apply three on the temple, about an inch and a half from the outer part of the orbit. Scarpa recommends applying the leeches to the vicinity of the eyelids, especially about the inner canthus, on the vena angularis, where it joins the frontal, deep orbitar, and transverse vein of the face. Beer prefers nearly the same situation, as that specified by Scarpa, viz. the inner canthus, immediately below the under eyelid; and he forbids the application of leeches above either canthus, as likely to produce a disagreeable ecchymosis in the cellular membrane of the upper eyelid. The number of leeches, and the time, which they should be allowed to suck, he thinks, ought to depend upon the severity of the inflammation. According to Beer, when this mode of bleeding is to be of any service, the patient will experience a considerable abatement of the throbbing pain, tension, &c. in the affected eye. Hence, when any of the leeches fall off prematurely, the bleeding from the bites is to be kept up, with a sponge dipped in warm water, until such relief is felt. In the acute stage, Beer considers the abstraction of blood by means of scarifications rarely admissible. (*B.* 1, *p.* 243.) Mr. Travers also sets down scarifications of the conjunctiva as mostly objectionable in the acute stage; though highly beneficial in the chronic, where the lining of the eyelids is thickened and over-vascular; and a considerable discharge of blood may be thus obtained, if the operation be briskly done with a sharp lancet, and the lower lid kept everted, and fomented. The same gentleman states, that cupping has a decided superiority over leeches, but that both are well adapted to relieve local congestion. Yet, he deems these methods too indirect to answer as substitutes for the lancet, where it is desirable to make the system "sustain and feel a reduction of power," in which case, blood must be taken from a vein, or the temporal artery. (*Synopsis, &c. p.* 249.) While inflammation of the conjunctiva is described by Dr. Vetch, as not much affected by bleeding, unless the quantity of blood taken away be such as to occasion syncope, he states, that the abstraction of blood, in quantities proportioned to the violence of the symptoms, more especially, by means of cupping and leeches, has for the most part sufficient control over the various states and individual symptoms of sclerotic inflammation. In some obscure cases of what this author terms amaurotic inflammation, he has seen great benefit derived from the application of leeches to the septum nasi, and he represents their being put directly on the conjunctival lining of the eyelids, as being sometimes more advantageous, than on the adjacent integuments, the orifices bleeding with great freedom. (*On Diseases of the Eye, p.* 15.)

If some of the above remarks are correct, scarifications were rather too boldly praised by the late Mr. Ware, as applicable to the acute stage of ophthalmy. But, supposing the first violence of the attack past, his recommendation of the practice either in the vascular and turgid state of the lining of the eyelids, or in the eversion of the lower one from a similar cause, seems perfectly unobjectionable. When the upper eyelid was very œdematous, and its thickness prevented the application of proper remedies to the eye, Mr. Ware also thought a few punctures near the ciliæ useful, by causing a discharge of bloody serum, and a quick subsidence of the swelling. And he speaks of the excision of a piece of the excessively tumid lining of each eyelid, in cases of ophthalmy with eversion, as having afforded great and speedy relief. (*On Ophthalmy, &c. p.* 39.)

The fourth general indication, enumerated by Beer, is that, which has for its objects a diet and regimen suited to the state of the case, after it has attained a degree, in which its effects begin to be felt throughout the system. When therefore the plan is to be rigorously practised, the patient's ordinary diet is to be reduced, and he is to be allowed only vegetable food, cooling drinks, water, weak lemonade, &c. And not merely the eye itself is to be kept at rest, but the whole body.

Should the disorder be further advanced, and attended with a great deal of inflammatory fever, the observance of the foregoing indications will not suffice for checking the inflammation and preventing suppuration, unless the *fifth indication*, laid down by Beer, be fulfilled, which *is to employ such remedies as operate upon the whole constitution.* 1. Purgative and gently aperient medicines, which will empty the bowels well, and lessen the determination of blood to the head and eyes. 2. Clysters, which are useful on the same principles. 3. The frequent exhibition of the nitras potassæ. 4. General bleeding, the efficacy of which will much depend upon the blood being voided in a full stream. Beer seems to prefer opening a vein on the foot; but, in England, the most experienced practitioners generally open a vein in the arm, and sometimes the temporal artery. The blood, as Beer remarks, should be allowed to flow, until the hard, small pulse rises and becomes plainly softer; for, otherwise the operation will be completely useless. Also when in these cases, general bleeding is no longer indicated, the employment of leeches will yet be advantageous, and, afterwards, scarifications may be practised, which, at an earlier period, would have aggravated all the inflammatory symptoms.

By strict attention to the five above explained indications, either without precipitation, or too much delay, the first stage of ophthalmy, even when in its most violent degree, may be checked and resolved; and all suppuration avoided, so that the eye may be restored to a perfectly sound state again, provided the patient, previously to the attack, was quite healthy, and of course the affection of the eye a genuine idiopathic inflammation. (*Beer, B.* 1, *p.* 246, 247.)

Respecting the *prognosis* and *indications in the second stage of ophthalmy in general, and of idiopathic cases in particular*, Beer offers many interesting remarks. He observes, that when ophthalmy has reached its second stage, which may be known by circumstances already referred to in the preceding columns, it must be clear, that the above indications are no longer valid, and the fulfilment of them would destroy the eye.

In the second stage, every thing which has a tendency to produce further weakness of the eye must be avoided, or suppuration will be the consequence: *the first indication*, therefore, specified by Beer, *is to let the eye be cautiously exposed according as its tendency will allow, to its wonted stimuli again.* 1. By letting fresh, dry, and, if possible, a warmish air, have free access to the organ. 2. By exposing the eye to as much light (not of a reflected description) as can be borne, not only without difficulty, but with pleasure. 3. By moderately exercising the organ, especially, in the inspection of agreeable diversified objects; a plan, which is of infinite service, when the eyeball itself has been affected.

The *second indication*, proposed by Beer *in the second stage of ophthalmy in general, is to apply tonic remedies, particularly those of a volatile kind, to the eye, which are to be discontinued in the event of suppuration.* 1. Beer praises the application of well warmed linen compresses, which, if necessary, may be sprinkled with camphor; or, in urgent cases, he uses little bags of aromatic herbs and camphor; a practice, in which I am disposed to think surgeons here will have little or no confidence. 2. However, when the eye is too irritable to bear the applicaon of bags of aromatic substances, Beer nctions the employment of poultices made of read crum and warm herbs, or the pulp of a oasted apple. But, this experienced author is ery particular in qualifying his approbation of moist applications with a caution, that they must ever be allowed to become completely cold on he eye, whereby they would do more harm in a uarter of an hour, than any good, which may ave been attained in many hours by their preious use. Hence, Beer employs poultices only n cases of necessity. In this country, "when he extreme vascular congestion and excessive ensibility are reduced, and the inflammation ends to become chronic, the use of cold lotions, f a slightly tonic quality, is substituted with great advantage for ablutions of warm water. The sulphates of alum and zinc are the best." *Travers, Synopsis, &c. p.* 252.) The employment of astringents also agrees with the advice elivered by Richter and Scarpa. Here then we ind a point on which Beer differs from the geneality of writers; but, nothing is clearer to me, han that his alarm about the ill effect of cold upon the eye in the second stage of ophthalmy is only the fruit of some theories, which he enterains, and not of impartial experience. 3. When here are small ulcers, or pustules, on the eyeball tself, Beer assures us, that great benefit is deived from dropping between it and the eyelids a epid solution of the lapis divinus, the composiion of which is elsewhere described (see *Lachrynal Organs*), and bathing the eye with the same pplication, to which a little of the vinous tincure of opium is added. Should this remedy fail n checking the progress of the ulcers, or pusules, Beer recommends the addition of acetate of lead. 4. And, says the same author, when no decided amendment is produced, within twentyour hours, the suppurating points must be ouched, once, or twice a day, according to the urgency of the danger, with a camel-hair pencil, dipped either in a watery solution of opium, or he vinous tincture of opium. In the worst cases, he even directs Hoffman's balsam, naptha, or the Peruvian balsam to be mixed with the vinous incture of opium.

But, Beer observes, that when these remedies have been too precipitately employed, and any granulations, or excrescences form, the treatment must be less active, and then these new producions will frequently recede of themselves; but, if hey should not do so, they may be removed with burnt alum, or caustic. (*B.* 1, *p.* 252.)

The third rule, laid down by Beer, *in the treatment of the second stage of ophthalmy*, cautions the practitioner not to apply the caustic or the knife, to any of the morbid changes, which either originate during the first stage, and continue in the second, or make their first appearance at the period of suppuration, as, for nstance, opacities of the cornea, eversion of one or both eyelids, &c. However, as exceptions to this advice, Beer adverts to the treatment of new-growths under the circumstances above specified, and to that of abscesses of the eyeball, where the matter is of an unhealthy quality, and so copious as to make an opening advisable, which practice, however, as a general one, he condemns. The other morbid changes, already alluded to, the practitioner must endeavour to remove simply by proper treatment of the second stage. (*Beer, B.* 1, *p.* 254.)

Beer's *fourth rule in the treatment of the second stage* of ophthalmy in general, and of idiopathic ophthalmy in particular, when the suppurative process is extending itself, and threatening to impair the health, is, 1st. To allow the patient such food as is both easy of digestion, and of a very nutritious quality, and even a moderate quantity of wine and spirituous drinks, if he has been accustomed to them. 2dly. To direct the patient to keep his eye exposed the greater part of the day, in a fresh, dry, and (if possible) mild air, and take just exercise enough in various ways to produce a slight degree of fatigue. 3dly. When the eye itself is affected with suppuration, and the sight is either thereby much impaired, or quite lost, and, of course, the patient very unhappy and depressed, Beer considers it highly beneficial to let his spirits be improved by society.

The *fifth rule*, or, *general indication in the second stage*, laid down by Beer, refers to the necessity of supporting the constitution, when the suppurative process is attended with a general febrile disturbance. For this purpose, he recommends, 1st. The exhibition of calamus aromaticus, naphtha, and camphor. 2dly. If they prove ineffectual alone, they are to be joined with other tonics, especially bark. 3dly. The warm bath, which, in consequence of the sympathy between the skin and eyes, is particularly efficacious. 4thly. Rubefacients, applied not far from the eye; means, which are exceedingly beneficial in the second stage of ophthalmy. (*B.* 1, *p.* 257.)

As an appendix to these general remarks, delivered by Beer, on the general treatment of ophthalmy in its first and second stages, I annex the sentiments of some other writers, as either confirming, or rendering questionable, some of his statements.

According to Scarpa, when bleeding and other evacuations have been practised, the next most useful measure is the application of a blister to the nape of the neck. He observes, that the skin here and behind the ears, has a stronger sympathy with the eyes, than any other part of the integuments. On the other hand, the late Mr. Ware preferred blistering the temples, and says: "When the leeches have fallen off, and the consequent hemorrhage has ceased, I would advise a blister of the size of half a crown, to be applied on the temples, directly over the orifices made by the leeches, and I have found, that *the sooner the blister has followed the bleeding, the more efficacious both have proved.*" He adds, that when ophthalmy is very violent, and resists common methods, the most beneficial effects are sometimes produced by the application of a blister large enough to cover the whole head. (*P.* 43, 44.)

With respect to blisters, another modern writer particularly objects to their being applied near the eye, or on the temples, "where they never fail to prove injurious." There is (says he) "but one exception to this, as a general rule; for, it would seem, that blisters, applied to the external surface of the palpebræ, in cases of purulent ophthalmia, tend considerably to diminish the purulency and chemosis." (*Vetch on Diseases of the Eye, p.* 17.)

In the second stage of acute ophthalmy, the vinous tincture of opium (the tinctura thebaica) has been very extensively used, as a topical application. In common cases, two or three drops may be insinuated between the eyelids and globe of the eye, twice a day; but, in other instances, attended with more sensibility, once at first will be sufficient. The late Mr. Ware, who brought this application into great repute, found, that introducing two, or three drops, of this medicine at the inner canthus, and letting them glide gradually over the eye, by gently drawing down the lower eyelid, proved equally beneficial, and less painful than letting them fall directly upon the eyeball. Immediately the application is made, it usually creates a copious flow of tears, a smarting, and a sense of heat in the eyes; which inconveniences, however, soon cease, and the eyes become clearer, and feel decidedly improved. But, notwithstanding every exaggeration, unbiassed surgeons are now fully convinced, that the vinous tincture of opium is a proper application only when the inflammatory action has been previously diminished by bloodletting, aperient medicines, and blisters, and when the action of the vessels has been weakened by the continuance of the disease. Nor is any doubt entertained, that the late Mr. Ware went much too far, when he recommended the vinous tincture of opium, as a most effectual application, in every species and stage of the disorder, from the most mild and recent to the most obstinate and inveterate. (*P.* 51.) Scarpa has seen the necessity of limiting the use of the remedy in question, and has expressly pointed out, that it is useful only when the violence of the pain, and the aversion to light, have abated. Indeed, Mr. Ware himself, a little before sanctioning its employment in all cases, has acknowledged, that, in certain instances, in which the complaint is generally recent, the eyes appear shining and glossy, and feel exquisite pain on exposure to the light, no relief at all was obtained. (*P.* 48, 49.) Mr. Travers has remarked, that "there are inflammations, which assume a chronic character in their commencement, evidently depending on a state of atony, of very partial extent, void of pain, and scarcely possessing any sign of inflammation, except the congestion of the vessels, or, if any, so feebly marked, as to encourage us to disregard them in the treatment. In such cases, a single stimulus will often restore the healthy action at once. The vinous tincture of opium has acquired a nostrum-like importance from its restorative operation in such cases; a virtue, I believe, not proper to it. A drop or two of the zinc, or the lunar caustic solution, or water impregnated with calomel, or a minute portion of the citrine ointment, or any other stimulant, would do as much." (*Synopsis, &c. p.* 252.)

Whenever the patient can easily bear a moderate degree of light, Scarpa directs all coverings to be removed from the eyes, except a shade of green, or black silk. A brighter light should be gradually admitted into the chamber every day, so that the eyes may become habituated, as soon as possible, to the open day-light; for, as Scarpa truly states, nothing has a greater tendency to prolong and increase the morbid irritability of the eyes, than keeping them unnecessarily long in a dark situation, or covered with compresses, and bandages.

Dr. Vetch has such a dislike to the plan of covering the eye, that he never suffers a shade to be worn, conceiving, that, in conjunctival inflammation it always does a great deal of harm by preventing a free exposure of the eye to a temperate atmosphere. (*On Diseases of the Eye, p.* 17.)

Besides the common remedies for inflammation, there are some very powerful means, which may be employed for the relief of particular states of ophthalmy with great effect. Thus, as the latter author has observed, by means of hyosciamus, belladonna, and stramonium, (see *Belladonna*) the important structure of the iris may be secured from injury, at the same time that other measures are adopted for checking the inflammation. Such medicines may even be applied, as a mechanical force, for detaching any recent adhesion. (*Op. cit. p.* 18.)

The uses of the argentum nitratum are also very extensive: "the slightest application of it in substance (says Dr. Vetch) can often remove the highest degree of morbid sensibility to light, and instantaneously restore quietude to the organ; it can prevent incipient changes, and obviate advanced ones; and may also be used in solution, as a valuable sedative."

The mention of so stimulating and active a substance as the nitrate of silver having a sedative effect may excite surprise; but the fact is unquestionable, and well illustrated in the treatment of several diseases. (See *Cornea* and *Iris.*) As another modern writer correctly states, it is remarkable, that even the weaker forms of medicated lotions irritate, and none more than such as contain opium. The relief, afforded by anodyne fomentations in general, is very various. "I have known them (says Mr. Travers) objected to as painful, and patients inquire if they might not substitute warm water for the aqueous solution of opium, and infusions of poppy and hemlock. The same observation applies especially to painful herpetic cutaneous affections, and acutely irritable ulcers. Upon these a solution of opium often acts as a stimulant, and augments pain, while the lunar caustic solution as often assuages it." At the same time, Mr. Travers admits, that exceptions occur, and that he has met with cases, "in which no other application, than the aqueous solution of opium could be borne." He has also known the vapour of laudanum afford the most marked relief to the irritability to light accompanying strumous ophthalmy. (*Synopsis of the Diseases of the Eye, p.* 251.)

According to Dr. Vetch, it is impossible, in cases of conjunctival ophthalmia, to possess an application of greater efficacy, than the undiluted liquor plumbi subacetatis, for altering the morbid and purulent state of that membrane; he also describes nicotiana, externally employed, as a narcotic and astringent, of singular service in lessening the pain, and tumefaction. (*P.* 19.) However, the discordance amongst the best writers, about the effects of favourite local applications, would lead me to enjoin rather attention to the leading principles of the treatment, than confidence in the superior efficacy of any particular drug, or composition. As also the local applications should vary in the different stages of purulent ophthalmy; no single one will always be right. If Beer had delivered no observations of greater importance, than his condemnation of Bates's camphorated lotion, and his praise of other styptic stimulating applications, his remarks would be of little value; but, as he has pointed out the different stages of purulent ophthalmia in a very correct manner, and adapted his remedies to these various states of the disease, his information comprehends scientific principles, and becomes peculiarly interesting. The same praise belongs also to Dr. Vetch's observations on purulent ophthalmy, who, in some points, both of the description of the complaint and its treatment, has surpassed Beer.

Of the different Kinds of Ophthalmy, Beer's classification is very comprehensive. According to the situations, in which ophthalmic inflammation first originates, he proposes a general division of it into three forms, as suggested by some of the older writers; viz. *inflammation of the eyelids, or blepharophthalmitis; inflammation of the parts between the orbit and globe of the eye;* and, lastly, *inflammation of the eyeball itself, or ophthalmitis.* He observes, however, that these distinctions seem to assign a considerable extent to the original seat of the affection; for, the expression, *inflammation of the eyelids* can only denote a case, in which the disorder begins at once in all the parts, composing the eyelids. In the same way, inflammation *of the parts between the eyeball and orbit* appears to signify, that all those parts constitute the original sphere of the complaint; while *inflammation of the eyeball* seems to denote that the disorder has begun at once in all the textures, of which this organ is composed. But, fortunately, as Beer remarks, the extent of the original seat of genuine idiopathic inflammation of the eye is seldom thus considerable; being mostly restricted to particular textures, from which it first spreads further only when neglected, or injudiciously treated. Hence, certain subdivisions of the complaint are necessary; and, accordingly, Beer subdivides *inflammation of the eyelids,* first, into the *erysipelatous* or *blepharophthalmitis erysipelatosa,* which commences in the integuments of these parts. Secondly, into that, which originates at the edges of the palpebræ, in the conjunctiva lining these parts, and the Meibomian glands, and which Beer denominates *glandular inflammation of the eyelids,* or *blepharophthalmitis glandulosa;* a case, described by writers under an infinite number of names, and often confounded with complaints of a totally different nature. Thirdly, when the effects of the inflammation are confined to a small portion of the eyelid, it constitutes the disease, termed the *inflammatory stye,* or, *hordeolum,* which Beer says is rarely a simple inflammation, but complicated with a scrophulous habit; a proposition, which, I think, will not receive any credit in England. Fourthly, as there is one more form of inflammation of the eyelids, Beer gives it the name of the *erysipelatous swelling of the corner of the eye,* or *anchylops erysipelatosa,* which affects the skin of the inner canthus, immediately over the lachrymal sac. The name, here suggested, expresses precisely the seat of the inflammation, and, as Beer thinks, will tend to prevent the case from being mistaken for inflammation of the lachrymal sac. *Inflammation of the parts in the orbit,* comprehends, first, *inflammation of the lachrymal gland;* secondly, *inflammation of the lachrymal sac,* a disorder, which begins in the lachrymal sac and nasal duct, and generally extends with great rapidity over all the excreting parts of the lachrymal organs; and, thirdly, *inflammation of the caruncula lachrymalis,* or the *encanthis inflammatoria.*

In the same way, inflammations of the eyeball admit of a classification, which is of the highest practical importance, first, into the *erysipelatous inflammation of the sclerotic conjunctiva,* the *ophthalmitis erysipelatosa,* which denotes that form of the disorder, which is first entirely confined to the membrane connecting together the eyelids and eyeball. Secondly, into *inflammation of the outer textures of the eyeball,* the *ophthalmitis externa,* originating in the cornea and sclerotica. Thirdly, into *inflammation of the innermost textures of the eyeball,* the *ophthalmitis interna,* which has two forms highly necessary to be recollected in practice; for the inflammation may begin immediately in the retina, choroides, the membrane of vitreous humour, &c. and spread from these textures to all the rest of the eyeball, being named *true internal inflammation of the eyeball,* or *ophthalmitis interna vera,* and thus discriminated from another case, which is originally seated in the iris, the adjoining corpus ciliare, the lens and its capsule, and afterwards extends from these parts to the more deeply situated coats and to the texture of the vitreous humour. This last form of internal inflammation of the eyeball is named both by Schmidt and Beer, *iritis.* The classification then embraces a view of the different forms of ophthalmy, as modified by constitutional causes; as the effect of contagious and infectious diseases, measles, small-pox, &c.; and as a complication of certain cachexiæ, like gout, rheumatism, and scurvy.

Although I have thus given a brief delineation of Beer's classification of ophthalmic inflammations, it is not my design, in the subsequent columns, to enter into a full consideration of every particular case, above enumerated; first, because the limits of this volume will not permit me to do so; and secondly, because some of these cases have been already considered in other parts of the work. (See *Lachrymal Organs.*)

Common Inflammation of the Eyelids. This form of disease is said by Beer to affect the upper much more frequently, than the lower eyelid, because the former obviously has a larger surface exposed to injuries from without; nor does the complaint always spread to the latter. From the margin of the eyelid, a very red, tense, painful swelling arises, attended with heat, throbbing, and a great deal of tenderness, when touched. It gradually extends over the whole eyelid; but seems to be plainly bounded by the edge of the orbit. The motion of the eyelid is always more or less obstructed, and, at length, when the inflammation has reached its greatest degree, it is completely prevented. Nor is there any difficulty in comprehending why, when the inflammation has become severe, the eye should be excessively dry, and every attempt on the part of the patient to move the eyelid should be productive of considerable pain, and of a sensation, as if some sharp extraneous substances lay under the lid; for, at this period, the palpebral conjunctiva is already severely inflamed, and, consequently, the secretion of mucus from the Meibomian glands is immediately stopped by the inflammation itself, while that of the tears is interrupted partly by the extension of the inflammation to the sclerotic conjunctiva, and partly by the effect of the sympathetic connexion existing between the conjunctiva of the eyelid, and that of the eyeball. To this last cause, viz. sympathy, Beer refers the supervening dryness and shrivelling up of the lachrymal papillæ, as well as the apparent closure of the puncta lachrymalia, and the uneasy dry state of the edges of the eyelids. Hence, also, the dryness of the adjacent nostril, and a very disagreeable smell of dust obliging the patient to sneeze repeatedly, which act is constantly attended with a great increase of pain in the swelling, a transient shooting of it to the eye and head, and a sensation as if flashes of light were elicited within the eyeball; a kind of hallucination, technically named *photopsia*. As the original seat of the inflammation is already extensive, one may readily understand, says Beer, why the affection in its first stage, particularly when neglected, or badly treated, should frequently give rise to some febrile disturbance of the system.

In the second stage of the case, or that of suppuration, which follows when the inflammation is violent and not soon dispersed, matter forms with the annexed train of symptoms. The redness suddenly increases very much, the eyelid becoming of a brownish red, and lastly of a purplish red colour. The swelling becomes more prominent, and presents a conical eminence, either in the middle of the eyelid, or close to the outer or inner canthus. The pain is irregular, and of a stinging, burning kind, a throbbing being felt only in the deeper part of the tumour. At length, the swelling becomes somewhat softer, and less sensible at its most projecting point. The secretion from the Meibomian and lachrymal glands, which, in the first stage of the disorder was suppressed, is now quite re-established, but more copiously, than in the healthy state. During sleep, a quantity of mucus accumulates between the edges of the eyes, and glues them together. An extraordinary sensation of cold and heaviness is felt all about the eye. Ultimately, the most prominent point of the swelling presents a pale red colour, followed by a yellowish livid tinge. As the abscess is now completely formed, the fluctuation of matter can be plainly felt. (*Beer*, *B.* 1, *p.* 269, *&c.*)

According to the same author, nothing very particular is known respecting the causes of the preceding form of ophthalmic inflammation, and, with the exception of blows, he has not been able to discover the precise circumstances, which give rise to it.

With regard to the prognosis, if the treatment be neglected, or injudicious, the inflammation may suddenly become so violent, as to produce in weak subjects gangrenous mischief. But, when the case is properly managed in its first stage, the second, or that of suppuration, never ensues; yet, says Beer, the curative measures must be decisive, and no time wasted on trifling means, though due regard must be paid to the constitution. When the inflammation subsides favourably, no vestiges of it remain, and even the redness, which is the latest in disappearing, completely goes off in a few days, and the function of the eyelid becomes perfect again.

If gangrene and sloughing take place, the outer coverings of the eyelid are destroyed, and the consequences are an incurable eversion of the part, (see *Ectropium*) or a hare eye, (see *Lagophthalmus.*) When suppuration happens favourably, the abscess sometimes breaks very well of itself in the upper eyelid; but, according to Beer, this does not readily occur on the lower one, nor without the formation of sinuses, which sometimes run quite into the orbit, after the abscess has burst, or been opened, the part heals up with great celerity in favourable constitutions, but slowly in others; vermilion granulations arise from the bottom of the cavity, and a cicatrix follows which is scarcely perceptible. When the abscess is very large, however, and bursts of itself, the upper eyelid continues for some time very much weakened. If the collection of matter be neglected, or wrongly treated, or the subject be unhealthy, or the disease be aggravated by the effects of a damp atmosphere, hurtful food, severe mental trouble, wet poultices, or too long confinement of the matter, then, says Beer, fistulæ are apt to be produced, sometimes complicated with necrosis of the bone, the certain effects of which are some permanent and mostly incurable disease of the eyelid, and impairment of its functions: 1st. A closure of the lachrymal canals, with a permanent stillicidium. 2. A complete obliteration of the same tubes, with an incurable stillicidium. 3. A prolapsus of the upper eyelid, from distension of the skin by the long confinement of the matter. 4. Inversion of the edge of the eyelid, from a shrinking of its cartilage. 5. Eversion of the eyelid, and hare-eye, from loss of skin. (*Beer.*)

As, in this species of inflammation, the organ of sight cannot well be afterwards affected, unless the disorder extend itself very much, the exclusion of air and light is here but of little use. Linen compresses, well wet with very cold water, or vinegar and water are to be applied; and, while the complaint is local, leeches are to be used; but, if the constitution be threatened with febrile symptoms, then Beer urges the necessity of venesection, low diet, purgatives, and general antiphlogistic measures. (*B.* 1, *p.* 275.)

In the second stage, with the exception of a few points, Beer states, that the case is to be treated like any other common abscess. When the matter is situated in the middle of the upper eyelid, not far beneath the skin, the abscess may be allowed to burst of itself, especially, if the patient have a great dread of the knife. But, if the matter lie near the outer, or inner canthus, it should be let out with a lancet as soon as its fluctuation is quite distinct, the incision being made in the direction of the fibres of the orbicular muscle. When fistulæ, or gangrene, have already taken place, the treatment should be like that, which is applicable to the same kind of mischief in most other parts of the skin.

Erysipelatous Inflammation of the Eyelids usually affects both these parts together, very seldom only the upper one, and never the lower alone. When also both are affected, the disorder always presents itself in the greatest degree in the upper eyelid. A pale, yellowish red, seemingly transparent, shining swelling arises from the edges of the eyelids and rapidly extends itself, without any determinate boundary, the faint red colour being gradually lost upon the eyebrow above, and not unfrequently upon the cheek below. When the inflamed part is gently touched, the redness disappears, but only for a moment. At length, the swelling towards the margins of the eyelids becomes exceedingly soft, and feels like a vesicle that has been raised by a blistering plaster. The pain is inconsiderable, not attended with throbbing, but rather with a sense of heat and stiffness; when the part is slightly touched, the patient experiences a lancinating sensation in it. Its temperature is not much increased. The secretions from the Meibomian glands, lachrymal gland, and mucous membrane of the nostrils, are much augmented. In a strong subject, the disorder, if genuine and idiopathic, is not productive of any constitutional disturbance; but, in bad habits, and weak females and children, it is sometimes attended with fever. However, when the complaint partakes of the phlegmonous character, and is badly treated, the general symptoms are occasionally very severe at the change from the first to the second stage, and the case may then terminate in a gangrenous kind of suppuration. In irritable, delicate children, says Beer, when the disease spreads over the face, the case requires the most skilful treatment to prevent a disastrous termination.

In strong persons, the second stage of this disorder rarely ends in a manifest suppuration; but there is rather an exudation of lymph, which, becoming dry, forms very small, delicate, branny scales, in the composition of which the desquamated cuticle has also a considerable share. In other instances, vesications of various sizes are formed on the erysipelatous surface, and burst, and discharge a fluid, which is converted into yellowish scabs.

According to Beer, the skin of the eyelids is particularly prone to erysipelatous inflammation. Beer considers the sudden effect of a cold blast of air, or of very cold water upon the skin of the eyelid, while in a state of free perspiration, as the most common cause of its being attacked with erysipelas, particularly in weak subjects. He states, however, that the complaint may be occasioned by the sting of bees, wasps, and other insects; accidents, which when the stings are not extracted, are liable to be followed by a violent and dangerous general inflammation of the eyeid, not unfrequently extending in a perilous degree to the eyeball itself. (*B.* 1, *p.* 281.)

With regard to the prognosis, no other case of ophthalmic inflammation so frequently subsides without the aid of surgery as this, provided the onstitution be healthy and strong; and, when the omplaint is resolved in its first stage, the vestiges of it afterwards are as little as those consequent o common inflammation of the eyelids.

The second stage, however well treated, is ollowed for a long time by a peculiar sensibility f the skin to the impression of cold damp air, nd a strong propensity to relapses. If, when the cuticle peels off, a patient of weak constitution sit in a current of damp cold air, or try to wash away the scales and scabs with cold water, Beer states, that an œdematous affection of the eyelid will be produced, which is often very obstinate, and apt to occasion a temporary inversion of the ciliæ (*Trichiasis*) or a similar state of the edge of the eyelid (*Entropium.*) And, he observes, that when from neglect, or bad treatment, an erysipelatous inflammation of the eyelid terminates in suppuration, the abscess is not like a common one, but the matter rapidly makes its way out through several openings in the already partially disorganized skin, and, in general, this state is followed by ill-conditioned tedious ulcerations, whereby a good deal of skin is always destroyed. Under these circumstances, all those consequences may be produced, which have been described as liable to take place from the second, or suppurative stage, of common inflammation of the eyelid. Gangrene and sloughing may even occur, when erysipelas of the eyelids is brought on by the unremoved sting of an insect, and efficient treatment is delayed.

The treatment, recommended by Beer in the first stage, consists in the application of cold water, and he remarks, that exposure of the part for a time to a cool, moist, but, in other respects, pure atmosphere, will often suffice for the removal of the complaint. When, however, the disorder increases, and assumes a phlegmonous character, the directions, given for the treatment of common inflammation of the eyelids, are to be followed.

In the second stage of erysipelas of the eyelids, Beer praises the good effects of a mild, dry air, of an equal temperature, and recommends covering the parts with a light bandage, under which are to be put well warmed linen compresses, which, for weak persons, should be sprinkled with camphor; or he directs the eyelids to be covered with bags of aromatic herbs; generally a very favourite plan with Beer, whenever he objects to moist applications. In such individuals, he observes, that the cure is promoted by keeping up the function of the skin with gentle diaphoretic medicines, with which, when the debility is very great, camphor should be joined. Should an abscess form, the same treatment is proper as in the second stage of common inflammation of the eyelids.

Glandular Inflammation of the Eyelids, is considered by Beer as the disease, of which all the various cases of purulent ophthalmy are only modifications, which he describes under the names of *idiopathic catarrhal ophthalmy; idiopathic catarrhal-rheumatic ophthalmy;* and *blepharo-blennorrhœa*, or *ophthalmo-blennorrhœa*. The two latter terms comprehend the purulent ophthalmy of infants, the Egyptian ophthalmy, the gonorrhæal ophthalmy, &c.

Glandular Inflammation of the eyelids, Beer knew very well, was so far a defective term, that it seemed to imply merely an affection of the Meibomian and mucous glands of those parts, whereas he means to express by this name the kind of inflammation, of which all the cases, usually called in this country *purulent ophthalmies*, are varieties and modifications, and in which the conjunctiva is also particularly affected.

Acute suppurative inflammation of the conjunctiva, divisible into the mild and severe forms, as proposed by Mr. Travers, appears, perhaps, a better name. (*Synopsis, &c. p.* 96, &c.) Dr. Vetch, who also prefers the general term *conjunctival inflammation*, observes, that from many internal and external causes, the membrane of the conjunctiva is liable to become the seat of inflammation, more especially that portion of it, which gives a lining to the inner surface of the eyelids. The disease, in its general nature, he says, differs little from that, which is met with in other parts having a similar surface, as the nose, the fauces, the bronchial cells, and the urethra; but, the continuation of the membrane forward upon the anterior portion of the eye, and the consequent liability of the inflammation to affect this important organ attach much interest to all the circumstances, capable of producing it. (*On Diseases of the Eye, p.* 148.) In the common glandular inflammation of the eyelids, described by Beer, which seems to me to correspond to the more moderate forms of *purulent ophthalmy* met with in this country, either the whole, or only that part of their edges, which is near one, or both canthi, is affected with a very red, hardish, sensible swelling, attended with a violent annoying degree of itching This swelling, Beer observes, does not extend far over the outside of the eyelid upwards, or downwards, at most, not more than a few lines; but it spreads over the palpebral conjunctiva, especially when neglected, or badly treated, and the constitution is weak. This, he says, can only be discovered when the eyelid is everted. The further the swelling extends over the inside of the eyelid, the more is the motion of the part obstructed, not on account of any want of power in the orbicular muscle, but from a fear of the pain, with which every attempt to move the eyelid is accompanied. The itching, which continually distresses the patient, more or less, is often succeeded by an irritating, burning kind of pain, which is particularly experienced when the eyelids are moved, and hence, the patient is obliged, as it were, to keep his eye closed. While the inflammation is restricted to the edges and conjunctiva of the eyelids, and the Meibomian glands situated under it, though the secretion from these glands is entirely stopped, that from the lachrymal gland is much augmented, and consequently, the disease is associated with a true *epiphora*, which is seriously aggravated whenever the eye is exposed to a strong light. As, under these circumstances, the tears are not properly blended with the Meibomian secretion, they must of course be very irritating to the eye and its surrounding parts, and less fitted for properly lubricating its surface. Hence, the pain now becomes burning, and not unfrequently the cheek, over which the tears run, is excoriated. As soon as the inflammation of the eyelids spreads further, and begins to affect the sclerotic conjunctiva, the effusion of tears ceases, the eye becomes preternaturally dry, and the patient constantly thinks, that he feels sand under the eyelids, which sensation is rendered almost intolerable by any motion of the eye, or eyelids. Children and women have so great a dread of this painful feel, that much persuasion is often requisite to induce them to let the eye be properly examined. If the glandular inflammation of the eyelids attain a considerable degree, the lachrymal papillæ shrink, and the puncta seem closed, which is particularly the case, when the disorder begins at the inner canthus.

In the *second stage* of the complaint, Beer describes the itching, burning sensation, and dryness of the eye, as undergoing a remarkable diminution, as either the canthi, or the whole extent of the edges of the eyelids, become more and more moist, and smeared with mucus, *an increased secretion of a puriform sebaceous fluid from the Meibomian glands being the first symptom, denoting the commencement of the second stage of the inflammation.* As this mucous secretion is not mixed with an adequate quantity of tears, it inspissates in the form of white, thin, delicate layers, which, from time to time, cover the cornea, and make the patient very apprehensive of becoming blind, as the flame of a candle in the evening, and other objects, appear to him more or less concealed by a dense mist. When, under these circumstances, however, the eyelids are repeatedly and briskly moved, or the eye is wiped, these appearances soon go off, the flakes of mucus being removed from the cornea. These accumulations of thickened mucus, Beer remarks, are apt to be most frequent and troublesome some time after a meal; and the eyelids become so firmly glued together during sleep with yellowish crusts, that, when the patient awakes in the morning, it is not till after a great deal of washing and bathing of his eyes with warm water, that he is able to open them again. The above described change in the quantity and quality of the secreted matter, as already mentioned, indicates the *first period of the second stage;* for Beer wishes it to be particularly noticed, that here, as in all inflammations of mucous membranes, the second stage of the disorder has three periods, to which the practitioner cannot be too attentive.

This morbid secretion of a mucous sebaceous matter does not continue long unattended with other effects; and, very soon, the peculiar appearances of suppuration are seen, at the same time that the conjunctiva of the eyelids becomes more considerably swelled, and a discharge takes place, not only from the canthi, or margins of the eyelids, but from the whole of the thickened villous surface of the palpebral conjunctiva, and which discharge is distinguishable at first view from the mucus, which, at an earlier period, accumulated in much smaller quantity only between the edges of the eyelids, and at the canthi. It is now no longer white, but yellow, completely like pus, with which it is in reality blended, and so viscid is it, that the crusts, which collect on the eyelids in the night-time, cannot be removed, without pulling the eyelashes away with them. Sometimes, says Beer, at the moment of suppuration, minute pustules, which are scarcely distinguishable, form either at the canthi, or along the edges of the eyelids, and are soon burst by the constant friction of the parts. These pustules indicate the second, or *suppurative period of the second stage* of the case, when either merely the canthus, or the whole of the margin of the eyelid, constantly becomes excoriated, and secretes mucus and purulent matter, the sore fretted places smarting so severely on exposure to the air, particularly to such as contains a large proportion of carbonic acid gas and nitrogen, that the patient is afraid of opening his eye. When the patient neglects himself, and continues in an unhealthy atmosphere, these excoriations of the skin, occurring in the suppurative stage, are always more extensive; nay, they sometimes spread over the lower eyelid, and down the cheek.

At length, after the excoriations have lasted, perhaps, several weeks, the suppurative process is checked and suppressed, either by surgical treatment, or accidental favourable circumstances, as change of regimen, weather, climate, &c., and, then, the excoriations immediately diminish.—However, a morbid secretion from the Meibomian glands still continues, making *the third period of the second stage*, and is apt to become habitual, if not rectified by art, or removed by the effect of accidental favourable circumstances, when it changes into a thin serous discharge, and then terminates.

Beer refers the causes of *glandular inflammation of the eyelids*, or *simple purulent ophthalmy*, to the immediate operation of various stimuli acting chemically upon the edge of the eyelid, and upon the exposed follicles of the glands of the eyelid towards the inner canthus. Hence, says he, when many men are living together in a polluted, noxious air, impregnated with extraneous substances, this form of inflammation is found to occur even in the strongest constitutions with such frequency, that it seems as if it were epidemic. And, according to Beer, the principal cause of the disease will be found to be in the atmosphere, and the next most frequent occasion of it, he observes, is uncleanliness, as washing the eyes with foul water, &c. At the same time, he seems aware that this explanation would not of itself be always quite satisfactory; for, he adds, that, although, under the above circumstances, no constitution, no sex, nor age, is spared, there must be some particular condition which is conducive to the disorder, or, at all events, to its more rapid and severe course, and the quick extension of the inflammation in certain individuals, which condition, he supposes, must depend either upon weakness of constitution, or upon excessive irritability, or, as he terms it, *vulnerability* of the whole surface of the body. Beer makes no mention of the effect of damp nocturnal air in warm countries as giving origin to purulent ophthalmy, so much insisted upon by Assalini and Dr. Vetch, but, which doctrine, in reference to the origin of purulent ophthalmies in England, I think completely fails; and what is still more worthy of notice, Beer never attempts to explain the propagation of the disease by its infectious nature. It is observed by Dr. Vetch, that the history of all diseases, originating from some particular impression received from the atmosphere, but capable, when formed, of propagating themselves by contagion, is rendered particularly difficult; because the same circumstances, which favour the communication by contagion, produce also a predisposition to be acted upon by the more general causes, existing in the atmosphere. The principal cause, which gives force and opportunity to the action of contagion, is the crowding individuals together into too limited spaces. The same circumstance, Dr. Vetch has seen give a predisposition to diseases of an epidemic, but not a contagious nature; and hence he infers, that it may produce the same predisposition to diseases, which are both contagious and atmospheric.—"The appearance of ophthalmia among the crews of ships and in barracks was often met with long before the late destructive and virulent disease (presently to be described). In the army, such an ophthalmia has extended to whole regiments, without any appearance of the disease among the inhabitants of the neighbourhood; and while the free intercourse, which subsists among the men, as to washing in the same water, using the same towels, and sleeping more than one in a bed, readily accounts for the rapid extension of the disease in the same corps, yet the excessive crowding together of men will often of itself engender inflammation of the conjunctiva." (*On Diseases of the Eyes, p.* 171.) I believe, with respect to the causes of all purulent ophthalmies, our present knowledge will permit us to venture no further than the tenor of the preceding observations, which is, that they originate epidemically, but probably multiply both in this manner, and by the infectious matter of the disease being inadvertently applied in various ways to the eyelids of other persons. This species of inflammation of the eyelids is rarely met with by the surgeon in its first stage, because only very timorous patients then seek medical advice, and most individuals, who feel in other respects well, relieve themselves by washing the eyes with cold water, and applying cold poultices, made of bread crum softened in water. Besides, when the disease is not very severe, it frequently subsides of itself, as in a favourable constitution, a better air is sometimes capable of restoring the healthy state of the eye. If, however, the disease at its very commencement should be violent, or attack an individual of very weak habit, Beer states, that it may immediately effect, not only the Meibomian glands, but the perichondrium of the cartilage of the eyelid, and produce an incurable entropium, which is also sure of taking place when the case is neglected, and followed by deeply extending ulcerative mischief. When the complaint is strictly idiopathic, it never brings on any general indisposition, except, by improper treatment, it should happen to be converted into a violent inflammation of the whole eyelid, which, according to Beer, only happens in weak subjects, and women and children, whose skin is in a very irritable state, or when a person of apparently good constitution remains under the influence of circumstances, which tend to augment the inflammation, as for instance, exposed to the air of a stable, privy, &c. in which event, Beer describes the inflammation of the eyelids as being quite of a peculiar description.

As for the prognosis in the second stage, Beer observes, that, if the excoriations at the suppurative period should spread all over the edges of the eyelids, and compel the patient to keep his eye incessantly shut, a partial adhesion of the eyelids to each other (*anchyloblepharon*) may be the result. Also, when, at either of the periods of the secretion of mucus, or at that of suppuration, the patient is content with merely softening with warm water the thick matter glueing the eyelids together, so as just to be able to open his eye; and does not completely free the eyelashes from the crusts, clusters of hairs will project inwards, (see *Trichiasis*) whereby a secondary inflammation of the conjunctiva of the eyeball will be excited, which, Beer says, should be carefully discriminated from a mere extension of the glandular inflammation of the eyelid. Such a trichiasis, he observes, may easily become incurable, when the edge of the eyelid is seriously injured by the depth of the excoriations. But, if the suppurative process be restricted chiefly to the canthus, especially the outer one, (which case, according to Beer, is not unfrequent in old, debilitated subjects, of a relaxed constitution) and if the excoriations should deeply penetrate the commissure of the eyelids, this may be completely destroyed, and the lower eyelid everted.

As the state of the atmosphere, uncleanliness, crowded and close places, &c. are considered by Beer to be the principal causes of the glandular inflammation of the eyelids, or simple purulent ophthalmy, one of the most important indications, in the first stage of the disorder, seems to him to be the removal of these hurtful circumstances. And, he declares, that, if immediate attention be not paid to such indication, it will be quite impossible to prevent a dangerous increase of the disorder. A cool fresh air, and bathing the eye with cold water, or a weak lotion of vinegar and water, Beer represents to be means, usually adequate to stifle this inflammation in its birth. In the second stage, he says, the indication is entirely different.

But, also in the beginning of this stage, and even at its second period, namely that of suppuration taking place, the disorder, according to Beer, seems for a short time to be benefited by the employment of cold water, but the consequences are rendered by such treatment a great deal worse; for a fresh, much more extensive, inflammation of the same kind again takes place. At the first period of the second stage, viz. while the secretion is a pure mucous and sebaceous matter, Beer says, that it is absolutely necessary to employ such external means, as are calculated to promote the action of the veins and absorbents. For this purpose, he recommends the following collyrium: ℞. Aq. rosæ ℥iv. Hydrarg. oxymur. gr. j. vel. gr. dimidium. Mucil. sem. cydon. ℈j. Tinct. opii vinos. ʒj. Misce. This eyewater is to be used lukewarm from four to six times a day, and the eye afterwards carefully and completely dried. No eye, in this state, he says, will bear more than the proportion of one gr. of the oxymuriate of quicksilver, and only seldom more than half a grain.

But, as soon as the suppurative period commences, attended with excoriations, gentle astringents, like the liquor plumbi subacetatis, in a solution of the lapis divinus (see *Lachrymal Organs*) should be added to the above lotion, for which they may at length be entirely substituted. And, when the suppurative period has terminated, but a morbid secretion of mucus yet obstinately continues, and threatens to become habitual, recourse should be had, without the least delay, to one of the following eye-salves, a bit of which, about the size of a small pea, Beer directs to be smeared once a day over the edges of the eyelids. ℞. Butyr. recentis insulsi ℥ss. Hydrargyri nitrico-oxydi gr. x. Tutiæ ptt. gr. vj. Misce. This ointment, he says, will sometimes answer; but, that it is mostly necessary to use Janin's salve, composed as follows: ℞. Butyri recentis insulsi ʒss. Hydrargyri præcipitati albi, gr. xv. Boli albi ℈j. Misce.

According to Mr. Travers, the mild acute suppurative inflammation of the conjunctiva is not attended with that excessive swelling of the eyelids, that intense pain, nor that profuse secretion, with which the vehement acute form of the disease is characterized. In the treatment, he directs a solution of alum to be early substituted for emollient fomentations, which he recommends to be freely used during the acute period. Simple purging and abstinence, he says, are generally sufficient to allay the febrile irritation, which is moderate. Topical bleedings, and blisters, kept open on the back of the neck, are also stated to be of great efficacy. "When the pain and irritability to light subside, and the discharge becomes gleety, the conjunctiva pale and flaccid, tonics, especially the extract of bark and the acids, do great good." (*Synopsis, &c. p.* 264.)

Catarrhal ophthalmy, so called by Beer, is described by him as a species of glandular inflammation of the eyelids, attended with a simultaneous affection of the mucous membrane of the nose, trachea, &c. brought on by particular states of the weather, and attacking so many persons at once, as to appear epidemic. The prognosis and indications are the same as those in common glandular inflammation of the eyelids, with this exception, that attention must be paid to the affection of other organs, and both at the first and second periods of the second stage, such remedies given as operate powerfully on the mucous membranes and skin, and, in general, during the second stage, an equal warm temperature, and gentle diaphoretics, with camphor, are highly beneficial.

Severe Purulent Ophthalmy.—The *Blepharo-blennorrhœa*, and *Ophthalmo-blennorrhœa*, of Schmidt and Beer; including the *ophthalmia neonatorum*; the *Egyptian ophthalmy;* the *gonorrhœal ophthalmy, &c.*, on which varieties, however, I shall annex to this account some further particulars, as they relate to each of these cases individually, because, though the following history contains an excellent general description of the severe forms of suppurative inflammation of the conjunctiva, it leaves unexplained some of the circumstances on which its varieties depend.

The vehement acute suppurative inflammation of the conjunctiva is described by Mr. Travers as being sudden in its attack; a feature, in which it particularly differs from the milder cases, usually met with in schools. (See *Lloyd on Scrophula, p.* 321.) It is accompanied with most severe darting pains; and the upper eyelid is sometimes in a few hours prolonged upon the cheek, owing to the infiltration and enormous swelling of the tissue, connecting the conjunctiva to the tarsus. (*Travers, Synopsis, &c. p.* 265.)

According to Beer, the modification of glandular inflammation of the eyelids, here to be considered, consists entirely in the rapid extension of the inflammation and suppuration, the disorder affecting, ere it is suspected, not only the whole of the conjunctiva of the eyelid, but also that of the eyeball, and the sclerotica and cornea. The swelling of the palpebral conjunctiva is described by Beer as being unusually great; at first, soft, somewhat elastic, smooth, and readily bleeding; but, afterwards, in the second stage, hard and granulated or, as another writer says, it "becomes preternaturally vascular, thickened, and scabrous, or forms fleshy eminences."—(*Travers, Synopsis, &c. p. 96.*) The first stage is rapidly over. At the first period of the second stage, the secretion both of mucus and pus is surprisingly copious. First, the mucus is whitish and thin; but, as soon as the suppurative process begins, it becomes yellowish and thick, and when an attempt is made to open the eyelids, it gushes out with such force, and in so large a quantity, as frequently to cover, in an instant, the whole cheek. Sometimes, this mixture of mucus and matter contains light-coloured streaks of blood; but, in worse cases these streaks are dark and brownish, or else a thin ichor is discharged, in which case, the progress of the disease is so rapid, that the eye can seldom be saved. The swelling of the conjunctiva of the eyelids, especially of that of the upper one, always increases during the first period of suppuration, and, when the discharge is more ichorous, the membrane is more granulated, so that, if the eyelid be opened carelessly, or during the child's crying, fits of pain, &c. the whole tumefied conjunctiva of the upper eyelid is immediately thrown outward, in the form of ectropium, and it is sometimes difficult, and even impracticable to turn the part inward again, especially, when the conjunctiva is already changed into a hard sarcomatous substance. While the swelling at the inner surface of the eyelids continues to increase, their outer surface, particularly that of the upper one, becomes reddened; but the redness is dark-coloured, inclining to brown, and when the child cries, to blue. In children, the whole cheek on the affected side is very often swelled, and sometimes the mucous membrane of the lachrymal sac and even of the nose, participates in the effects of the disorder. Sometimes, at first, only one eye is affected, and the other is afterwards attacked. And, according to Beer, just before the period of suppuration, it is by no means uncommon for rather a profuse bleeding to take place from the eye; an event, which though it seriously alarm the parents of the child, or an adult patient, is hailed by the experienced surgeon as a favourable omen; for, in such cases, the suppuration is generally very mild, and not of a destructive kind, and the swelling of the conjunctiva of the eyelids, as well as that of the sclerotic conjunctiva, if already present, soon undergoes a remarkable diminution after such hemorrhage, which often recurs two or three times. When during the first, very short and transient stage, the inflammation extends also to the sclerotic conjunctiva, this membrane forms a pale-red, soft, irregular swelling, all round the cornea, which at length seems so buried, that at the period of the mucous secretion, its centre can hardly be discerned; and, when suppuration begins, both mucus and pus are discharged from the conjunctiva of the eyeball in profuse quantity, particularly accumulating over the cornea, and not unfrequently drying into a thick pellicle, when long detained in the eye. Hence, the case looks as if the whole eyeball, or, at least, all the cornea, were in a state of complete suppuration. At length, the tumefied conjunctiva of the eyeball becomes sarcomatous, though never in such a degree as that of the eyelids. When the suppurative period ceases, and with it the most urgent danger to the eye, the secretion of mucus alone continues, as at the first period of the second stage, the swelling of the conjunctiva of the eyelids, and of the sclerotic conjunctiva when this has also been affected, diminishes, and the disorder ends in an increased effusion of tears, or true epiphora. When the effects of the suppuration upon the conjunctiva of the eyeball are more severe, the corneal production of this membrane in the most favourable cases is raised from the subjacent cornea, and so opaque, that the eyesight is lost, or at all events seriously impaired, until the transparency returns, which is sometimes late, especially when efficient treatment is not put in practice. Should the suppuration be very deep, the cornea, which always turns whiter and whiter, presents near the edge of the swelling of the conjunctiva an arrangement, similar to that of the leaves of an old book, and at length seems converted into a mass of purulent matter, which projects more and more out of the depression in the swelled conjunctiva, and then bursts in its centre either quickly and with very violent pain, or slowly without any suffering, an oval hole being left, behind which the yet transparent crystalline lens appears, included in its undamaged capsule. At this period, adults can often see very plainly, and fancy their recovery near at hand, or, at least, all danger over. Already, however, every part of the cornea has been more or less perforated by ulceration, the iris protrudes through all these apertures, so as to form what has sometimes been named the staphyloma racemosum. In a very short time, not exceeding a few hours, the capsule of the lens is affected, and bursts like the cornea, when it is discharged either with, or without, a portion of the vitreous humour. At length, the suppuration subsides, and with it the protrusions of the iris, the opening in the cornea becoming closed with a brown, or blueish, opaque flat cicatrix. But, if in this destructive form of suppuration, nothing is done for the relief of the disease, the whole eyeball suppurates, the eyelids become concave, instead of convex, and the fissure between them closes for ever. In adults of feeble constitutions when the case is not properly treated, but particularly in weak children, this excessively violent form of conjunctival inflammation and suppuration spreads with such rapidity, that a considerable general disturbance of the system is occasioned. Indeed, according to Mr. Travers, in the common course of this vehement form of conjunctival suppurative ophthalmy, the system sympathizes; chilliness is succeeded by a hot and dry skin; and the pulse is frequent and hard. Yet, it is particularly pointed out by the army surgeons, that one peculiarity of the Egyptian purulent ophthalmy is its being generally attended with little constitutional disturbance. When the above-described annihilation of the eye-ball takes place, it always creates violent general indisposition in unhealthy weak children, and even leaves adults for a long while afterwards in an impaired state of health.

According to Beer, who appears to have no idea of infection being concerned, the particular cause of this unfortunate extension of idiopathic glandular inflammation of the eyelids, both in infants and adults, frequently depends altogether upon the foul atmosphere, in which they are residing, and hence, says he, the disorder is, as it were, endemic in lying-in and foundling hospitals, where the air is much contaminated by effluvia, from the lochia, the crowding together of many uncleanly persons, dirty clouts, &c. The unjustifiable folly of exposing the eyes of new-born infants to every degree of light; a tedious labour, in which the child's head is detained a long while in the vagina: and roughly washing the eyes after birth with a coarse sponge; are other circumstances, supposed by Beer to be conducive to the origin of the complaint in new-born infants. The reality of many of these causes I regard myself with a great deal of doubt; and as for his conjecture, that sprinkling cold water on the head in baptism, while in a state of perspiration, may produce the complaint, it is too absurd to need any serious refutation. The disorder, he says, is always more rapid and perilous in new born infants than adults; (*B.* 1, *p.* 318) a remark, which does not agree with the statements usually made, if the Egyptian ophthalmy, as seen in the army, be comprehended. It is observed by Mr. Travers, that the highly contagious nature of the suppurative ophthalmia, whether in the mild, or vehement acute form, is sufficiently proved. For one person, affected with this disease, above three months old, he thinks at least twenty are attacked under that age. "The mother is the subject of fluor albus, or gonorrhœa, and the discharge is usually perceived about the third day." (*Synopsis, &c. p.* 97.) Some further observations on the causes of some of these severe modifications of glandular inflammation of the eyelids will be introduced, after the prognosis and treatment have been considered. This will be the more necessary, as the propagation of the disorder by infection is here entirely overlooked.

According to Beer, whenever an idiopathic inflammation of the glands of the eyelids attains the severe forms exhibited in the purulent ophthalmy of infants, the Egyptian ophthalmy, and gonorrhœal ophthalmy, the prognosis must naturally be unfavourable, and this in a greater degree, the more the inflammation and suppuration have extended to the eyeball itself. The cases are still more unpromising, when they happen, in poor, half-starved, distressed individuals, whom it is impossible completely to extricate from the circumstances, which either cause, or have a pernicious effect upon, the disease. Should an incidental ectropium not be immediately rectified, says Beer, it will continue until the end of the second stage and even frequently longer, so as to require particular treatment. When at the period of suppuration, merely the layer of the conjunctiva, spread over the cornea, is destroyed, the prognosis, in respect to the complete recovery of the eyesight, is favourable, although it takes place but slowly. If the effects of the disease at this period should be deeper, yet the cornea not destroyed, only rendered flat and somewhat opaque; or, if the cornea should be ulcerated only at a very limited point; there will remain, in the first case, an opacity of the cornea; but, in the second, a partial adhesion of the iris to the latter membrane (synechia anterior) is apt to follow, with a more or less extensive cicatrix on the cornea, covering in a greater or lesser degree the lessened and displaced pupil, and thus diminishing, or preventing vision. When, during the inflammation and suppuration, a considerable part, or the whole of the iris adheres to the cornea, and this is not penetrated by ulceration, the result, in the first case, is a *partial*, in the second, a *complete staphyloma* of the cornea, which does not fully develop itself, until towards the decline of the second stage of the ophthalmo-blennorrhœa. If the inflammation should spread to the textures of the eyeball itself, so as to produce severe constitutional disturbance, the eye wastes away in the midst of the profuse discharge, the eyelids sink inwards, and the fissure between them becomes permanently closed. (*Beer, B.* 1, *p.* 319.)

Beer notices the opinion of the celebrated Schmidt, which was, that the ophthalmo-blennorrhœa, or purulent ophthalmy involving the sclerotic conjunctiva, always has a fixed duration of a month, in new-born infants, and of six, eight, or twelve weeks, in very weak individuals. Beer acknowledges the correctness of this opinion, only in cases where the surgeon has to deal with a completely formed ophthalmo-blennorrhœa, and not in a more recent case, or one in which the disease is chiefly confined to the inside of the eyelids. (*Blepharo-blennorrhœa.*) When the disorder is met with in the first period of the second stage, or it is confined to the palpebral conjunctiva and Meibomian glands, and truly idiopathic, Beer asserts, that its course may be restricted by efficient treatment to a few days, as he has often proved in the establishment for foundlings at Vienna.

It is further remarked by Beer, that, in this modification of genuine idiopathic glandular inflammation of the eyelids, the indications have something peculiar in them. If, by chance, the surgeon meet with the disease in its first stage, it will be most benefited by the application of folded linen wet with cold water; and sometimes a brisk purge of jalap and calomel, and putting a leech over the lachrymal sac at the inner canthus, will promote the subsidence of this dangerous species of ophthalmy. The case, however, rarely presents itself for medical treatment, thus early, and, *in hospitals*, Beer says, *antiphlogistic treatment is, on this account, hardly ever indicated.*

With some exceptions of importance, the treatment, advised by Beer, for the second stage of these severer forms of purulent ophthalmy, resembles that proposed by him for the second stage of simple glandular inflammation of the eyelids, or the milder varieties. These more severe kinds of purulent inflammation of the eye, implied by blepharo-blennorrhœa and ophthalmo-blennorrhœa, he says, should never be viewed and treated merely as local disorders; but that, both in children and adults, internal remedies should be exhibited, particularly volatile tonic medicines. In cases, where the cornea is already attacked by a destructive ulcerative process, manifold experience has convinced him, that bark, combined with naphtha, and the tincture of opium, is the only means of saving the eye; but, that if the suppuration be confined to the eyelids, the decoction of calamus aromaticus with naphtha and opium will mostly answer. When, on the supervention of suppuration, the pain in the eye and neighbouring parts is excessively severe, Beer assures us, that friction with a liniment of opium will give great relief. In new-born infants, the maternal milk of right quality will mostly do more good, than internal medicines: but, if the case be very urgent, and the child feeble, Beer thinks volatile medicines may sometimes do good.

With respect to particularities, made necessary in the local treatment by the modified nature of the inflammation, Beer offers the following information: First, in new-born infants, or very young children, the oxymuriate of mercury cannot be used without danger, though blunted with mucilage; and even in adults, it should be employed in these cases with great circumspection. Secondly, the mucus and purulent matter should not be allowed to remain long under the eyelids, as such lodgment is found to promote the destruction of the layer of the conjunctiva situated on the cornea; but, at the same time, Beer thinks, that leaving any water on the eyes, after cleaning them, and letting it become cold there, will have quite as pernicious an effect. Hence, he is very particular in directing all the mucus and purulent matter to be wiped away from the eye with a bit of fine sponge moistened with a warm mucilaginous collyrium, but not so wet as to let the fluid drop out of it; or when they are very copious, and in large flakes, he even recommends them to be washed away by means of Anel's syringe; but, he says, that every part about the eye should be immediately afterwards well dried with a warm napkin, and then covered with a warm camphorated compress. Thirdly, during the suppurative period, according to Beer, common tincture of opium, or the vinous tincture, is the best local application, the parts being smeared with it twice a day, by means of a fine camel-hair brush. It is only in a few instances, that a small proportion of the lapis divinus (see *Lachrymal Organs,*) mixed with the mucilaginous collyrium, can be endured. Beer declares, that he has never seen any good produced by Bates's camphorated lotion, which was so highly praised by the late Mr. Ware. Fourthly, when the suppurative period has terminated, the mucous secretion again becomes white and thin, as at the very commencement of the second stage, but it is always more copious; now is the time, (as in the last stage of simple glandular inflammation of the eyelids) when the topical use of mercury, joined with styptics, especially in the form of an eye-salve, is indicated. Fifthly, if an eversion of the upper eyelid should happen from washing the eye carelessly, or the mere crying of the infant, in consequence of the thickened granulated state of the palpebral conjunctiva, the position of the eyelid must, if possible, be immediately rectified; for, afterwards, this cannot be done. In order to avoid this ectropium, the eyelids should never be opened while the child is crying, or in any way agitated; for, at such periods, the thickened scabrous conjunctiva will suddenly protrude, and cannot be kept back. Beer says, that the eyelid should be replaced in the manner directed by Schmidt. (*Ophthalmol. Bibl. 3, B. 2, Stück, p.* 149.) The surgeon having smeared the ends of the thumb and forefinger of each of his hands with fresh butter, is to take hold of the everted cartilage of the eyelid at the outer and inner canthus, draw it slowly a little upwards, and then suddenly downwards. Thus, the thickened conjunctiva, if not too fleshy and granulated, may be quickly reduced, and the ectropium removed. But, if the swelling of this membrane should be already very considerable, and have begun to be hard and studded with excrescences, the thumbs should be placed so as to compress rather the middle of the eyelid. However, if the ectropium cannot be at once removed, it is to be treated, after the termination of the second stage of the purulent ophthalmy, as a sequel of this disorder. (See *Ectropium.*)

In the ophthalmo-blennorrhœa, the alteration of the sclerotic conjunctiva is said by Beer to be very different from chemosis; a remark, which is strictly correct, inasmuch as ordinary chemosis is not attended with that change in the surface of the sclerotic conjunctiva, which fits it for the secretion of pus. But, if we are to understand by chemosis, a copious effusion of lymph in the loose cellular substance between the conjunctiva and the eyeball, this state must be admitted as one of the usual effects of severe purulent ophthalmy.

" It is after this morbid condition, which is characteristic of the suppurative ophthalmia, (says Mr. Travers) that the conjunctiva forms fungous excrescences, pendulous flaps, or hard callous rolls protruding between the palpebræ and globe, and everting the former, or, if not protruding, causing the turning of the lid over against the globe. The tarsal portion takes on from the same cause the hard granulated surface, which keeps up incessant irritation of the sclerotic conjunctiva, and at length renders the cornea opaque." (*Synopsis, &c. p.* 98.)

The treatment, recommended by Mr. Travers for the vehement acute suppurative inflammation of the conjunctiva, consists in a very copious venesection, by which, he says, the pain is mitigated, if not removed; the pulse softened; and the patient sinks into a sound sleep and perspires freely. The high scarlet hue and bulk of the chemosis are sensibly reduced, and the cornea is brighter. The blood-letting, if necessary, is to be repeated, and the patient briskly purged, every dose of the opening medicine being followed by a tea-spoonful of a solution of emetic tartar, so as to keep up a state of nausea, perspiration, and faintness. When the discharge becomes thin, gleety, and more abundant, the swelling of the eyelid subsides, the conjunctiva sinks and becomes pale and flabby, the pain and febrile irritation are past, and the cornea retains its tone and brightness, Mr. Travers considers the case safe, and states, that the prompt exhibition of tonics, with the use of cooling astringent lotions, will prevent its lapsing into a chronic form. " But, if, when the lowering practice has been pushed to the extent of arresting acute inflammation, the patient being at the same time sunk and exhausted, the cornea shows a lacklustre and raggedness of its whole surface, as if shrunk by immersion in an acid, or a grey patch in the centre, or a line encircling, or half encircling its base, assuming a similar appearance, the portion so marked out will infallibly be detached by a rapid slough, unless by a successful rally of the patient's powers, we can set up the adhesive inflammation, so as to preserve *in situ* that which may remain transparent." (*Synopsis*, *&c. p.* 266.) Here we find some approximation of practice, between Mr. Travers and Professor Beer; but it is almost the only point, in which any resemblance can be found in their modes of treatment.

The granulated, or fungous state of the palpebral conjunctiva, produced by purulent ophthalmy, sometimes demands particular treatment, after the original disease is subdued. If such state of the eyelid be not rectified, it often keeps up a "gleety discharge, irritability to light, drooping of the upper lid, a pricking sensation as of sand in the eye, and a preternaturally irritable and vascular state of the sclerotic conjunctiva; with these are frequently combined opacities of the cornea." (*Travers, op. cit. p.* 271.) The affection, as conjoined with opaque cornea, is particularly noticed by Dr. Vetch, who describes the disease of the palpebræ as consisting, at first, in a highly villous state of their membranous lining, which, if not treated by appropriate remedies, gives birth to granulations, which in process of time become more deeply sulcated, hard, or warty. Along with the villous and fleshy appearance of the lining of the eyelids, there is a general oozing of purulent matter, which may at any time be squeezed out by pressing the finger on the part. The diseased structure is highly vascular, and bleeds most profusely when cut. It possesses, as all granulated surfaces do, a very great power of growth, or reproduction. Dr. Vetch has seen many cases, in which it has been removed, with more zeal than discretion, twenty or thirty times successively, without this disposition to reproduction having suffered any diminution. Indeed, he assures us, that the operation was very unfavourable to the ultimate recovery of the part; "a new surface is produced of a bright velvety appearance, much less susceptible of cure than the original disease, and which, even if at length healed, does not assume the natural appearance of the part, but that of a cicatrized surface," not attended with a return of the transparency of the cornea. It is satisfactorily proved by the observations of Dr. Vetch, that this diseased state of the inner surface of the eyelid was not only known to Rhases, and other old practitioners, under the names of sycosis, trachoma, scabies palpebrarum, &c. but that its treatment by the actual cautery, excision, and friction was also recommended by them. The honour of having introduced the preferable mode of cure with escharotics, Dr. Vetch assigns to St. Ives. No substances appear to Dr. Vetch more effectual for this purpose, than the sulphate of copper and nitrate of silver. He says, that they should be pointed in the form of a pencil, and fixed in a port-crayon. "They are to be applied, not as some have conceived, with the view of producing a slough over the whole surface, but with great delicacy, and in so many points only, as will produce a gradual change in the condition and disposition of the part." As long as any purulency remains, Dr. Vetch states, that the above applications will be much aided by the daily use of the liquor plumbi subacetatis. When the disease resists these remedies, and the surface is hard and warty, he applies very minute quantities of finely levigated powder of verdigris, or burnt alum, to the everted surface, with a fine camel's hair pencil, but carefully washes them off with a syringe before the eye-lid is returned. The caustic potassa, lightly applied to the more prominent parts of the diseased surface, will also answer. (See *Vetch on Diseases of the Eye*, *p.* 73, *&c.*) Mr. Lloyd also gives his testimony in favour of the superiority of the nitrate of silver, which he has employed in the form of a saturated solution for restoring the healthy state of the inner surface of the eyelid. (*On Scrophula*, *p.* 328.) The practice of excision was followed by the ancients, and revived of late years in England by Mr. Saunders, who did with scissars what Sir W. Adams and others have subsequently performed with a knife, or lancet. Mr. Travers, I may observe, is also one of the advocates for the excision of the granulations and hardened excrescences of the conjunctiva. If there be a nebula of the cornea, with a plexus of vessels extending to it, these are then divided, near the edge of the cornea, in the manner recommended by Scarpa. Mr. Travers afterwards applies a solution of the sulphate of copper, the liquor plumbi subacetatis, or the vinous tincture of opium. One remark which he makes tends very much to confirm the general advantage of the practice inculcated by Dr. Vetch; for, it is observed, "the application of the bluestone, or of the lunar caustic, is often useful in preventing the regeneration of the granulations after their excision." (*Synopsis, &c. p.* 272.) My friend Mr. Lawrence, whose experience in diseases of the eye is very considerable, informs me, that he finds caustic the sure mode of permanently removing the granulated fungous state of the inner surface of the eyelid, and that, when the granulations are cut away, they are frequently reproduced; a fact, on which Dr. Vetch has particularly insisted.

Egyptian Ophthalmy. One of the best accounts of this disease, as it appeared in the army, is that delivered by Dr. Vetch. Although there can be no doubt, that the disorder, in all its general characters, closely corresponds to the severe form of acute suppurative inflammation of the conjunctiva, as described by Beer; yet, it has some peculiarities. Thus, one thing noticed in the Egyptian ophthalmy, but not in other purulent ophthalmies, is, that *the first appearance of inflammation was observable in the* lining of *the lower eyelid.* (*Peach, in Edin. Med. and Surgical Journ. for January*, 1807, *Vetch, on Diseases of the Eye*, p. 196.) According to the latter writer, the feeling of dirt, or sand, rolling in the eye is a symptom requiring particular attention, as its accession is a certain index of the disease being on the increase. It is subject to exacerbations and remissions, the attacks always taking place in the evening, or very early in the morning. *The first stage of the disease* is said by Dr. Vetch to be *characterized by its great and uniform redness, without that pain, tension, or intolerance of light, which accompanies most other forms of ocular inflammation;* and, in particular, that in which the sclerotic coat is affected. From the very beginning of the complaint, there is a disposition to puffiness in the cellular texture between the conjunctiva and the globe of the eye, often suddenly swelling out into a state of complete chemosis, and, at other times, making a more gradual approach to the cornea. While effusion is thus taking place upon the eye, œdema is likewise going on beneath the integuments of the eyelids. This enormous tumefaction of the eyelids is said to be generally consentaneous with the complete formation of chemosis; entropium is produced, and the integuments of the two eyelids meet, leaving a deep sulcus between them. When the external swelling begins, the discharge, which was previously moderate, and consisted of pus, floating in a watery fluid, changes into a continued stream of yellow matter, which, diluted with the lachrymal secretion, greatly exceeds in quantity that derived from any gonorrhœa. Although, says Dr. Vetch, the tumefaction may be, at first, farther advanced in one eye than the other, it generally reaches its greatest height in both about the same. The patient now begins to suffer attacks of excruciating pain in the eye; a certain indication of the extension of the mischief. "An occasional sensation, as if needles were thrust into the eye, accompanied with fulness and throbbing of the temples, often precedes the deeper seated pain." This last is often of an intermitting nature, and a period of excruciating torture is succeeded by an interval of perfect ease. Sometimes, the pain shifts instantaneously from one eye to the other, and is seldom or never equally severe in both at the same time; and sometimes instead of being in the eye, it occurs in a circumscribed spot of the head, which the patient describes by saying, he can cover the part with his finger. Sooner or later, one of these attacks of pain is terminated by a sensation of rupture of the cornea, with a gush of scalding water, succeeded by immediate relief to the eye, in which this event has happened, but generally soon followed by an increased violence of the symptoms in the other. At length, the attacks of pain become shorter, and less severe, though they do not cease altogether till after the lapse of many weeks, and even months. *During this stage of the disease*, according to Dr. Vetch, *there is seldom the slightest alteration of the pulse, unless the lancet have been freely employed.* The patient's general health is little impaired, his appetite continues natural, but sleep almost totally forsakes him.

As the pain abates, the external tumefaction also subsides, and a gaping appearance of the eyelids succeeds; their edges instead of being inverted, now becoming everted. This is what Dr. Vetch designates as the third stage of the disease.

After the swelling of the second stage has subsided, the eyelids are prevented from returning to their natural state by the granulated change of the conjunctiva, which lines them; and an eversion of them now occurs in a greater or lesser degree. (*Vetch on Diseases of the Eye, p.* 196, 202.) Amongst other interesting remarks, made by the same author, he states, that there is no reason to warrant the idea, that the ulceration ever proceeds from within outwards. He observes, that, when any large portion of the cornea sloughs, an adventitious and vascular membrane is often produced, which finally forms a staphyloma. "In some few cases, (says he) I have seen the lens and its capsule exposed, without any external covering whatever, and, for a short time, the patient saw every thing with wonderful accuracy; but, as soon as the capsule gives way, the lens and more or less of the vitreous humour escape, the eye shrinks, and the cornea contracts into a small horn-coloured speck." This total destruction of the globe of the eye is said generally to insure the other, and renders it less liable to be affected by future attacks of inflammation.

A few years ago, an ophthalmy, supposed to be of the same nature as the Egyptian, though milder, like that which has generally been observed in schools, occurred to a great extent in the Royal Military Asylum at Chelsea, and Mr. M'Gregor, the surgeon, favoured the public with an excellent description of the disease, and some highly interesting facts and reflections upon the subject. The symptoms generally made their appearance in the following order: "A considerable degree of itching was first felt in the evening; this was succeeded by a sticking together of the eyelids, principally complained of by the patient on waking in the morning. The eyelids appeared fuller externally, than they naturally are; and on examining their internal surface, this was found inflamed. The sebaceous glands of the tarsi were considerably enlarged, and of a redder colour than usual. The caruncula lachrymalis had a similar appearance.

"In 24 or 30 hours after the appearance of the above-mentioned symptoms, a viscid mucous discharge took place from the internal surface of each eyelid, and lodged at the inner canthus, till the quantity was sufficient to be pressed over the cheek by the motions of the eye. The vessels of the tunica conjunctiva, covering the eyeball, were distended with red blood, and the tunica conjunctiva was generally so thickened, and raised, as to form an elevated border round the transparent cornea. This state was often accompanied with redness of the skin round the eye; which sometimes extended to a considerable distance, and resembled, in colour, and form, very much what takes place in the cow-pox pustule, between the 9th and 12th days after inoculation.

"When the purulent discharge was considerable, there was a swelling of the external eyelids, which often prevented the patient from opening them for several days. The discharge also frequently excoriated the cheeks as it trickled down. Exposure to light caused pain. When light was excluded, and the eye kept from motion, pain was seldom much complained of.

"These symptoms in many subsided, without much aid from medicine, in 10, 12, or 14 days; leaving the eye for a considerable time in an irritable state. In several, however, the disease continued for a much longer time, and ulceration took place on the internal surface of the eyelids, and in different parts on the eyeball. If one of those small ulcers happened to be situated on the transparent cornea, it generally, on healing, left a white speck, which, however, in the young subjects, under our care, was commonly soon removed. In some few instances, an abscess took place in the substance of the eyeball, which, bursting externally, produced irrecoverable blindness." (See *Trans. for the Improvement of Med. and Chir. Knowledge, Vol.* 3, *p.* 31—40.)

When the local symptoms had prevailed two or three days, some febrile disturbance occurred; but, except in severe cases, it was scarcely observable.

Mr. M'Gregor considered this ophthalmy to be of the same nature as that, which raged with such violence in the army at different periods, after the return of our troops from Egypt in 1800, 1801, and 1802. However, he found, that its consequences were not so injurious to children as to adults; for, out of the great number of children afflicted with the disease at the Military Asylum, only six lost the sight of both eyes, and twelve the sight of one eye, (*Op. cit. p.* 49.) On the other hand, Dr. Vetch informs us, that, in the second battalion of the 52d regiment, which consisted of somewhat more than 700 men, 636 cases of ophthalmia were admitted into the hospital between August, 1805, and August, 1806; and that "of this number, fifty were dismissed with the loss of both eyes, and forty with that of one." And as Mr. M'Gregor observes, it is a melancholy fact, as appears from the returns of Chelsea and Kilmainham Hospitals, that 2317 soldiers were on the 1st of December, 1810, a burthen upon the public, from blindness in consequence of ophthalmia. The cases, in which only one eye was lost, are not here included.

The attacks of the disease appear to be much more frequent, severe, and obstinate, in hot sultry weather, than in cold, or temperate seasons. (*Op. cit. p.* 37, 54, *&c.*)

Mr. M'Gregor also observed, that the ophthalmy was more severe and protracted in persons of red hair, or a scrophulous habit, than in others. The right eye was more frequently and violently affected, than the left. In females, the symptoms were greatly aggravated for some days previous to the catamenia; but, on this evacuation taking place, they were quickly lessened. Mr. M'Gregor further remarks, that the measles, cow-pox, and mumps, go through their course as regularly in persons affected with this species of ophthalmia, as when no other disease is present; a circumstance which, with some others, proves that the disorder is entirely local. (*P.* 54, 55.)

With respect to the causes of the *Egyptian Purulent Ophthalmy*, much difference of opinion has prevailed, and, indeed, there was a time, when the disease was regarded by the majority of army surgeons, who alone had opportunities of judging of it, as not being in reality *contagious*, but *dependent upon local epidemic causes; the irritation of sand*; *peculiarity of climate, &c.* The late Mr. Ware even doubted the propriety of calling this ophthalmy *Egyptian*, and he contended that a disease, precisely similar in its symptoms and progress, had been noticed long ago in this and other countries; and that, in Egypt, several varieties of ophthalmy prevail. He preferred calling the disease the *Epidemic Purulent Ophthalmy*. On the other hand, Sir W. Adams conceives, that it ought rather to be called *Asiatic Ophthalmy*, as recent investigations prove, that it prevails in the greater part of Asia, and was long ago described by Avicenna. (*Graefe, Journ. der Chir.* 1 *B. p.* 170.)

That there has been long known in this country an infectious species of purulent ophthalmy, cannot be doubted. The case, described by many surgeons, as proceeding from the sudden stoppage of gonorrhœa, or the inadvertent application of gonorrhœal matter to the eyes, which disorder will be presently noticed, is certainly an infectious purulent ophthalmy. It is also admitted, that it resembles Egyptian ophthalmy, by the intensity and rapidity of its symptoms; but the latter case is strongly characterized by the quickness with which it causes, especially in adults, opacities, or ulcerations of the cornea; the long continued irritability of the eyes after the subsidence of inflammation; but, more particularly, its very *infectious* nature, by which it spreads to an extent, *that has never been observed with regard to any other species of purulent ophthalmy.* There have been epidemic ophthalmies, of other kinds, which have been known to affect the greater part of the population of certain districts and towns in England. The celebrated ophthalmy, which happened at Newbury, in Berks, some years ago, is an instance, that must be known to every body. But I know of no *purulent* inflammation of the eyes, which ever spread to a great extent in England, before the return of our troops from Egypt.

The reflections and observations of Mr. M'Gregor, as well as those of Dr. Vetch, and Dr. Edmonstone, I think, leave no doubt of two facts; first, that this ophthalmy was at all events brought from Egypt; and, secondly, that it is infectious, *but only capable of being communicated from one person to another by actual contact of the discharge.* "If (says Dr. Vetch) any belief were entertained by the officers of the British army, during the first expedition to Egypt, that the disease was contagious, it was of a nature very vague and indefinite. Combined as its operations necessarily must be in that country *with other exciting causes,* there would be more difficulty in the first recognition of the fact. But, the continuance of the complaint with the troops, after their departure from the country, could scarcely fail to lead to the obvious conclusion of its possessing a power of propagation. Before the disease reached this country, the opinion of its being contagious was adopted by many. *Dr. Edmonstone*, in the account which he published of the disease, as it appeared in the regiment, to which he was surgeon, after its return to England, *first made the public acquainted with the fact of the disease being communicable.* In an account of the Egyptian ophthalmia, as it appeared in this country, printed in the early part of 1807, *I first established, that the communication of the disease was exclusively produced by the application of the discharge from the eyes of the diseased to those of the healthy.*" (*On Diseases of the Eye, p.* 178.)

The opinion that the disease is ever communicated from one person to another, through the medium of the atmosphere, is at present nearly abandoned. During the whole time that Dr. Vetch had the management of the ophthalmic hospitals, there never was an instance of any medical officer contracting the disease, although exposed to what might be supposed to be the greatest concentration of any contagion that could arise in the worst stage of the complaint. Two orderlies only contracted the disease, and both in consequence of the accidental application of the virus. However, Sir W. Adams maintains, that he has seen many cases, which prove that the disorder, like small-pox, may spread contagiously, without any kind of inoculation. (See *Graefe's Journ. B.* 1, *p.* 174.) That the disease may also be partly propagated by epidemic causes in particular situations, I think as certain and clear, as that there must be a cause for the first commencement of the disorder in situations where infection by contact is out of the question. And as Dr. Vetch has observed, "from whatever cause inflammation of the conjunctiva may originate, when the action is of that nature, or degree of violence as to produce a puriform, or purulent discharge; the discharge, so produced, operates as an animal virus, when applied to the conjunctiva of a healthy eye. Considering the various modes, by which such a contact must inevitably occur in the usual relations of life, it must be obvious, that wherever ophthalmia prevails, whether it be the effect of local conditions of the soil, or of the atmosphere, naturally or artificially produced, this contagious effect must sooner or latter mix, or unite its operation with that of the more general and original one; and hence, without regard to this property of the disease, its occurrence must often remain inexplicable, and at variance with the more general cause existing in external circumstances. And, further, as the disease, produced by infection, is of a nature more violent and malignant, than that produced by the impression of atmospheric causes, it will, in every instance of extensively prevailing ophthalmia, occasion two different forms of disease, which, as long as they are considered as one and the same, will produce, according as the one or the other predominates, very discordant results." (*On Diseases of the Eye, p.* 175.)

Mr. M'Gregor relates three cases, which prove, that the matter, after its application, produces its effects in a very short time. I shall only cite the following example:—On the 21st of October, 1809, about four o'clock, P. M. Nurse Flannelly, while syringing the eyes of a boy, let some of the lotion, which had already washed the diseased eyes, pass out of the syringe into her own right eye. She felt little or no smarting at the time; but, towards nine o'clock the same evening, her right eye became red, and somewhat painful, and when she awoke next morning, her eyelids were swelled, there was a purulent discharge, pain, &c. (*Op. cit. p.* 51.)

The late Mr. Ware, though he admitted, that the infection was brought into this country from Egypt by the troops, conceived, that the same disease also sometimes arose from the matter of gonorrhœa being applied to the eyes, and that it had been prevalent in this country before the return of the army from Egypt. He thought, however, that the infection was generally communicated by contact. Mr. Ware observes, some of the worst cases of the purulent ophthalmy of children have happened in those, whose mothers were subject to an acrimonious discharge from the vagina at the time of parturition. Some of the worst forms of the purulent ophthalmy in adults have occurred in those, who, either shortly before the attack of the ophthalmy, or, at that very time, laboured either under a gonorrhœa, or a gleet. Mr. Ware does not mean to impute every purulent ophthalmy to such a cause; but, in the majority of adults, whom he has seen affected, if the disorder had not been produced by the application of morbid matter, from a diseased eye, it could be traced to a connexion, between the ophthalmy, and disease of the urethra. Other causes, Mr. Ware acknowledges, may contribute to aggravate, and, perhaps, produce the disorder, and the purulent ophthalmy in Egypt has been attributed to a great number. The combined influence of heat and light, of a burning dust continually raised by the wind, and of the heavy dews of the night, may powerfully tend to excite inflammations of the eyes. Yet something more must operate in causing the malignant ophthalmy now under consideration; for the same causes operate with equal violence in some other countries, besides Egypt, and yet do not produce the same effect; and, in this country, (says Mr. Ware) the disorder prevailed during the last summer, to as great a degree, and upon as great a number of persons within a small district of less than a mile, as it ever did in Egypt; and, yet, beyond this space, on either side, scarcely a person was affected with it. The disorder was certainly brought into this country by the soldiers who returned from Egypt, and was probably communicated from them to many others. Now, as the action of the atmosphere alone cannot account for the spreading of the disease, &c. Mr. Ware is led to believe, that this particular disorder is only communicable by absolute contact; that is, by the application of some part of the discharge, which issues, either from the conjunctiva of an affected eye, or from some other membrane secreting a similar poison, to the conjunctiva of the eye of another person. In schools and nurseries, in consequence of children using the same basins and towels, as others who had the complaint, the disease has been communicated to nearly twenty in one academy. Hence, Mr. Ware censures the indiscriminate use of those articles, in schools, nurseries, hospitals, ships, and barracks. (*P.* 14, 15.)

That in Egypt the origin of the disease cannot rightly be imputed to the effect of the sand and hot winds of the country, is clearly proved; 1st. Because, if this were the case, the disease would not be most prevalent in the autumnal season, during the inundation of the Nile. 2dly. The inhabitants of the Delta would not be more subject to it, than the Bedouin Arabs, who live on the sands of the desert. Not only the Bedouin Arabs, says Dr. Vetch, remain free from the disease, but Europeans, *who are not particularly exposed to the night air, are also safe from its attacks.* "The nature of military duty prevented our soldiers from using this precaution, and in a particular manner they became victims to the complaint. The men suffered more in proportion to the officers of the English army; as the latter enjoyed a better, though often an incomplete defence from the coldness and dampness of the night; and officers, employed in strictly military duty, suffered more than those attached to the civil departments." (*Vetch on Diseases of the Eyes, p.* 157.) And Assalini remarks, that if the dust or sand were the sole cause of ophthalmia, we ought to be exempted from the disease, where the cause does not exist. The contrary, however, was the case in the Delta, and principally on the cultivated borders of the Nile, during its inundations. *When we were exposed to the air during the night, we were immediately attacked with ophthalmia*, though the dust and sand were then under water. Larrey also imputes the origin of the disease to the cold damp nocturnal air, after the great heats of the day. (*Graefe's Journ. B.* 1, *p.* 179.)

Whoever reads the account of the Egyptian ophthalmia, as given by Mr. M'Gregor and Dr. Vetch, will be convinced, that the disorder is only communicable from one person to another by the application of the infectious matter to the eyes. Probably, the common mode of propagation is the inadvertent use of the same towels, or even merely touching the same articles, which have been in the hands of infected persons, who must be supposed occasionally to apply their fingers more or less to the eyelids. In this last way, the commencement of the disease may be accounted for in regiments upon their entering into barracks, which have been quitted by other infected soldiers. "Flies, in warm weather, (says Mr. M'Gregor) are seen in great numbers surrounding patients labouring under ophthalmia; and I much suspect are very frequently the medium, by which the disease is communicated." (*P.* 54.) The matter is observed to be most infectious, when the disease is in an acute state.

Dr. Vetch adverts to two important questions, connected with the history of the Egyptian ophthalmy. The first relates to the length of time which the disease has, at different periods, lain dormant, and especially between the return of the troops from Egypt, and the breaking out of the disease in the 52d regiment. An explanation of this fact is attempted by supposing, that the complaint exists, and is liable to a renewal of its infectious quality, long after the eye seems to have recovered its natural and healthy appearance. Perhaps, it would be as well to be content with the fact, that, in crowded barracks, under particular circumstances, soldiers, who have once had the disease, are very liable to relapses. The other question is, why has the disease produced such ravages in the army in England, and not in that of France? It is well known, that the French soldiers in Egypt suffered as much as our own troops from the affection, and great numbers of them returned to France with the disease in a chronic form. "In many (says M. Roux) the influence of their native climate has sufficed for the removal of all vestige of the disorder. On the contrary, in others, it has continued in a chronic state, either attended with the loss of one, or of both eyes; and many of our invalids remain with the affliction. But, it has not been found, that those soldiers who returned from Egypt, have ever communicated a contagious ophthalmia, either in regiments, in which many of them have been incorporated; or in invalid houses, where others have obtained their retirement; or in the individuals belonging to the different classes of society. Such is the objection that has been made, and may always be again urged, against the opinions and remarks of the English, respecting the Egyptian ophthalmy." (*Voyage faite à Londres en* 1814, *ou Parallèle de la Chir. Angloise. &c. p.* 49.)

Larrey, who admits that the disease may be communicated by application of the matter, argues, that it is not contagious in any other way, because, in Egypt, for want of sufficient hospital room, patients with this and other diseases were mixed together, without the ophthalmia being propagated to any of the patients, who were careful to avoid the above mode of infection. (*Graefe's Journ. B.* 1, *p.* 179.) Larrey, however, need not have used this reasoning with us, because it is a mistake in him to suppose, that the disease is here commonly regarded as communicable through the medium of the atmosphere. While, however, English surgeons chiefly explain the extension of the disease by the infectious nature of the discharge when applied to the eyelids, and Larrey admits that the matter is thus infectious, the latter, as well as Roux, assures us, that none of the healthy soldiers, who came home with the blind invalids from Egypt, were attacked with this species of ophthalmy. A great number of those invalids were received in the hospital of the guards at Paris, and treated there without any of the other patients being infected. (*Graefe's Journ. loc. cit.*) On my return from the Mediterranean through France in 1802, I saw many of the French troops in a town between Marseilles and Lyons, with bad eyes, contracted in Egypt, associating with other soldiers, whose eyes were perfectly healthy, and living in the same barracks; a proof, that the French soldiers, with the exception of climate, or some other protecting cause, were placed apparently in circumstances, in which the disease here made such extensive ravages. This is a point, which I humbly conceive, is not at all solved by Dr. Vetch's belief, that the difference is explicable by the French troops being sent into the field; for, in fact, the soldiers with diseased eyes were in barracks, or hospitals, as well as our own troops.

But, notwithstanding it seems proved, that the discharge from the eyes in the Egyptian ophthalmy is so actively infectious in England, it appears from an experiment, made by Mr. Mackesy, that its application may sometimes be made to a healthy eye, without the disease following as a matter of certainty; for he applied to his own eyes linen, impregnated with matter discharged from the eyes of patients in the fully formed stage of the disease, and even allowed some of the matter to pass under the eyelids; yet the complaint was not communicated. (See *Edinb. Med. and Surg. Journ. Vol.* 12, *p.* 411.)

One of the most material circumstances, in which the practice of English surgeons differs from that of foreign practitioners in cases of severe purulent, and especially Egyptian, ophthalmy, is the freedom and boldness, with which the former attack the disease in its first stage: Mr. Peach recommends taking away at once as much as 60 ounces of blood; (*Edinb. Med. and Surg. Journ. for January*, 1807,) and Dr. Vetch lays great stress on the striking benefit of bleeding the patient till syncope is produced. "When inflammation has its seat in the sclerotic coat, (says he) general blood-letting may for the most part be dispensed with, and even when employed to the greatest extent, the same benefit does not ensue. In the purulent inflammation of the conjunctiva, however, although some good may be derived from depletion, yet a perfect command over the disease depends less on lowering the system, than on the temporary cessation of arterial action by syncope, which it becomes the object of the operation to produce. This practice, besides its efficacy, will accomplish the cure with a much less expenditure of blood, than is occasioned by the repeated bleedings generally had recourse to, where this method of rendering one equal to the cure of the complaint has been neglected. Some time before the approach of faintness, the redness of the conjunctiva for the most part disappears; but this is no security against the return of the disease, if the flow of blood be stopped, without deliquium animi succeeding." (*On Diseases of the Eye*, *p*. 206.) The attacks of a painful sensation, as if gravel were in the eye, he considers as a proof of the disease increasing, and in the early stage of the disease, as a better indication of the necessity for bleeding, than the appearance of the eye itself.

With respect to applications, Dr. Vetch speaks very highly of the beneficial effects produced in the beginning of the case by dropping into the eye the undiluted liquor plumbi subacetatis, which, he says, diminishes the discharge, lessens the inflammation, and is incapable of doing harm in any stage of the disease. He places great confidence in the salutary results of a free exposure of the eye to the atmosphere; and speaks in high terms of the good derived from applying at night to the eye an infusion of tobacco, two drams of the leaves to eight ounces of water. "It possesses (says Dr. Vetch) the valuable properties of acting as a powerful astringent, restraining the purulent discharge, and diminishing the œdema, or external swelling of the palpebræ; at the same time, that its narcotic qualities often relieve the pain and the perpetual watchfulness, which the largest doses of opium cannot subdue." (*P*. 211.) Bleeding, however, is the "sheet anchor," and the only means of preventing the destruction of the cornea, whenever attacks of pain in the eye, or orbit, denote the unsubdued state of the disease. (*P*. 212.) When the disease shifts its violence from one eye to the other, and is of long duration, Dr. Vetch recommends cupping, and the eye to be more carefully cleaned by the injection of tepid water, or any gentle astringent lotion, and afterwards wiped dry. When the discharge continues acrid and scalding, he directs blisters to be applied to the nape of the neck, and behind the ears. He wishes it to be distinctly kept in mind, that, the time for the employment of bleeding, with the view of saving the eye, is during the first stage, or early part of the second; and when ulceration of the cornea has commenced, the case is to be treated on the principles applicable to sclerotic inflammation.

With regard to the plan of diminishing inflammatory action by medicines which excite nausea and sickness, instead of having recourse to the lancet, Dr. Vetch states, that, in soldiers, it does not answer so well, and in the end proves more debilitating.

As soon as the external œdema of the eyelids subsides, and they begin to be everted, Dr. Vetch begins the cure of the granulations and general villosity, by a very light and careful application of the argentum nitratum. The everted portion is then to be returned, and secured in its place with a compress and bandage. This method is to be repeated every time the eye is cleaned, and, in the course of a fortnight, the tendency to ectropium will be removed. (*P*. 229.)

Assalini found venesection, all emollient applications, and eyewaters hurtful. He first purged his patients, and then introduced into their eyes a few drops of a solution of the lapis divinis, (see *Lachrymal Organs*,) to which was sometimes added a small quantity of the acetate of lead. He speaks favourably of leeches, and sometimes he put a small blister on the temple, or behind the ears. (See *Manuale di Chirurgia*; *Milano*, 1812.)

Perhaps, the best mode of putting an immediate stop to the Egyptian ophthalmy, when it prevails extensively in a regiment in garrison, or barracks, is to put the men, actually affected, into a detached hospital at a considerable distance from the rest of the corps. which should be dispersed as much as possible in separate billets and villages. Purulent ophthalmy is a disease, which makes great head only when large numbers of persons are either exposed together to the epidemic causes, which first give birth to it, or to the causes which occasion the disease to be communicated from one individual to another, as when soldiers are crowded together in the same building, using the same towels and water, &c. Notwithstanding the reports of Roux and Larrey prove, that the disease did not spread in the French army, after the return of uncured soldiers from Egypt to France, though these were freely mixed with their comrades in hospitals and barracks, the same security did not extend to the British troops lately in the latter country, who at one time were threatened with a very extensive renewal of the Egyptian ophthalmy amongst them, but which was wisely checked by attention to the principles above specified, and in which Sir James Grant, the head of the medical department of that army, had the greatest confidence.

In the cases under Mr. M'Gregor, local applications were found most advantageous. During the inflammatory stage, however, this gentleman also had recourse to antiphlogistic means, spare diet, bleeding, neutral salts, &c. The topical treatment was as follows: Leeches were freely and repeatedly applied near the eye. But while there was much surrounding redness, instead of leeches which created too much irritation, fomentations with a weak decoction of poppy-heads, and a little brandy, were used. A weak solution of acetate of lead, and sulphate of zinc, had mostly a good effect, when applied to the eye. The vinous tincture of opium did not answer the expectations entertained of it. But, of all the remedies. the ung. hydrarg. nitrat. was found most frequently successful. It was applied by means of a camel-hair pencil, and at first weakened with twice its quantity of lard. The red precipitate, well levigated, and mixed with simple ointment, sometimes answered when the ung. hydrarg. nitrat. failed. Well levigated verdigris, and a quack medicine, called the golden ointment, proved also sometimes efficacious. (*P*. 41—43.) According to Mr. M'Gregor, blisters behind the ears, and upon the neck, are useful; but hurtful when put nearer to the eye. In cases, where the disease seems to resist antiphlogistic means, and ulceration has commenced on the external surface of the cornea, this gentleman approves of discharging the aqueous humour by a puncture, as advised by Mr. Wardrop.

When the violence of the inflammation has subsided, Mr. M‘Gregor recommends the use of Bates's camphorated water, diluted with four, five, or six times its quantity of water. But the astringent collyrium, from which he saw most good derived, was a solution of the nitrate of silver, in the proportion of half a grain to every ounce of distilled water. In some cases, it may be used stronger.

Tepid sea-water sometimes proved serviceable in removing the relics of the complaint. (*P.* 56, *&c.*)

The late Mr. Ware was in favour of bleeding; but he rarely carried it to the extent, which has been done in the army. In weak persons, instead of repeated venesection, he preferred topical bleeding, either from the vein, that passes on the side of the nose, or by means of five or six leeches put on the temple. Sometimes, he thought it better to scarify the inside of the lower eyelid, with the point of a lancet, carried along parallel to, and very near the margin of this part. He objects to pricking the eyelid in an infinite number of places, as very painful, and likely to increase the irritation. The lancet (he says) never need be applied more than twice, and rarely more than once; and, perhaps, less pain will be occasioned by making the incision with the edge, rather than the point of the lancet. After taking away blood, Mr. Ware says, a large blister on the head, or back, is often useful. Anodynes should be given, with occasional purgatives, and an antiphlogistic regimen. (*Ware on Purulent Ophthalmy,* 1808, *p.* 26, *&c.*)

As a local application, Mr. Ware preferred the aqua camphorata, which was used exactly in the same way, as will be described in speaking of his method of treating the purulent ophthalmy of children. When the inflammation was very great, he only put four or five grains, instead of eight, of the sulphate of copper to eight ounces of water. He usually employed the lotion cold, especially in children; but, in adults, in whom the general fever and local inflammation were considerable, he was obliged to use it warm. In cases of great pain and swelling, it should be very weak, less often applied, and sometimes only warm water injected. In such circumstances, Mr. Ware also sanctions fomenting the eye with a flannel, or sponge, wet with a hot decoction of poppy-heads, or mere hot water. When the cornea threatens to burst, this gentleman approves of opening it, in order to discharge the aqueous humour, by making an incision in a place, where the scar will not obstruct vision, as first suggested by Mr. Wardrop.

Purulent Ophthalmy of Infants. Dr. Vetch describes the external appearances of this case as not materially different from those of the purulent ophthalmy of adults; but, he states, that its nature is considerably modified by the more delicate texture and greater vascularity of the parts affected, and the more intimate connexion, subsisting between the vessels of the conjunctiva and those of the sclerotic coat. Hence, he says, the inflammation is sooner communicated to this coat, and sloughing and ulceration of the cornea occur earlier in infants, than adults. When the œdema ceases, the inner surface of the palpebræ becomes sarcomatous, and this diseased surface, when the eyelids are opened, forms an exterior fleshy circle, beyond which the relaxed conjunctiva of the eye comes forward as a second; and often the caruncula lachrymalis adds still farther to the valvular appearance, which the part presents. (*On Diseases of the Eye, p.* 256—258.)

According to the late Mr. Ware, the principal difference, between the purulent ophthalmy in infants and that in adults, consists in the different states of the tunica conjunctiva: in the former, notwithstanding the quantity of matter, confined within the eyelids, is often profuse, the inflammation of the conjunctiva is rarely considerable, and whenever the cornea becomes impaired, it is rather owing to the lodgment of such matter on it, than to inflammation; a statement, which appears to me very questionable. But, in the purulent ophthalmy of adults, the discharge is always accompanied with a violent inflammation, and generally with a tumefaction of the conjunctiva, by which its membranous appearance is destroyed, and the cornea is made to seem sunk in the eyeball. (*Ware on Epidemic Purulent Ophthalmy, p.* 23.) In children, the affection of the eyes is occasionally accompanied with eruptions on the head, and with marks of a scrophulous constitution. (See *Ware, p.* 138, *&c.*) The only inference to be drawn from this fact is, that scrophulous, as well as other children, are liable to this disorder of the eyes.

The following is the treatment recommended by Mr. Ware. If the disease be in its first stage, the temporal arteries are to be opened, or leeches applied to the temples, or neighbourhood of the eyelids, and a blister put on the nape of the neck or temples. The child should be kept in a cool room, not covered with much clothes, and if no diarrhœa prevail, a little rhubarb or magnesia in syrup of violets should be prescribed.

A surgeon, however, is seldom called in before the first short inflammatory stage has ceased, and an immense discharge of matter from the eyes has commenced. Of course, (says Mr. Ware) emollient applications must generally not be used. On the contrary, astringents and corroborants are immediately indicated, in order to restore to the vessels of the conjunctiva and eyelids their original tone, to rectify the villous and fungous appearance of the lining of the palpebræ, and thus finally to check the morbid secretion of matter. For this purpose Mr. Ware strongly recommends the *aqua camphorata* of Bates's Dispensatory: ℞. Cupri sulphatis, bol. armen. ā ā ʒiv. Camphoræ, ℥j. M. & f. pulvis, de quo projice ℥j. in aquæ bullientis ℥iv. amove ab igne, et subsidant fœces. Mr. Ware, in his late *Remarks on Purulent Ophthalmy,* 1803, observes, that he usually directs the aqua camphorata, as follows: ℞. Cupri sulphatis. bol. armen. ā ā gr. viij. Camphoræ gr. ij. Misce, et affunde aquæ bullientis ℥viij. Cùm lotio sit frigida, effundatur limpidus liquor, et sæpissimè injiciatur paululum inter oculum et palpebras. This remedy possesses a very styptic quality; but, as directed in Bates's Dispensatory, it is much too strong for use before it is diluted; and the degree of its dilution must always be determined by the peculiar circumstance of each case. Mr. Ware ventures to recommend about one dram of it to be mixed with an ounce of cold clear water, as a medium or standard, to be strengthened or weakened as occasion may require. (*P.* 143.) The remedy must be applied by means of a small ivory or pewter syringe, the end of which is a blunt-pointed cone. The extremity of this instrument is to be placed between the edges of the eyelids, in such a manner, that the medicated liquor may be carried over the whole surface of the eye. Thus the matter will be entirely washed away, and enough of the styptic medicine left behind to interrupt and diminish the excessive discharge. According to the quantity of matter, and the rapidity with which it is secreted, the strength of the application, and the frequency of repeating it, must be regulated. In mild recent cases, the lotion may be used once or twice a day, and rather weaker than the above proportions; but, in inveterate cases, it is necessary to apply it once or twice every hour, and to increase its styptic power in proportion; and when the complaint is somewhat relieved, the strength of the lotion may be lessened, and its application be less frequent.

"The reasons for a frequent repetition of the means just mentioned, in bad cases, are, indeed, of the most urgent nature. Until the conjunctiva is somewhat thinned, and the quantity of the discharge diminished, it is impossible to know in what state the eye is; whether it is more or less injured, totally lost, or capable of any relief. The continuance, or extinction, of the sight frequently depends on the space of a few hours: nor can we be relieved from the greatest uncertainty, in these respects, until the cornea becomes visible." (*Ware, p.* 145.)

This author condemns the use of emollient poultices, which must have a tendency to increase the swelling and relaxation of the conjunctiva. If poultices are preferred, he particularly recommends such as possess a tonic or mild astringent property; as one made of the curds of milk, turned with alum, and an equal part of unguentum sambuci, or axungia porcini. This is to be put on cold, and frequently renewed, without omitting the use of the injection. (*Ware, p.* 147.)

When the secreted matter is glutinous, and makes the eyelids so adherent together, that they cannot be opened, after being shut for any length of time, the adhesive matter must be softened with a little fresh butter mixed with warm milk, or by means of any other soft oleaginous liquor, after the poultice is taken off, and before using the lotion. (*P.* 147.)

If the eversion of the eyelids only occurs when the child cries, and then goes off, nothing need be done in addition to the above means. When, however, the eversion is constant, the injection must be repeated more frequently than in other cases; the eyelids put in their natural position, after its use; and an attendant directed to hold on them, with his finger, for some length of time, a compress dipped in the diluted aqua camphorata. (*P.* 148.)

In some cases, when the inside of the eyelids has been very much inflamed, the tinctura thebaica, insinuated between the eye and eyelids, has been useful. If, after the morbid secretion is checked, any part of the cornea should be opaque, the unguentum hydrargyri nitrati, melted in a spoon, and applied accurately on the speck, with a fine hair pencil; or Janin's ophthalmic ointment, lowered and used in the same manner; may produce a cure, if the opacity be not of too deep a kind. When the local disease seems to be kept up by a bad habit, alteratives should be exhibited, particularly the black sulphuret of mercury, or small doses of calomel.

The treatment, recommended by Dr. Vetch, is as follows: If the inflammation have not extended to the conjunctiva of the eye, its further progress may be checked by removing the infant to a healthy atmosphere, and washing the eye with any mild collyrium. Leeches are commended throughout the whole course of the complaint. On the first accession of the tumefaction, the best effect will often be produced by the application of a small portion of ointment, composed of lard, or butter ℥vj. and x. gr. of the red nitrate of mercury, without any wax. As the purulency advances, the liquor plumbi subacetatis, he says, will be found not less serviceable, than in other instances of purulent ophthalmy. For promoting the separation of any slough, he recommends a solution of the nitrate of silver; and for curing the relaxed state of the conjunctiva, a solution of alum, or of the sulphate of copper. (*On Diseases of the Eye, p.* 260.)

The *Purulent Ophthalmy, arising either from suppression of gonorrhœa, or from the inadvertent conveyance of gonorrhœal matter to the eyes*, is said to produce rather a swelling of the conjunctiva, than of the eyelids, which is followed by a discharge of a yellow greenish matter, similar to that of clap. The heat and pain in the eyes are considerable; an aversion to light prevails, and, in some instances, an appearance of hypopion is visible in the anterior chamber of the aqueous humour. When the complaint proceeds from the second cause, it is described as being less severe, than when it arises from the first. However, by such gentlemen, (*Ware, Travers, &c.*) as have seen unequivocal instances of purulent ophthalmy excited in the second way, the disease is said to be remarkable for its violence and intensity. The reality of cases of purulent ophthalmy from the application of gonorrhœal matter to the eyes, seems supported by such a mass of evidence, that I believe, the fact must be admitted. Yet, from some statements, lately published by Dr. Vetch, it would appear, that the frequency of this mode of infection must be very much lessened by the circumstance of the matter taken from the urethra, not being capable of communicating the disease to the eyes of the individual, by whom such matter is secreted, though probably capable of doing so to the eyes of another person.

In the same way, the urethra cannot be affected by the application of matter taken from the purulent eyes of the individual, on whom the experiment is made. At least, of these circumstances, there is a negative proof in some facts recorded by Dr. Vetch. "In the case of a soldier, received in a very advanced stage of the Egyptian ophthalmia, in whom destruction of the cornea had to a certain extent taken place, I took occasion to represent the possibility of diverting the disease from the eyes to the urethra, by applying the discharge to the latter surface. Accordingly, some of the matter, taken from the eyes, was freely applied to the orifice of the urethra. No effect followed this trial, which was repeated on some other patients, all labouring under the most virulent state of the Egyptian disease, and in all the application was perfectly innocuous. But, in another case, where the matter was taken from the eye of one man, labouring under purulent ophthalmia, and applied to the urethra of another, the purulent inflammation of the urethra commenced in 36 hours afterwards, and became a very severe attack of gonorrhœa. From the result of these cases, (says Dr. Vetch) I could no longer admit the possibility of infection being conveyed to the eyes from the gonorrhœal discharge of the same person. Some time after this, the improbability, or rather impossibility of this effect was rendered decisive by an hospital assistant, who conveyed the matter of gonorrhœa to his eyes, without any affection of the conjunctiva being the consequence." (See *Vetch on Diseases of the Eye*, *p.* 242.) Hence, this gentleman is led to refer the connexion, between gonorrhœa and ophthalmia, in the same person, to peculiarity of constitution; but the theories, on which this opinion rests, my limits will not allow me to examine.

If it be actually true, that, in adults, a species of purulent ophthalmy does originate from the sudden suppression of gonorrhœa, are we to consider the complaint so produced as a metastasis of the disease from the urethra to the eyes? This ophthalmy does not regularly follow the suppression of gonorrhœa, nay, it is even a rare occurrence: also, when it is decidedly known, that the purulent ophthalmy has arisen from the infection of gonorrhœa, namely, in those instances, in which the matter has been incautiously communicated to the eyes, it appears, that such an affection of these organs, so produced, is different from the one alluded to, inasmuch as it is slower in its progress, and less threatening in its aspect. When the eyes are affected, the disease of the urethra is not always suspended. (*Vetch on Diseases of the Eye*, *p.* 239.) Hence, there is good reason for supposing, that no metastasis takes place in this species of purulent ophthalmy, supposed to be connected with a suppressed gonorrhœa; but, we must be content with inferring that, if it really has such a cause, it originates from a sympathy, prevailing between the urethra and eyes. and, that the difference of irritability, in different people, is the reason, why it is not an invariable consequence of the sudden stoppage of a gonorrhœa.

The injection of warm oil, the introduction of a bougie into the urethra, and the application of cataplasms to the perinæum, with a view of renewing the discharge from the urethra, form the outline of the practice of those, who place implicit reliance in the suppression of gonorrhœa being the cause of the complaint. The rarity of the occurrence; the frequency of the sudden cessation of the urethral discharge; the possibility of an ophthalmy arising, as well at this particular moment, as at any other, totally independent of the other complaint; cannot fail to raise in a discerning mind a degree of doubt, concerning the veracity of the assigned cause. Besides, admitting, that there is a sympathy, between the urethra and eyes, how are we to ascertain, whether the suppression of gonorrhœa be the cause or the effect of the ophthalmy, supposing that the one ceases, and the other commences, about the same time? Actuated by such reflections, I am induced to dissuade surgeons from adopting any means calculated to renew a discharge of matter from the urethra. When the purulent ophthalmy, in adult subjects, is decidedly occasioned by the actual contact, and infection of gonorrhœal matter, applied accidentally to the eyes, no one has recommended this unnecessary and improper practice.

The first indication, in the treatment of the disease from either cause, is to oppose the violence of the inflammation, and thus resist the destruction of the eye and opacity of the cornea. A copious quantity of blood should be taken away both topically and generally; mild laxatives should be exhibited, and a blister applied to the nape of the neck, or temples. The eyes ought to be often fomented with a decoction of white poppy-heads, and warm milk repeatedly injected beneath the eyelids. To prevent the palpebræ from becoming agglutinated together, during sleep, the spermaceti cerate should be smeared on the margins of the tarsi. every night.

When the heat and pain in the eyes, and febrile symptoms have subsided; when an abundant discharge of pus has commenced; all topical emollients are to be relinquished, and a collyrium of Aq. rosæ, ℥x. containing Hydrarg. oxy. mur. gr. j. used in their place. Scarpa states, that in the ophthalmy, originating from the inadvertent communication of the matter of gonorrhœa to the eyes, applications, in the form of ointment, such as the ung. hydrarg. and Janin's salve, to which might be added the ung. hyd. nitrat. avail more, than fluid remedies.

Inflammation of the Eyeball in general. From cases, in which the eyelids are at first chiefly affected, I pass to the consideration of inflammation, as commencing in the eyeball itself. As Beer remarks, fortunately it is only very seldom, that the whole of the organ is at once attacked with genuine idiopathic inflammation, without any part of its texture being spared. Although this kind of ophthalmy is far more frequent, than common inflammation of the orbit, it is much more rare, than the same disorder of the eyelids. For the most part, healthy inflammation of the eyeball has a limited point of origin, from which it spreads, sometimes quickly, sometimes slowly, over the whole organ. During an exceedingly violent, tense, throbbing pain, affecting not only the eye itself, but extending to all the surrounding parts, the bottom of the orbit, and within the head, the white of the eye becomes suffused with an uniform redness, which, on attentive examination, is found to be seated not only in the conjunctiva of the eyeball, but also in the sclerotica, and to exhibit at first a very fine vascular network, which, as the redness grows more intense, assumes the appearance of scarlet cloth, forming all round the cornea an uniform circular prominent fold, which has a very firm feel, and is so tender, that, when touched in the gentlest manner, the patient cries out with agony. The circumference of the cornea continues to be more and more covered by this increasing swelling of the conjunctiva, until at length only a portion of its centre remains visible. At the same time, the pupil is very much contracted; the iris motionless; and though vision is nearly or entirely lost, the patient is seriously disturbed by fiery appearances before the eye. When the iris is naturally grey, or blue, it turns greenish, and, when brown, or black, it becomes reddish. Every movement of the eyeball and upper eyelid is suspended, and the orbit feels to the patient, as if it were too small, which, Beer says, is in reality the case, because the whole of the eyeball, and not merely the conjunctiva, is enlarged, so as to project like a lump of raw flesh further and further between the edges of the palpebræ, and completely fill every part of the orbit. While the eyeball enlarges, the cornea always loses its transparency, and the inflammation spreads to the eyelids, the lower one at last becoming everted by the excessive and firm tumefaction of the parts behind it, and the upper one presenting the most unequivocal marks of phlegmonous inflammation. The secretion of tears and mucus is now entirely suppressed, and, of course, the eye preternaturally dry. At the very commencement of this violent form of ophthalmy, the constitution is disturbed by a severe attack of inflammatory fever, and irritable patients are not unfrequently seized with delirium. Here, says Beer, terminates the first stage of this very dangerous disorder.

When the disease is left to itself, suppuration comes on, attended with fever and constant shiverings; the swelling of the sclerotic conjunctiva undergoes a remarkable increase, and assumes a dark-red colour, at the same time that it becomes softer. The pain becomes irregular, throbbing, and, when the eye or eyelids are touched, of a lancinating description. As a morbid secretion now begins to take place from the Meibomian glands, the swelled conjunctiva has a more moist appearance. The upper eyelid has a purple hue, and, on account of the continually increasing size of the eyeball, is pushed further and further outward. The portion of the cornea, still discernible in the middle of the protuberant conjunctiva, acquires a snowy whiteness, which afterwards changes to yellow. The patient feels an oppressive sense of heaviness in the orbit, and a disagreeable kind of coldness all round the eye. At length, the throbbing and tension are so agonizing, that the patient often expresses a wish to have the eyeball extirpated. If no effectual treatment be adopted, the eye now bursts, and a mixture of matter and blood, together with the scarcely perceptible remains of the lens and vitreous humour, is discharged with considerable force to some distance in front of the patient; an occurrence, sometimes termed *rhexis*, or *rhegma oculi*. From this moment, the pain all at once subsides into a very moderate feel of burning in the eye; and suppuration goes on, until all the textures of the organ are annihilated, the orbit has an empty appearance, and the closed eyelids sink into a concavity. Thus ends, as Beer observes, the second stage, after much tedious and general indisposition. But, he remarks, that the course of the case is quite different, when it has been wrongly treated in its first stage with stimulants, or exposed to the ill effects of tobacco smoke, the drinking of spirits, improper diet, immoderate exercise, &c.; for, under the operation of these unfavourable circumstances, the second stage may commence with dreadful gangrenous mischief, every vestige of the organization of the eye disappearing, and the parts at length sphacelating, while large abscesses form around, and, unless efficient medical aid be promptly given, the patient loses his life.

With respect to the causes of such an attack of the whole eyeball at once by common inflammation in a healthy subject, they must be of an exceedingly violent description, such as injuries produced by gunpowder, burns, and lesions either of a mechanical kind, or acting both chemically and mechanically together; a subject already fully treated of in the foregoing columns.

The following are the observations, which Beer delivers on the prognosis: While, in the first stage of this dangerous form of ophthalmy, the eyesight yet remains, and the eyeball itself is not enlarged, if the patient can be properly taken care of, some hope may be entertained of dispersing the inflammation so favourably, that, with the exception of a weakness of sight, of longer or shorter continuance, no ill effects will be left. It is manifest, however, that under these circumstances, the surgeon should not be too bold in promising a perfect cure; for, the very commencement of such an inflammation of the whole eyeball, even when the disorder is purely idiopathic, is unavoidably attended with some risk, not only of permanent blindness, but of the eye itself being destroyed in the most painful manner; and, when things turn out rather better, a tolerably favourable termination of the case is uncommon. But, as soon as the power of seeing is quite lost, the pupil nearly closed, and the eyeball prodigiously swelled, it will be fortunate, if the inflammation can be resolved, so as to preserve the shape of the organ; for, the restoration of the eyesight is entirely out of the question. But, besides the irremediable loss of vision, the disorder under these circumstances always produces a greater or lesser closure of the pupil, which however, has no share in causing the blindness.

In the second stage of the case, of course, the hope of restoring vision is quite past, and if the eyeball itself, and not merely the conjunctiva, has been considerably swelled in the first stage of the case, the chance of preserving the natural shape of the organ extremely unpromising. But, when the eye bursts, the latter desideratum is impossible. If the first stage should have been so violent as to induce gangrene, the practitioner will have enough to do in preventing sphacelus, and death, the danger of which is considerable, on account of the intimate connexion between the eye and parts in the orbit, and the brain and its membranes.

In the first stage, antiphlogistic treatment, in the general sense of the expression, is indicated, and the case is not to be regarded merely as a local disorder. However, with respect to topical bleedings, the surgeon, says Beer, should be more active, than in other examples of ophthalmy, and, after copious venesection and the use of leeches have produced some relief, the protuberant conjunctiva, round the cornea, should be deeply scarified with a lancet. If, in the first stage, delirium come on, as it sometimes does during the violence of the inflammatory fever, Beer directs one of the external jugular veins to be opened: or blood might be taken from the temporal artery.

In the second stage of the case, when the re-establishment of vision is quite impossible, and the objects are to endeavour to keep the eye of a good shape, and quickly lessen the suppuration, warm emollient poultices, and particularly those made of apples, are the applications, on which Beer bestows his praises. This topical treatment is to be assisted with internal means, as explained in the preceding pages, because the disorder is attended with a general disturbance of the constitution. When matter is fully formed, and its fluctuation can be distinctly felt, Beer approves of opening the abscess with a lancet; for, it is only by this means, that the annihilation of the eyeball can be prevented. If the eye has already burst, the preservation of its form is no longer possible, and, according to Beer, both the topical and general treatment should be partly of a tonic description. When gangrenous mischief has occurred, the practice ought to conform to the principles explained in the article, *Mortification.*

External Ophthalmy. Inflammation of the Outer Coats of the Eye. Ophthalmitis Externa Idiopathica, of Beer. The modifications of this common species of ophthalmy, as the latter author observes, have a variety of names applied to them, as *ophthalmia levis*, *ophthalmia angularis*, *taraxis*, and sometimes *chemosis*, and *ophthalmia sicca*. Together with a preternatural dryness of the eye, and a sensation, as if the eyeball were compressed on every side, the white of the eye becomes covered with a general redness, which, though it affect both the sclerotica and the conjunctiva, will be found on attentive examination to be much more considerable in the former, than the latter membrane, in which only a delicate plexus of blood vessels is at first perceptible. The motions of the eye and eyelids are not absolutely prevented; yet, the patient never moves these parts, except when he is actually obliged to do so, as every motion of them, if not actually painful, occasions a good deal of annoyance. Though the cornea cannot be said to become opaque, its clearness is always much diminished, and this change is the greater, the redder the white of the eye appears. These effects, which occur almost simultaneously, are followed by pain, which increases every moment, at first extending over the whole eyeball, and then to the surrounding parts, and to the top of the head. As the pain grows more severe, every movement of the eyeball, and palpebræ becomes more distressing, the dryness of the eye greater, and the redness of the sclerotic conjunctiva augments, either more slowly, or quickly, according to the degree of inflammation, until the network of blood vessels, which was at first distinguishable, entirely disappears, and the conjunctiva looks like a piece of red cloth, quite concealing the sclerotica, and forming round the cornea a very painful, firm, uniform circular projection. Thus, the cornea seems as if it lay in a depression, with its margin partly covered by this inflammatory swelling of the conjunctiva. At the period when the protuberance of the latter membrane takes place, the cornea itself always becomes less and less clear, and of a reddish grey colour, so that neither the iris nor the pupil can be any longer distinguished, and the power of vision is reduced to a faint perception of light. The pain, which was that of heaviness and tension, now becomes of a throbbing description, and the eyelids, which now begin to participate in the effects of the inflammation, are no longer capable of covering properly the swelled conjunctiva. The eyeball and eyelids are perfectly motionless; and, if an attempt be made by the patient to move them, the efforts of the muscles may be perceived, but still no movement of the parts intended is performed. The orbit feels as if it were too small for the eye, and the constitution suffers a severe attack of inflammatory fever. Thus, says Beer, does the first stage of this form of ophthalmy gradually rise to its highest degree, to which he applies the name of *true chemosis.*

However, it is observed, that idiopathic external ophthalmy does not always become so violent, as for instance, when the complaint has been excited merely by the lodgment of some small foreign body under the eyelids; for, though, in such a case, the conjunctiva and sclerotica are both reddened together, yet even when no aid is afforded, if no other sources of greater irritation are present, the redness does not readily increase so as quite to conceal the sclerotica, or to be attended with an inflammatory swelling all round the cornea. This milder form of external ophthalmy has sometimes received the name of *taraxis*. It is the *mild acute ophthalmy*, of Scarpa, characterized, as this author says, by redness of the conjunctiva and lining of the eyelids, an unnatural sensation of heat in the eyes, uneasiness, itching and shooting pains, as if sand were lodged between the eye and eyelids. At the place, where the pain seems most severe, Scarpa remarks, that some blood vessels appear more prominent and turgid, than other vessels of the same class. The patient keeps his eyelids closed; for he feels a weariness and restraint in opening them, and by this means, he also moderates the action of the light, to which he cannot expose himself, without increasing the burning sensation, lancinating pain, and effusion of tears. If the constitution be irritable, the pulse will be a little accelerated, particularly towards the evening; the skin dry; and sometimes slight shiverings, and nausea and sickness take place.

According to Scarpa, mild acute ophthalmy is often the consequence of a cold, in which the eyes, as well as the pituitary cavities, fauces, and trachea, are affected. It is not unfrequently occasioned by change of weather, sudden transitions from heat to cold, the prevalence of easterly winds, journeys through damp, unhealthy, sandy countries, in the hot season of the year, exposure of the eyes to the vivid rays of the sun, draughts of cold air, dust, &c. Hence, it does not seem extraordinary, that it should often make its appearance as an epidemic, and afflict persons of every age and sex. As additions to the list of remote causes, authors enumerate the suppression of some habitual evacuation, as bleedings from the nose, or piles, the menses, &c. a disordered state of the primæ viæ, worms, dentition, &c.

Between Beer and some late writers, there is either one point of difference in their descriptions of external ophthalmy, or else they mean different cases; for, while Beer represents the redness as affecting the sclerotica at first more than the conjunctiva, other writers describe the affection of the sclerotica as generally secondary, when it happens at all; for, according to modern observations, it is not *unavoidably* either an attendant upon, or an effect of, simple inflammation of the conjunctiva.

As the second stage of external ophthalmy comes on, the symptoms vary, according to the degree of the complaint in its first stage; but when, what Beer calls, a *true chemosis* is produced, the following are described by him as the usual appearances. The circular prominent fold of the conjunctiva, round the cornea, becomes of a dark red colour, and the swelling increases, but it becomes softer and less painful. The hardly visible portion of the cornea, situated in the depression formed by the circular protuberance of the conjunctiva, seems at first perfectly white, and afterwards yellowish, being the seat of more or less purulent matter. Though the swelled conjunctiva is every where moistened with a thin whitish mucus, this secretion, says Beer, is never so copious as to run over the face, as in the case of ophthalmo-blennorrhœa. In this stage, the lower eyelid is turned somewhat outwards, in consequence of its lining becoming more swelled. While suppuration is taking place in the cornea, attended with the febrile symptoms, which usually accompany the formation of acute abscesses, little collections of matter sometimes occur at different points of the conjunctiva, and after they have burst, a probe may easily be passed rather deeply into them, without any particular pain. (*Beer, B.* 1, *p.* 412.) The suppuration continually advancing, the swelling of the conjunctiva, and of the whole eyeball, now diminishes, the effects of the inflammation penetrate deeply into the organ, and the structure of the eye is so altered, as not to be cognizable, the part shrivelling up, as Beer says, into a motionless, whitish mass. However, according to this author, these deep effects of suppuration are sometimes produced only in a certain part of the eyeball, especially when the chemosis is the consequence of an external injury; and, in this circumstance, the rest of the circumference of the globe of the eye exhibits its natural organization, while, in the part above alluded to, there is a funnel-like depression, attended with a considerable diminution in the size of the organ.

But, says Beer, when an idiopathic external inflammation of the eye has only attained the milder degree, expressed by the term *taraxis;* as, for instance, when the complaint is principally owing to the lodgment of some mechanically, or chemically irritating substance under the eyelids; the redness of the conjunctiva and sclerotica undergoes a remarkable increase on the accession of the second stage: the first of these membranes becomes somewhat swelled: the pain is lancinating and irregular; and the secretion of tears unusually profuse; but at the point, where the extraneous substance lodges, an open superficial suppuration occurs, and according to Beer, the case both in the first and second stage, is generally accompanied with no febrile symptoms.

In the first stage, Beer represents the prognosis as very favourable, provided the disorder does not exceed that degree, to which the name of *taraxis* is applied; for, with the aid of proper treatment, the inflammation, when of a healthy kind, may be soon so favourably removed, as not to leave a vestige of it behind. If the cause of the disorder be not greater, than a moderate injury or wound of the eye, any traces of the lesion, which are perhaps still remaining, will disappear as soon as the inflammation subsides. On the other hand, when this kind of ophthalmy presents itself in the form of *true chemosis*, the prognosis is serious, and must be made with great reserve, especially when the patient is of a weak irritable constitution, a child, very stubborn and unmanageable, or incapable of following strictly the advice, which he receives from his medical attendant; for, under these circumstances, it will not be in the power of the latter to prevent the complaint from advancing unremittingly to its second stage, in which event, the ill consequences of suppuration will be incalculable. But, if these unfavourable conditions are not present, though the genuine idiopathic chemosis may really have attained a violent, and almost its highest, degree in the first stage, not only the eye may be saved by prompt and judicious treatment, but also the eyesight; nor will the result be different, even when the cornea continues for some time deprived of its transparency, and the power of vision impaired by a slight varicose affection of its conjunctival covering. These effects, says Beer, at length completely disappear, less in consequence of the aid of medicine, than of a proper regimen, the uninterrupted enjoyment of a fresh, dry air, &c.

The prognosis in the second stage, is under very different circumstances; for, as Beer observes, though the inflammation in the first stage may really not exceed that degree which is implied by the term *taraxis*, yet, if any suppurating point, occasioned by some slight preceding injury, be not efficiently treated, or if there be any loss of substance, already produced by the injury itself, a more or less opaque, white cicatrix is apt to remain on the cornea, and cause a permanent impediment to vision in a degree determined by the situation and extent of the opacity. And, in addition to this risk, it is to be remembered, that if the suppurating point be entirely neglected, or erroneously treated, the cornea, or sclerotica may be penetrated by ulceration, and, in the first case, a prolapsus of the iris, an adhesion of this organ to the cornea, (synechia anterior,) a disfigurement of the pupil, or an irregularity of the cornea, be produced; while, in the second, the consequences may be a partial wasting away of the eyeball, attended with loss of sight, and of the natural shape of the part. (*Beer, B.* 1, *p.* 417.)

Beer further observes, that, when this species of ophthalmy presents itself in its first stage in the form of *true chemosis*, the prognosis in the second stage is very unfavourable; for, when the cornea is generally pervaded by suppuration, the eyesight, and, in some degree, the form of the eyeball, are for ever lost, and it will be lucky, if the case can be brought to a conclusion with the mere destruction of the cornea. But, when the matter points at once in several places of the conjunctiva, round the cornea, all idea of preserving the shape of the eye sufficiently for the application of an artificial eye is out of the question, and the surgeon will be very successful, if he can now check in moderate time the suppuration, which continues with a good deal of general indisposition. An extraordinary relaxation of the conjunctiva of the lower eyelid, and a consequent ectropium, are the least disastrous effects of the abscesses of the eye thus produced. Lastly, Beer remarks, that when chemosis is in the second stage, that is to say, attended with suppuration of the eye, it rarely happens, under the most favourable circumstances, that the eyesight and shape of the organ can be preserved entirely free from permanent injury. (*B.* 1, *p.* 418.)

Let us next consider the treatment of idiopathic external ophthalmy in its modifications of simple inflammation of the conjunctiva, mild acute ophthalmy, or taraxis, and severe acute ophthalmy, with chemosis.

According to Mr. Travers, simple inflammation of the conjunctiva, unconnected with injury of the eye, and neither depending upon any established disorder of the system, nor modified by a scrophulous diathesis, may be easily and speedily reduced, even in its most acute form, by bleeding, and some brisk doses of purgative medicine. (*Synopsis of the Diseases of the Eye*, *p.* 247.) For the relief of mild acute ophthalmy, Scarpa recommends low diet, gentle purging, with small repeated doses of antimonium tartarizatum, the removal of any extraneous body lodged under the eyelid, and frequently washing the eye with a warm decoction of mallow leaves, and covering it with a very soft emollient poultice, included in a fine little muslin bag. Mr. Travers also expresses his decided preference to a tepid application in the painfully acute stage of inflammation, and considers simple warm water generally better, than medicated lotions, like the aqueous solution of opium, or infusions of poppy and hemlock.

When the disease presents itself in its first stage, in the mild form of taraxis, says Beer, it usually runs its course, quite uncomplicated with any general indisposition, and may be cured by moderate antiphlogistic treatment, in which, indeed, since the eyeball itself is affected, particular attention must be paid to lessening the action of the light and air upon the organ. But, when a true chemosis is present, every antiphlogistic means must be promptly and rigorously put in practice, internal as well as external remedies being employed, and, besides common measures, the conjunctiva, round the cornea, is to be scarified; a proceeding never necessary in the case of taraxis. Such scarifications, Beer observes, have a wonderful effect, when practised at the proper period, after venesection and topical bleeding with leeches have been fully put in execution, and when the cuts are made deep, so as to produce immediately a copious discharge of blood. "By means of such scarifications (says he) I have seen the inflammation and all its threatening effects recede, as it were, before my face, when no material relief could be effected by other measures." (*B.* 1, *p.* 419.)

Of the application of the vapour of æther, or of the juice of lettuces, to the eye and eyelids, for the relief of chemosis, as recommended by Mr. Ware, (*p.* 54,) I shall only say, that they are plans, which do not retain the confidence of modern practitioners.

General and local bleeding, and, if chemosis be present, scarifications having been put in practice, the treatment is to be continued by administering purgatives of the mildest description, and, after their operation, applying blisters, according to the directions given in a preceding part of this article. In the first stage of severe acute ophthalmy, Scarpa considers topical emollient applications to the eye most beneficial, such as mallows boiled in new milk; bread and milk poultices; or the soft pulp of a baked apple; all included in fine little muslin bags. Remedies of this description should be renewed at least every two hours. The patient should be directed to observe perfect quietude, and to lie with his head in an elevated position. To keep the eyelids from adhering together, in the night time, the spermaceti cerate is proper. When ophthalmy is accompanied with a violent pain in the head, the late Mr. Ware recommended a strong decoction of poppy-heads as a fomentation. (*P.* 51.)

Under the preceding plan of treatment, the first stage of severe ophthalmy commonly abates in about a week. The burning heat and darting pains in the eyes, and the febrile disturbance of the constitution subside. The patient is comparatively easy, and regains his appetite. The eyes become moist again, and can now be opened, without experiencing vast irritation from a moderate light. In this state, notwithstanding they may continue red, and the conjunctiva swelled, all evacuations are to be left off, as well as the use of topical emollients, for which latter astringent, corroborant collyria are to be substituted. Scarpa recommends the following application: ℞. Zinci sulphatis gr. vj. Aquæ distillatæ ℥vj. Mucil. sem. cydon. mali ℥ss. Spiritûs vini camphor. guttas paucas. Misce et cola. This collyrium may be injected with a syringe, between the eye and eyelids, once every two hours; or the eye may be bathed in it, by means of an eye-cup. Such persons as cannot bear cold applications to the eye, must have the same kind of collyrium a little warmed; but as soon as the irritability is lessened, it may be used cold.

Scarpa then speaks of the good effects, produced in the second stage of ophthalmy by the application to the eye of two or three drops of the vinous tincture of opium, once or twice a day; a subject already considered in the foregoing columns. The utility of letting the eye be habituated to the light, as soon as it can bear it, is next strongly commended; a rule of great importance, but, on which I need not here dwell, because it has been already insisted upon in the general observations.

When idiopathic external ophthalmy has terminated in suppurations of little extent, Beer speaks highly of the benefit derived from a solution of the lapis divinus, (see *Lachrymal Organs*,) containing the liquor plumbi subacetatis, or from smearing the suppurating points with a little laudanum. In worse cases, Beer states, that, when such local treatment is combined with the internal exhibition of bark and naphtha, and a diet and regimen, conducive to the support of the system, its efficacy is very great. And here, says he, it is worth observing, that while the solution of the lapis divinus is of great service in the second stage of *true chemosis,* it is more or less detrimental in the kind of chemosis, which accompanies purulent ophthalmy, especially if not blended with mucilage, and, even when thus qualified, it cannot be endured by weak and irritable subjects, affected with the latter complaint; a fact, not observed in other instances of chemosis. (*B.* 1, *p.* 420.)

When pustules, or abscesses in the swelled conjunctiva point round the cornea, a free outlet to the matter must be immediately made in each of them with a lancet; for, if this be not done, as Beer observes, the matter will spread extensively, and the eyeball be in danger of being destroyed. For an account of the method of treating the eversion of the lower eyelid, sometimes remaining as a consequence of the disorder, see *Ectropium.*

Inflammation of the sclerotica. The modern attempts to class ophthalmies, according to the texture of the eye first or chiefly affected, promises, I think, to lead to clearer views of the subject, and sounder practice. One circumstance, particularly adverted to, both by Dr. Vetch and Mr. Travers, in inflammation of the sclerotica, is the appearance of a vascular zone at the margin of the cornea. By the latter gentleman, this effect is ascribed to the particular distribution of the vessels. "Branches from the straight vessels of the conjunctiva penetrate the sclerotica obliquely towards the margin of the cornea, and the long ciliary vessels pass in sulci of this membrane to the plexus ciliaris at the root of the iris. At the interior border of the sclerotica, where the annulus ciliaris is adhering closely to this tunic, the ciliary communicate with the muscular branches, and being in deep-seated inflammation fully injected with red blood, the condensation of colour gives the well known and remarkable appearance of a vascular zone at the margin of the cornea." (*Synopsis, &c. p.* 126.) According to Dr. Vetch, only a few interspersed trunks are posteriorly observed, "which do not affect the natural appearance of the intermediate space, but, these diverging as they come forwards, produce a zone, more or less complete, of minute hair-like vessels, distinguished by their rectilinear direction, and their uniform concentration towards the margin of the cornea; their colour advances with the progress of the disease, from that of a delicate pink, or damask rose, to a deeper hue, and imparting a faint blush to the part immediately surrounding it." (*On Diseases of the Eye, p.* 27.) There appears, however, to be a good deal of variety in the symptoms of sclerotic inflammation; for rheumatic inflammation of the eye, described by Beer, and Wardrop, as particularly affecting the sclerotica, in common with other fibrous membranes, is not noticed by these authors as characterized by the red zone round the edge of the cornea. Indeed, instead of there being posteriorly only a few interspersed trunks, Mr. Wardrop states, "that (in rheumatic ophthalmy) the blood-vessels are generally *equally* numerous over the whole white of the eye, passing forwards in nearly straight lines from the posterior part of the eyeball, and advancing close to the cornea; but, neither passing over it, *nor leaving the pale circle around it,* which is so *striking when either the choroid coat, or iris, is inflamed.* If the vessels be closely examined, the general redness will be found produced more from numerous small ramifications, than a few large trunks." (*Med. Chir. Trans. Vol.* 10, *p.* 3.) However, as if there must be no harmony on this subject, Beer describes the blood-vessels, in rheumatic ophthalmy, not as being *equally* numerous over the whole white of the eye, but as being *in some places collected in larger numbers or clusters,* and he differs again from Mr. Wardrop, in describing the redness as coming on with considerable intolerance of light, (*Lehre von den Augenkr. B.* 1, *p.* 397, 398,) while the latter author distinctly mentions, that "the eye does not seem to suffer from exposure to light." (*Med. Chir. Trans. Vol.* 10, *p.* 6.) I can only reconcile these accounts by concluding, that, sclerotic inflammation, like that of other textures of the eye, has stages and modifications, which account for these seeming contradictions. And, with respect to the vascular zone, round the edge of the cornea, it would appear, at all events, to belong to iritis, as well as sclerotic inflammation. The vessels of the sclerotic coat are observed by Dr. Vetch, to follow the motion of the eye, and he says, that they may, by this circumstance, be distinguished from those of the conjunctiva, "the vessels of the latter, independent of their *darker* colour, their more tortuous form, and varying size, have likewise a more longitudinal direction, and as they proceed from the angles of the orbit, they form radii of a larger circle. The distinction between the inflamed vessels of the conjunctiva, and the sclerotica, (says Dr. Vetch) I consider to be, therefore, obvious; but, *that any difference can be observed in the arrangement, or appearance of the vessels of the latter, sufficiently distinct to indicate the peculiarity of the exciting cause, or specific nature of the case, is more than I have been able to perceive.* The general character, as it arises out of the structure of the part, will be found the same, whether the cause be gout, rheumatism, or syphilis. The vessels, such as I have described them, will always be most observable on the upper portion of the eye, as it is in that place that the inflammation is most intense, except when its locality is affected by any external exciting cause, in which case, it will be greatest near the injured part." (*On Diseases of the Eye, p.* 29.)

While Dr. Vetch describes the vessels of the conjunctiva as exhibiting in sclerotic inflammation a darker colour, than that of the vessels of the sclerotic coat itself, Mr. Travers represents the vessels of the *latter membrane,* which pursue a straight course to the margin of the cornea, as having a somewhat *darker hue than the areolar vessels upon the loose portion of the conjunctiva.*

It should be mentioned, however, that by sclerotic inflammation, Dr. Vetch signifies inflammation of the eye itself, as contrasted with conjunctival inflammation; but, how far this will account for the differences, above pointed out between his description and that of Mr. Travers, I am not prepared to say. According to Mr. Travers, ordinary inflammation of the sclerotica is secondary, that is to say, this membrane is usually affected only as intermediate to the conjunctiva and the other tunics. However, he has occasionally observed, in a recent ophthalmia, a turgescence of the vessels, which pursue a straight course to the cornea, unaccompanied with any affection of the iris, and so slight a vascularity of the loose conjunctiva, that he was disposed to regard the case as a primary sclerotitis. The inflammation, he says, is not acute, and the motions of the eyeball are painful. It sometimes accompanies, and sometimes follows, rheumatic inflammation. If continued, it presents the vascular zone and a pupil contracted, or drawn a little to one side. It is often seen in company with eruptions, or sore throat, of a pseudo-syphilitic character, or is secondary to gonorrhœa. (*Travers, Synopsis, &c. p.* 128.)

The practice, recommended by this gentleman, is as follows: obtuse pain in the eyeball, he says, may be materially relieved by blood-letting, and by antimony and ipecacuanha with opiates. Mercury is stated to have much less power over this case, than iritis. In general the patient is seriously reduced, and very irritable, from suffering rheumatic inflammation in the elbow, knee, or ankle; a state, to the production of which the previous use of mercury has commonly contributed. But, though such is stated to be the case, the moderate and cautious employment of this mineral is set down as generally indispensable in the treatment. And, in the interval of the mercurial action, the nitric acid is alleged often to be of great service. The preparations of mercury, preferred by Mr. Travers, in these cases, are the oxymuriate in doses of one $\frac{1}{12}$ or $\frac{1}{8}$ of a grain, and the hydrargyrus cum creta, in doses of from five to ten grains, twice or thrice a day. As auxiliaries for allaying irritation, he prescribes the pulv. ipecac. comp. hemlock, hyosciamus, and the extract of sarsaparilla, either dissolved in the decoction, or taken solid. (*Vol. cit. p.* 289.) On *rheumatic inflammation of the eye*, a few observations will be hereafter inserted.

Idiopathic Inflammation of the Internal Textures of the Eyeball, or *Internal Ophthalmy in general.*—According to Beer, internal inflammation of the eye does not always originate in one particular texture, but, in some instances, commences in the retina, choroides, &c.; while, on other occasions, its principal seat is in the iris, from which membrane it quickly extends itself to the corpus ciliare, and the crystalline lens and its capsule, or else in another direction to the sclerotica, cornea, &c. These differences in the seat of the disorder obviously depend upon the way, in which the exciting causes have operated; for, when they are such as immediately affect the retina only, the inflammation must have its origin in this texture, as when the disorder is produced by the effect of the sudden entrance of any very strong vivid, or reflected, light into the organ. This case, Beer denominates *ophthalmitis interna idiopathica, proprie sic dicta.*

The exciting causes, however, may not affect directly the retina, and parts immediately next to it, but may operate chiefly upon the iris, in which event, this part is the chief seat of the inflammation, and the complaint is named both by Schmidt and Beer, *iritis idiopathica.* This form of inflammation, Beer says, is seen after the extraction of the cataract, and accidental injuries of the eye, where the weapon, with which they were produced, has either penetrated directly to the iris, and more or less contused it, or roughly entered the eyeball near the ciliary edge of this membrane, without actually wounding it. (*Lehre von den Augenkrankh, B.* 1, *p.* 421.)

Symptoms of the first stage of idiopathic internal ophthalmy, properly so called. While a very uneasy sensation of general constriction and tension affects the whole eyeball, and soon changes into an obtuse, deep throbbing pain, increasing every instant, and quickly propagating itself over the eyebrows to the top of the head, as Beer observes, the power of vision gradually declines, and, at the same time, the pupil, which plainly loses its clear shining blackness, contracts without being deprived of its circular figure, or drawn out of its natural position, until, at length, it is so completely closed, that the iris seems as if it had no aperture whatever. But, long before this perfect closure of the pupil has taken place, the power of seeing is entirely gone, though after the faculty of perceiving the external light is extinguished, fiery appearances, which seriously trouble the patient, are seen at each pulsation of the bloodvessels within the eye. As the development of these symptoms is going on, the iris evidently loses its natural colour, becoming, as Beer says, greenish, when it was grey, or blue; and reddish, when it was brown, or black. In consequence of the iris swelling, and projecting towards the cornea, the anterior chamber becomes considerably diminished. Immediately the least mark of the swelling of the iris is seen, together with a moderate degree of contraction of the pupil, the whole sclerotica assumes a pink-red colour; a plexus of innumerable bloodvessels is seen in the conjunctiva; and the cornea loses a good deal of its natural brilliancy, without being actually opaque. The latter symptoms of this form of ophthalmy are attended with manifest general indisposition, and intolerable headach. Sometimes, in the first stage of the case, the pupil, though much lessened, is not absolutely closed, but thickish, and if examined with a magnifying glass, it has a reddish grey appearance, and the power of vision, notwithstanding the continuance of the aperture, is quite lost. (*Beer.*)

Symptoms in the second stage. According to the same author, while the eye is suffering very irregular throbbing pain, attended with a sensation of heaviness and cold in it, an increase of the redness of the conjunctiva, severe constitutional disturbance, and constant shivering, there is suddenly formed at the bottom of the anterior chamber a collection of matter which above presents a horizontal line, but, on every inclination of the head sideways, changes its position. This matter continues to accumulate more and more, until it not only reaches the pupil, but fills the whole of the anterior chamber, constituting the case termed *Hypopium.* If the disease be left to itself, says Beer, the matter collects in such quantity, that the cornea is rendered more prominent, and afterwards conical, very like an abscess, ultimately bursting during an aggravated attack of pain, when the eye shrinks, and the sufferings gradually cease. This kind of hypopium Beer names *true*, in order to distinguish it from the case, in which the matter passes into the anterior chamber out of an abscess in the cornea, and which he terms a *false* hypopium. When, at the end of the first stage, the pupil is not entirely closed, one may discern in the second stage, at the period of matter presenting itself at the bottom of the anterior chamber, (though not easily with the unassisted eye) whitish filaments, extending from the edge of that opening towards its centre, produced by the coagulable lymph effused in the aqueous humour, the secretion of which was interrupted in the first stage, but now commences again. And, continues Beer, one may perceive, with a good magnifying glass, a very delicate cobweb-like membrane, which, when the matter collected lies over the pupil, and remains for a good while unabsorbed, at length becomes quite yellow, the matter being really encysted by it in the form of a small lump, which remains in the pupil, and partly projects into the anterior chamber, forming the case, which Beer denominates a *spurious purulent cataract*, to which the edge of the iris is so closely adherent, that sooner than a separation could be effected the whole of the iris would be torn in pieces. When the pupil has been completely closed in the first stage, these effects of course cannot take place.

With respect to the causes of this form of ophthalmy, Beer remarks, that, as there are not many circumstances, which can produce it, the case belongs rather to the less frequent kinds of inflammation of the eye. As predisposing, he mentions plethora, and irritability of the eyes occasioned by little exercise of them. Experience has convinced him, however, that by far the most usual cause of this internal ophthalmy is an extraordinary, long continued straining of the eye in the inspection of small, microscopic objects in a strong reflected light.

Respecting the prognosis, he represents it as not unfavourable, when the inflammation of the eyeball is moderate, proper treatment immediately employed, the pupil not yet very much contracted, and the power of seeing not considerably impaired. But, if the power of vision should seem, as if it were abolished, the prognosis is extremely uncertain. And, if the pupil should close, after the entire stoppage of vision, no hope can be entertained of the recovery of the sight; for, if the pupil open again on the subsidence of the inflammation, it will yet continue very small and motionless, and the eye blind. When the case is mistaken in its first stage, and neglected or erroneously treated, Beer says, it changes into a very perilous general inflammation of the whole eyeball; a disorder, already considered.

In the second stage, the prognosis is constantly unfavourable; for, the eyesight has always been already destroyed at the end of the first one, and the only expectation of the practitioner can now be to preserve the shape of the eye, while as speedy a check as possible is put to the suppuration. If the case has been so mismanaged in its first stage, that a violent inflammation of the whole eyeball is inevitable, and traces of chemosis are already present, the chances of the figure of the eye being lost in the second stage are still greater, and as Beer observes, the surgeon will be fortunate, if he can now prevent a frightful morbid change of the organ.

In the treatment of the first stage, Beer describes the indications as being exactly the same as in common ophthalmy, except that no scarifications are necessary, unless the case change into a violent inflammation of the whole eyeball. However, great promptitude in the application of proper curative measures is here particularly called for, as the least delay is apt to cause either a total loss of sight, or at least a serious impairment of it.

With few exceptions, the treatment of the second stage is also like that of ophthalmy in general. Warm poultices, Beer says, can only be employed with great circumspection. When matter collects in the anterior chamber, he strongly condemns making an opening in the cornea, by which practice, he states, that the eye would certainly be rendered quite deformed. He recommends leaving every thing to the absorbents, the action of which is to be invigorated by general and local remedies. Poultices are now to be laid entirely aside, and the effect of warmth tried. Blisters are to be applied alternately behind the ear and on the temple. The eye is to be smeared with the vinous tincture of opium, two, or three times a day, by means of a camel-hair brush, or even four times, when the anterior chamber is filled to the extent of one half of it. Beer's experience leads him to approve of opening the cornea only in very urgent cases, that is to say, when the eye is so distended with matter, that the cornea is in a state of an abscess, which threatens to burst. In one part of his observations, Beer describes the matter in these instances as fluid; a point on which he differs from Scarpa; but, he afterwards confesses, that when an opening is practised, the matter must not be expected to flow out immediately like that of a common abscess. See *Hypopium.*

Idiopathic Iritis. The following is Beer's description of the disease. Together with an obtuse, heavy, deep pain in the eye, producing a sensation, as if the eyeball were continually pressed upon by one of the fingers, a manifest and incessantly increasing uniform contraction of the pupil takes place, as well as a gradual diminution of the movements of the iris; yet, the pupil neither loses its circular shape, nor changes its position in the eye, and, at the same time, an intolerance of light commences. When the pupil is examined with a glass, it is found to have already lost the shining blackness, which is peculiar to it in the healthy state. While these changes are occurring in the pupil, the colour of the iris undergoes a material alteration, first at its lesser circle, which grows much darker, and afterwards at its greater circle, which turns greenish, when it was grey or blue, but reddish, when it was brown or black. At the same time, the margin of the pupil becomes indistinct, and appears not so sharp as natural. As soon as the greater ring of the iris has undergone a considerable change of colour, this membrane becomes evidently swelled, and projects towards the cornea, so that the anterior chamber is very much lessened. As early as the period, when the contraction of the pupil, and the immobility of the iris, are observable, a serious diminution of the power of vision occurs; because, in all cases, the inflammation extends more or less over the anterior layer of the crystalline capsule, and, afterwards, when the case is somewhat more advanced, says Beer, one may perceive quite plainly, with the unassisted eye, those effects of inflammation on the capsule, which have been so excellently described by Walther. (*Abhandl. aus dem Gebiethe der Practischen Medicin*, 1 *B. Landshut*, 1810.) In proportion as the inflammation makes progress, the pain grows more severe and extensive, and, towards the end of the first stage, it shoots particularly up to the top of the head; a circumstance, strikingly proved whenever any thing like slight pressure, aggravates the pain in the eye. The redness, perceptible in the eye during the whole of the first stage, is inconsiderable, and seems to be not at all proportioned to the violence and danger of the inflammation; for the sclerotica is only of a rose-red colour, and even this pale redness fades towards the circumference of the eyeball. (*B.* 1, *p.* 434.)

According to Beer, idiopathic iritis is always attended with a corresponding general disturbance of the system; but, a good deal depends upon whether the inflammation spreads immediately to the deeper textures of the eye, or to its outer coats, or in both directions at once. In the first case, the constitutional indisposition is always more severe, and the danger of the disease increases every moment; in the second instance, the augmentation of the general symptoms is less striking; but, in the third, the inflammation, and the corresponding febrile symptoms soon rise in such a degree, that the possibility of preserving the eyesight becomes very doubtful. The continued operation of hidden exciting causes, neglect, and erroneous management of the disease, also produce considerable differences; and, as Beer observes, it not unfrequently happens, that a genuine idiopathic iritis, which does not appear at first very dangerous, nor rapid in its progress, will suddenly change, under the unfortunate concurrence of the circumstances, above alluded to, into a complete inflammation of the whole eyeball, destroying the organ in a few days, unless the most efficient treatment be speedily adopted.

In the second stage, says Beer, in conjunction with a corresponding still more manifest general indisposition, the pain in the eye grows very irregular; luminous appearances flash within the organ, and seriously annoy the patient, especially in the dark, while the power of seeing the external light undergoes a great decrease; the redness, even in the conjunctiva, increases; and the pupil, which hitherto has been perfectly circular, becomes more or less angular. At these angles, something of a light greyish colour may be seen projecting behind the pupillary edge of the iris, and on examination with a glass, plainly appears to be a very delicate layer of coagulating lymph, by which, first the lesser ring of the uvea, and (if proper treatment be not expeditiously employed) also its greater ring, are soon rendered adherent to the anterior portion of the capsule of the lens, (*synechia posterior*,) which membrane, as the disease advances, becomes more and more deprived of its transparency. Under these circumstances, it is evident, that the power of vision must daily decline, and, that if this process of the effusion of lymph and its organization be not resisted by powerful measures, the patient will soon be left just capable of faintly distinguishing the light. While the above described changes are taking place between the uvea and anterior portion of the capsule, very peculiar effects are occurring in the anterior chamber; for, as the iris continues to project further towards the cornea, the latter membrane grows less and less transparent, and the iris seems as if concealed in a mist, at the same time, that a small, yellowish, red, round prominence is formed at one, or more places together, generally between the greater and lesser rings of the iris, and proves afterwards to be a small abscess, which ultimately bursting, pours its contents into the anterior chamber, and thus occasions a true *Hypopium*. For several days, the flakes of the burst little cyst, still connected with the iris, may be seen floating in the aqueous humour, until they gradually disappear. When there is not merely one, but several of these little abscesses, says Beer, the greater part of the anterior chamber may be filled with matter, so that little more of the iris can be distinguished. In weak subjects, at this period of suppuration, blood may not unfrequently be perceived in the chamber of the eye; a circumstance, regarded by Beer as a very unfavourable omen, in respect to the recovery of sight, as in such cases, portions of blood and matter are apt to lie in the posterior chamber entangled in the lymph. According to the same author, the matter in the anterior chamber is at last absorbed; the pupil, if it has been concealed, can again be seen, but it appears angular and very turbid; and in consequence of the layer of lymph in the posterior chamber, the eyesight is exceedingly diminished, or even reduced to the mere power of knowing light from darkness. Such, says Beer, is the course of the second stage of idiopathic iritis, when the inflammation has not extended far beyond its proper focus, and has been principally confined to the iris, corpus ciliare, the lens and its capsule, and the anterior part of the sclerotica. But, if it should spread more deeply to the vitreous humour, the retina, the membrana Ruyschiana, and the choroides, symptoms of internal ophthalmy (strictly so called) then occur with great vehemence in the first stage, and, at the termination of the second, the eyesight is for ever certainly destroyed in such a degree, that not the least perception of light remains; and, even if the patient should think, that he can distinguish it, the feel is only a deception; a development of light within the eye itself; of which, the surgeon may easily assure himself by placing the patient with his back towards the light, and asking him to point out where it is; or by putting him directly opposite a window, and moving the hand slowly along before his eyes; of which proceeding the patient will be quite unconscious. The effects left in the eye after such an iritis, and indicating its mischievous extension, are so characteristic, that, on the first inspection of the eye, no surgeon can entertain a doubt of the deeper textures of the eye having been involved in the inflammation. But, when idiopathic iritis extends rather to the external, than the deep textures of the eye, the swelled iris, as early as the end of the first stage, approaches so near the cornea, which grows less and less clear, that they seem as if they were adherent, ere the second stage has commenced. And, indeed, on the accession of this stage, they actually adhere together at every point, either directly, or with the intervention of a mass of coagulating lymph. In the first event, at the end of the second stage, the cornea forms a conical protuberance, and a total staphyloma arises; (see *Staphyloma ;*) but, in the second, the cornea is said not to undergo this change. On the contrary, it becomes rather flat, and on account of the layer of organized lymph, which fills up the space between the cornea and iris, little of the latter membrane can be discerned, and, what can be seen, appears to have its organization entirely subverted. When idiopathic iritis in its first stage extends its effects directly over the whole eyeball, the eye becomes nearly or quite destroyed in the same manner, as in cases of violent acute ophthalmy.

The causes, which give rise to idiopathic iritis, must always be such as operate directly upon the iris; and, hence, the disorder is usually a consequence of injuries and wounds of the eye, produced by accident, or in operations. And, says Beer, although rheumatic inflammation of the eye, when neglected, or wrongly treated, may at length affect the iris, and adjacent textures, yet, such an iritis is but a secondary effect, derived from the pre-existing rheumatic ophthalmy. All injuries in which the weapon, or instrument, has more or less pressed against, pushed, irritated, or violently bruised, or torn, the iris itself, and all largish wounds of the cornea, are to be accounted the principal exciting causes of idiopathic iritis. Hence, extraction of the cataract is not unfrequently followed by this inflammation, when the flap of the cornea is kept too long opened, and the iris is hurt with any blunt instrument; when the incision in the cornea is too small, and a hard cataract pushes the iris between the lips of the wound, and is slowly pressed out of the eye; when many pieces of the cataract break off, and it is necessary repeatedly to introduce Daniel's scoop for their removal; or when, notwithstanding the operator proceeds with the utmost delicacy, the patient is excessively timid, and unmanageable, or particularly irritable and prone to inflammation. This form of iritis is also produced by couching, reclination through the sclerotica, keratonyxis, and operations for artificial pupil. Nor, as Beer observes, is it at all surprising, that iritis should follow these last operations, as the surgeon has often to meddle with an iris, that has been already violently inflamed.

Prognosis in the first stage. Serious as the disorder always is; important as the textures are, in which the inflammation is most severe; and quickly as vision may be for ever annihilated by it; yet, says Beer, the prognosis, in the first stage, is very favourable, when the true nature of the case is at once understood, and treated as it ought to be. The prognosis is the most favourable, when the inflammation is not extensive; but, it must be very reserved, when the inflammation extends either deeply backward, forward, or in both directions. Beer remarks, that, when iritis is purely idiopathic, and judiciously treated in its first stage, it is incredible with what rapidity its effects recede. When it is produced immediately by an injury of the iris itself, and some part of this membrane is torn, the risk of the inflammation is not the only thing for consideration; for the chance of the function of the iris being permanently impaired by the injury must also be taken into the account. And, says Beer, as in these severe injuries of the eyeball, it is impossible to foretel what may be the result of the inflammation, it is a good maxim always either to defer making any prognosis, or to deliver only a doubtful one. When idiopathic iritis has already changed either into a complete internal ophthalmy, or into a violent inflammation of the whole eyeball, no incautious promises should be made, about the recovery of the eyesight, or even about preserving the shape of the eye. (*Beer.*)

Prognosis in the second stage. Though, says Beer, this is much less favourable, than in the first stage, yet if proper measures be not deferred, a perfect recovery of the eye may often be effected. Here a great deal depends upon the state of the layer of lymph effused in the posterior chamber, and of suppuration. If it be plain to the naked eye, that no coagulating lymph lies in that chamber behind the contracted pupil, but slight greyish filaments are discernible with a magnifying glass, projecting only a little way from behind the pupillary edge of the iris; if the colour merely of the lesser circle of the iris be changed, while no little cyst of matter is yet formed on the latter membrane, and the sight is lessened only in a small degree, being somewhat cloudy; the complaint may be so completely cured by proper means, that not a vestige of it will remain. However, for some time after the termination of the second stage, the motions of the iris will be more sluggish than natural, though the pupil effectually adapt itself to the variations of light. On the other hand, when a considerable, though fine, web-like membrane can be plainly seen behind the pupil; when the colour of the larger circle of the iris is somewhat altered; and the power of vision is seriously lessened; though, by effectual treatment, the sight may be re-established sufficiently to enable the patient to read and write; yet, says Beer, it will for ever continue weak; the pupillary edge of the iris will never regain its perfect freedom, but constantly remain more or less angular; and the pupil never assume again the clear shining blackness, which, in persons not of great age, it naturally exhibits. Still more remarkable are the sequelæ of idiopathic iritis, when a small cyst of matter has been formed on the iris, and discharged its contents into the anterior chamber; for, in this case, under the best circumstances, the former colour of the iris never entirely returns. According to Beer, when at the first visit of the surgeon, vision is quite interrupted by the effusion of lymph in the posterior chamber, so that the patient can no longer perceive any object with the affected eye, though capable of distinguishing the light, and the outlines of some things; when the pupil is at the same time very contracted, and the colour of the greater circle of the iris entirely changed; there is no hope of recovery of the sight at first, though some chance of benefit may be subsequently afforded by the formation of an artificial pupil, If, says Beer, in such a case, matter has been effused from several little suppurating points of the iris, so copiously into the anterior chamber, that nearly all this cavity, or at least the half of it, is filled up, though after absorption some power of distinguishing light may return, little or no hope can be entertained of any effectual benefit from a future operation for an artificial pupil. When, at the termination of the first stage, the cornea is so severely inflamed, that the iris almost touches this membrane in its untransparent thickened state, all prospect of saving the eyesight is over, and it will be fortunate if the natural shape of the eye can now be preserved, and the formation of a staphyloma of the cornea prevented. When the layer of lymph between the cornea and the iris is extensive, and considerable bloodvessels can be seen proceeding into it from the iris, Beer says, nothing will succeed in re-establishing vision. And he observes, that, when an idiopathic iritis, at the close of its first stage, has changed into a true internal ophthalmy, and the pupil is already quite blocked up, so that even the light cannot be distinguished, the recovery of sight is quite impossible, and the surgeon must make every exertion to prevent the shape of the organ from being destroyed. In this disease, says Beer, a relapse, even when the inflammation has not been very considerable in the first attack, almost constantly ends in partial or complete blindness of the affected eye, as the progress of the case is so rapid, that there is not time enough to render effectual assistance.

Beer directs idiopathic iritis to be treated in its first stage like a case of pure internal ophthalmy, the practice being somewhat modified, however, according to the direction and degree, in which the inflammation has spread, when the surgeon is first consulted. When the inflammation continues a good while limited, or spreads but very gradually to the outer texture of the eyeball, general and local antiphlogistic remedies are to be employed with moderation; but, if it immediately extend itself to the innermost parts of the eye, or both inwards and outwards together, and threatens to end in an universal inflammation of the eyeball, antiphlogistic treatment must be most rigorously adopted. (*Beer.*) This author then notices the unfortunate state of the case, when, towards the end of the first stage, the eyesight happens to be entirely destroyed, the iris is close to the cornea, and there is danger of a staphyloma. In this desperate state of things, his apprehensions of this last disease, lead him to suggest a plan, (the propriety of which I regard with much suspicion,) which is nothing less, than actually trying to increase the inflammation, by stimulating the eye several times a day with laudanum, sulphuric æther, &c. with the view of doing what? Why, of obliterating the sources of the aqueous humour! the continuance of the secretion of which is set down as one of the essentials to the production of staphyloma. (*B.* 1, *p.* 447.)

The treatment of idiopathic iritis in its second stage, as recommended by Beer, is on the whole, both generally and locally, like what has been advised for the same stage of pure internal ophthalmy; but here, he says, it is necessary to pay particular attention to the direction, in which the inflammation extends itself in the first stage, so that the treatment may be regulated with greater precision. Beer also advises great attention to be paid to the effusion of lymph in the posterior chamber; as towards the end of the second stage, much may be done which would afterwards be too late. Thus, when the surgeon perceives towards the end of the second stage, that the layer of lymph in the posterior chamber does not completely prevent, though it seriously diminishes vision, and that it is likely to remain in the same state, after the termination of the second stage, Beer recommends topical applications to the eye, and if these prove unavailing, internal alterative medicines, and even mercury, which, he says, when the treatment is judiciously conducted, ought not to be omitted. Here, also, he observes, another deviation must be made from the usual practice in the second stage of ophthalmy: calomel joined with opium, is to be exhibited with calamus aromaticus, bark, &c. Externally, Beer speaks highly of the benefit of a collyrium, containing the oxymuriate of mercury, without any mucilage, but with a considerable addition of the vinous tincture of opium. When these remedies cease to be efficacious, or the eye cannot bear fluid applications, as is sometimes the case, Beer recommends a bit of the following salve to be smeared once a day, between the edges of the eyelids, and allowed slowly to melt there, and become diffused over the eye: ℞. Butyri recentis insulsi ℥ij. Hydrargyri nitrico-oxydi rubri gr. vj. Extract opii gr. viij. M. Beer also states that rubbing a little mercurial ointment, with which some opium is blended, once a day into the eyebrow, will greatly promote the removal of the lymph effused in the posterior chamber. (*B.* 1, *p.* 450.)

Excellent as Beer's description of idiopathic iritis certainly is, there are some imperfections in his method of treatment. 1st, It does not appear to me, that he insists sufficiently upon the necessity of taking away a very large quantity of blood at the commencement of the case, and of repeating the general and topical bleeding, until the circulation is duly lowered, and the violence of the inflammation checked. 2dly, Though his recommendation of rigorous antiphlogistic treatment implies the approbation both of bleeding and cathartics, he says nothing of the use of moderate doses of tartarized antimony, in weakening the pulse; a practice, highly praised by the late Mr. Saunders. (*On Diseases of the Eye*, *p.* 26, *8vo. Lond.* 1811.) 3dly, If mercury has the power of arresting acute inflammation of the iris, "both prior to, and after, the effusion of adhesive matter," and of rapidly removing, "by an excitement of the absorbing system, peculiar to itself, the newly effused matter," (*Travers, Synopsis, &c. p.* 291,) then Beer must delay too long the employment of this powerful medicine, since he does not commence its use until the close of the second stage, when he has found, that the absorption of the effused lymph cannot be effected by other means. 4thly, Beer entirely overlooks the important utility of belladonna and hyosciamus in producing a dilatation of the pupil, whereby adhesions of the iris to the capsule of the lens, or to the cornea itself, may frequently be prevented, or their ill effects considerably lessened. Belladonna, (says Mr. Saunders,) "if properly applied to the eye, during the adhesive process of inflammation, will cause the inner margin of the iris to expand, and recede from the axis of the pupil, and will thus overcome the restraint, arising from the agglutination of lymph, by elongating the organized bands, which connect the iris and capsule, if they have not been of long duration. Thus, the adhesions are drawn out to a degree of tenuity, and consequently transparency, and a considerable quantity of light is admitted. If the effect of the inflammation has been slight, the adhesions will be trivial, and the pupil only slightly irregular. The iris will retain a certain power of action, and vision will be very little injured. In general, the pupil is misshapen, and the iris perfectly fixed; but, if the aperture be of sufficient size, and the capsule not rendered too opaque, the patient will enjoy a very useful degree of sight." (*Saunders, p.* 32.) Respecting belladonna, it is observed by Langenbeck, that, as all applications directly to the inflamed eye itself are frequently hurtful, and render it still more painful and irritable, it is a good plan to let the extract of belladonna be smeared upon the eyebrow, instead of putting a solution of it immediately in contact with the conjunctiva.—(*Neüe Bibl. B.* 2, *p.* 236.) The same author expresses his attachment to Beer's method of rubbing mercurial ointment with opium into the eyebrows; and, after dwelling, with due force, on the necessity of copious and repeated bleedings, leeches, evacuations, &c. he cautions practitioners not to be led into the supposition, that the efficacy of belladonna will supersede the occasion for taking away blood. He even declares, that, during the first vehemence of the inflammation, the application is quite inefficient, and that it frequently will not succeed in producing a dilatation of the pupil, before bleeding has been practised. "If, (says Langenbeck), bleeding is to be useful in iritis, it must be copious, and often repeated."

Specific Cases of Iritis. The foregoing observations refer to idiopathic iritis, or inflammation of the iris uncomplicated with any specific disease. But there is an iritis, which "appears in company with rheumatism of the chronic form; sometimes with gout; with the constitutional signs of the lues venerea; and during, or following, the action of mercury upon the system."—(*Travers, Surgical Essays, Part* 1, *p.* 59.)

Mr. Hunter entertained doubts, whether any inflammations of the eyes are syphilitic, and he appears to found his opinion upon two circumstances: one is, that, if such cases be venereal, the disease is very different from what it is when it attacks other parts, and is attended with more pain, than venereal inflammation, arising from an affection of the constitution: the second is, that he never saw these cases, attended with such ulceration, as occurs when the complaint invades the mouth, throat, and tongue. (*Hunter on the Venereal Disease, p.* 324.) On the other hand, the generality of modern surgeons believe in the reality of venereal ophthalmy, though their accounts of the symptoms and appearances of the complaint are in some respects discordant. Scarpa says, the venereal ophthalmy is peculiar in not discovering manifest signs of inflammation, stealing on clandestinely, *without much uneasiness.* It afterwards relaxes the vessels of the conjunctiva and lining of the palpebræ, and changes the secretion of Meibomius's glands. In time it causes ulceration of the margins of the eyelids; the ciliæ fall off, and the cornea grows opaque. In the worst stage, it excites itching in the eyes, which is exasperated at night, and abates in violence towards morning, as do almost all the effects of syphilis. It never attains the state of chemosis. With the exception of the venereal ophthalmy, in the form of iritis, I cannot discover, that any thing very certain has yet been made out. By this observation, however, it is not meant to assert, that cases, corresponding to Scarpa's description, do not present themselves, and may not be relieved by his method of treatment; but, that their venereal character is not fairly proved. In examples, like those described by Scarpa, the decoct. sarsap. the oxymuriate of mercury; mezereon; guaiacum; and even mercurial frictions, may be employed, with leeches and blisters. Scarpa particularly recommends a collyrium, made with the oxymuriate of mercury. When the eyelids are ulcerated, the unguentum hydrargyri nitratri, weakened at first with twice or thrice its quantity of the unguentum cetaceum, is the best topical application.

The iris is now supposed to be more liable, than any other part of the eye, to venereal inflammation. (*Wardrop's Essays on the Morbid Anat. of the Eye, Vol.* 2, *p.* 36.) The case is mentioned by Mr. Saunders, who recommends the vigorous exhibition of mercury, and the use of belladonna. Its symptoms and treatment, however, have been more particularly detailed by Beer. (*Lehre von den Augenkr. B.* 1, *p.* 553.) As this case, and some other specific forms of iritis, are described in the 1st vol. of the last edition of the First Lines of Surgery, I need here only refer the reader to that volume, and to a few works containing additional information on iritis in general; as *Saunders's Treatise on some Practical Points, relating to Diseases of the Eye, p.* 21, 8vo. 1811; *and particularly the later editions, in which the utility of mercurials is noticed.*

In the article *Hypopium*, I have referred to an early case, in which the quick exhibition of mercury and its good effects were exemplified in Germany. But whatever claims the continental surgeons may have respecting the first administration of mercury in iritis, I believe it a justice due to Dr. Farre and Mr. Travers to state, that these gentlemen have undoubtedly given not only the best practical directions on the subject, but laid the greatest stress upon the necessity of the practice, establishing the efficacy of mercury, as a means *as well of resisting the effusion of lymph* in the eye, as of exciting the absorption of it, after it has been effused. (See *Travers, in Surgical Essays, Part* 1.) Consult also *J. Vetch, A Practical Treatise on the Diseases of the Eye, p.* 88, *&c.* 8*vo. Lond.* 1820. *Weller's Manual of the Diseases of the Human Eye, Trans. by Monteath,* 8*vo. Glasgow,* 1821. *J. Wardrop, Morbid Anatomy of the Eye, Vol.* 2, *chap.* 20, 8*vo. Lond.* 1818. *H. B. Schindler, de Iritide Chronica. Vratislaviæ,* 1819. *J. A. Schmidt uber Nachstaar und Iritis nach Staar-Operationen,* 4*to. Wien,* 1801; a work of high repute. *Carmichael in Obs. on the Specific Distinctions of Venereal Diseases, p.* 31. *Quarterly Journ. of Foreign Medicine, Nov.* 1818.

Rheumatic Inflammation of the Eye. According to Mr. Wardrop, the albuginea acquires a brick-red tinge, or an admixture of yellow with crimson red, which colour, he supposes, is probably caused by the serous part of the blood being tinged with bile, "an effect, likely to take place from the marked derangement of the biliary organs, which usually accompanies this disease." Contrary to the statement of Beer, who describes the blood vessels as being in clusters, Mr. Wardrop observes, that they are generally equally numerous over the whole white of the eye, passing forwards in nearly straight lines from the posterior part of the eyeball, and advancing close to the cornea; but neither passing over it, nor leaving the pale circle around it, which is so striking, when either the choroid coat, or the iris is inflamed. If the vessels be closely examined, the general redness will be found produced more by numerous small ramifications, than a few large trunks. There is frequently a little swelling of the conjunctiva, which sometimes forms a slightly elevated ring round the cornea. In mild cases, little change takes place in the anterior chamber in the early stage; but, as the disease advances, the cornea becomes dull and turbid. Upon close examination, one or more of the layers of the conjunctiva on the cornea will generally be found to be abraded, especially towards its circumference. At the commencement of the disease, there is often a disagreeable feeling of dryness of the eye; but, sooner or later, a very copious secretion of tears takes place. The eyelids are observed to be very little affected. At first, the chief seat of pain is generally in the head, though sometimes in the eyeball itself. Mr. Wardrop describes the pain as usually most severe in the temple of the affected side, but, he says, that it is often seated in the brow, the cheek-bone, the teeth, or the lower jaw. "Sometimes the pain is precisely confined to one half of the head, and sometimes there is a severe pain in the cavity of the nose, or in the ear. The pains are more of a dull agonizing kind, than acute, and though unceasing, they vary much in degree, coming on at times in very severe paroxysms, and with great violence when the head is bent downwards. Sometimes, the pain is excited by merely touching the scalp, and the patient is unable to rest his head on the affected side, or even lean it on a pillow. In most cases, the pain is said to be remittent, the paroxysm coming on in the evening, continuing during the night, being most severe about midnight, and abating towards morning.

In the eyeball, says Mr. Wardrop, the patient generally complains more of a sense of fulness and distention, than of pain; and, though there is a great degree of external redness, *the eye does not seem to suffer from exposure to light;* a point, on which Professor Beer delivers a directly opposite statement, at least, in relation to the first stage of the disease. However, these authors both agree in considering the sclerotica, as generally the chief seat of rheumatic inflammation; but, Beer sets down the iris as likewise subject to be attacked. He admits also, that, in the second stage, the aversion to light undergoes a considerable diminution. According to Mr. Wardrop, rheumatic ophthalmy is always accompanied with more or less symptomatic fever, severe paroxysms of which take place towards evening, and the functions of the primæ viæ are much deranged, "the appetite being impaired, and the evacuation always changed in quality." In severe cases, the pain in the head soon becomes agonizing, the redness of the eyeball increases, the whole white of the eye is crowded with blood vessels, and the conjunctiva swelled. At length, ulceration commences in the cornea, through which the aqueous humour is discharged, and the eyeball collapses, when all pain ceases; or abscesses may form within the posterior chamber, and burst through the sclerotic coat. (*Wardrop, in Med. Chir. Trans. Vol.* 10.) Beer describes small watery vesicles as forming on the cornea, or white of the eye, and changing during severe pains into small ulcers, which occasion an appearance, as if a small piece were torn out of the surface of the cornea. He adds, that they seldom leave scars behind; but generally little pits, which are soon filled up in healthy subjects. (See *Weller on Diseases of the Eye, Vol.* 2, *p.* 217.)

The causes of rheumatic ophthalmy, enumerated by writers, are change of weather, variation of temperature, exposure to damp, a cold current of air directly striking the eye, and a constitution disposed to rheumatism. Mr. Wardrop states, that both sexes are equally subject to the disease; but that he has observed it most frequently in adults, and persons of rather advanced age. Only one eye is usually affected; and when the second is attacked, the disease is almost always less severe in it, than that which is first inflamed.

According to Mr. Wardrop, rheumatic ophthalmy resembles syphilitic more, than any other kind of inflammation of the eye. But, he notices, that, *in rheumatic ophthalmy, the proper vessels of the sclerotic coat are enlarged,* which is the cause of the redness being generally diffused over the whole albuginea, whereas *in syphilitic inflammation, it is the anterior ciliary arteries, passing along the sclerotica on their way to the iris, which are chiefly affected;* and hence the pale ring, which is always observed between the cornea and the enlarged vessels. Mr. Wardrop further explains, that though these diseases resemble each other in the pains round the orbit, and their evening exacerbation, *patients, with syphilitic ophthalmy, always have the constitutional symptoms of syphilis.*

When the disease has made much progress, and the symptoms have not yielded to other remedies, Mr. Wardrop recommends the evacuation of the aqueous humour, as a practice, from which the most beneficial effects may be expected. After the operation, fomentations are the only necessary applications; but, if the eye continue long irritable, the vinous tincture of opium is to be used. He enjoins attention to the state of the biliary organs in every stage of the disease, and speaks highly of the sudden relief sometimes afforded by an emetic, care being taken to empty the bowels afterwards with calomel and rhubarb, or other purgatives. If the functions of the skin were suddenly interrupted by a chill just before the attack, this author prescribes a couple of grains of antimonial powder, alone, or combined with opium, to be taken every four or six hours. Little advantage, he says, is derived from local bleeding, and where venesection may become necessary, on account of the complaint resisting other means, it is to be practised with moderation.

In the early stage, Mr. Wardrop has found, that the pain in the eye and eyebrow are sometimes much alleviated by a fomentation with the decoction of poppy-heads. He also praises blisters to the nape of the neck, or behind the ear; but, disapproves of their being put near the eye itself. The vinous tincture of opium, he says, is the only local application, which he has ever seen decidedly beneficial; but, its use is to be deferred, till a late stage of the inflammation, when all febrile symptoms have been subdued. "After the primæ viæ have been well evacuated, the tongue may still remain very white, and the pulse quicker, than natural." In this state, small doses of bark, either alone, or with the mineral acids, will be most serviceable. (*Wardrop in Med. Chir. Trans. Vol.* 10.) The outlines of Beer's practice may be given very briefly; in the first stage, he applies a leech to the inner canthus, and covers the eye with a cold poultice, with a small proportion of vinegar in the water, with which it is made. Diaphoretics are also prescribed. In the second stage, guaiacum, camphor, arnica, antimonials, blisters to the neck, or behind the ears, frictions with opium over the eyebrows, and covering the eyes with bags of aromatic herbs and camphor, are the means of the relief. When abrasions, or ulcerations exist on the conjunctiva, sclerotica, or cornea, a collyrium of the lapis divinus, with a large addition of the vinous tincture of opium, is commended; or if the ulcers are large, and on the cornea itself, they may be touched with the latter tincture by means of a camel-hair pencil. After each use of the collyrium, Beer covers the eye again with the bags of aromatic herbs and camphor. (See *Weller on Diseases of the Eye, Vol.* 2, *p.* 218.) Respecting the last application, I have already expressed my belief, that it is one, which is not likely to obtain credit amongst English surgeons.

Scrophulous Ophthalmy. According to Mr. Travers, the inflammation of the conjunctiva, termed *strumous*, when it has not proceeded to a change of texture, is not marked by any prominent local character. "The vascularity is inconsiderable. This inflammation sometimes accompanies pustule of the sclerotic conjunctiva, in which case, the vascularity is diffused, instead of being partial, as in pure pustular inflammation, and the *intolerance of light, characteristic of the strumous inflammation*, is present in a greater or lesser degree. It accompanies also the morbid secretion of the lids, when the eye-ball becomes affected by the acuteness and duration of that disease, and the pustule on the cornea, especially the variolous pustule. In its simplest form, it is almost peculiar to young children, stationary, marked by a very slight redness of the sclerotic conjunctiva, and the greatest possible degree of intolerance (*of light*)." The same author attributes the disease to a morbid sympathy of the retina with the secreting surfaces of the primæ viæ and skin. The following is the treatment, proposed by Mr. Travers for each form of scrophulous ophthalmy:

1. *Strumous inflammation, without change of texture, vascularity more or less, intolerance* (of light) *excessive.* Calomel and opium at night; emetic tartar to continued nausea; gentle alvine evacuants; diaphoretic drinks; large open blister on the nape of the neck; leeches; tepid bath; tepid, or cold water washes, as most agreeable; vapour of opium; large bonnet shade; no bandages; spacious airy apartments; and light bed-clothing.

2. *With recent diffused opacity of the corneal conjunctiva, and vessels raised upon and overshooting the corneal margin.* Calomel and opium to slight ptyalism; purgatives on alternate days; leeches; blisters alternated behind the ears and on the nape of the neck and temples. As the acute stage passes off, repeated circular sections of the vessels on the sclerotica, near the margin of the cornea.

3. *With herpetic ulcers of the cornea.* The same; blisters on the temples; as the inflammation yields, solut. argent. nitrat.; vin. opii; solut. cupr. sulph.; dilute zinc lotion.

4. *With pustules.* If partial, weak zinc, or alum lotion; ung. hydrarg. nitrat.; occasional brisk purgatives; infusion of roses with additional acids; tonic bitters; columba; gentian, &c.; blisters behind the ears, repeated if necessary; if the vascularity is diffused by the multiplication of pustules, or the duration of inflammation, with irritability to light, treatment as in strumous inflammation without breach. Ung. sub-acet. plumbi.

5. *With inflammation of the follicles and puriform discharge.* Active measures at first, but not long continued. Blisters; when becoming chronic, with thickened lids, scarifications; zinc, alum, or copper wash, dilute; ung. hydr. nitrat.; hydr. nitr. oxid.; sub-acet. cupri; tonics and sedatives; if obstinate, issue or seton.

6. *Convalescent state.* Infusion of roses; cascarilla; columba; decoction of bark; with dilute sulphuric, or nitric acid; steel, rhubarb, and soda: or magnesia, as aperients; tonic collyria and gently stimulant ointments; nutritive diet; country air; shower, or sea-bath, in the warm months. (*Travers's Synopsis, &c. p.* 92—260, *&c.*)

When I look at the discordant accounts of what are called scrophulous affections of the eye, and the difference of practice laid down by different writers, I leave the subject with an impression, that the terms *scrophulous* and *strumous* are here employed as much at random as in any other cases, which can be specified. Indeed, the attempt to reconcile the various statements and descriptions of scrophulous ophthalmy, would puzzle the most able man in the profession; and it is with this belief, that I avoid contrasting the sentiments of Beer, Weller, Lloyd, and other modern writers with those already delivered. (See particularly *Beer's Lehre von den Augenkr. B.* 1, *p*, 588, *&c.*; *Weller's Manual of the Discases of the Eye, Vol.* 2, *p.* 265, *&c.*; *and Lloyd on Scrophula, p.* 312, *&c.*)

The following observations explain the practice of Scarpa, and the late Mr. Ware.

No specific being known for scrophula, the treatment, in this instance, rather consists in preventing the aggravation, than in attempting the radical cure of the complaint. Every thing debilitating is hurtful: as all evacuations; indigestible food; intense study; a sedentary life; damp marshy habitations; uncleanliness; frequent transitions from heat to cold. On the other hand, observing to regulate the action of the bowels with the mildest laxatives: and the administration of bark, either alone or conjoined with the tinct. guaiaci ammoniata, do good. Alterative medicines, and especially æthiops mineralis, from gr. ss. to gr. xx. in the day, taken for a few weeks uninterruptedly; liquor calcis, in broth or gruel, at first, in the dose of ℥iij. at breakfast, and afterwards the same quantity, twice daily for a few months; together with the uniform observance of a good regimen; may tend much to abbreviate the duration of this obstinate species of the disease. (*Scarpa.*)

Mr. Ware found, that the addition of xx. to xxx. gr. of the potassæ sulphas to each dose of bark, suffices to keep the bowels in a regular state, when there is a tendency to costiveness. In some cases, in which there was little appearance of inflammation, this gentleman found the eyelids so relaxed, and the eyes so irritable, that children would not open their eyes, even in the darkest room. In some of these relaxed cases, very beneficial effects were produced by administering internally small doses of opium, night and morning, to abate the irritability. Sea-bathing is always serviceable in scrophulous ophthalmy, and, probably the mere residence on the sea-coast, and the respiration of the sea-air, may bring about some of those advantages, which have been exclusively attributed to bathing. Friction of the body with a flesh-brush or flannel, should be employed morning and evening.

With regard to topical applications, those of a soft relaxing kind prove injurious, as also retirement in dark situations. Slightly astringent collyria; the ung. tutiæ, and the ung. hyd. nitrat. are proper when there are excoriations upon the eyelids, and when, from their occasional adhesion to each other, there is reason to suspect, that the secretion from the sebaceous glands has not its proper qualities. Mr. Ware also found that one drop of the thebaic tincture, dropped into the eye, once or twice in the course of the day, contributed greatly, both to abate the irritability, and to increase the strength of the relaxed vessels. (*On Scrophulous Ophthalmy, p.* 26.) The same gentleman occasionally mixed old verjuice with cold spring-water, at first, in the proportion of one part of the former to six of the latter, and sometimes increased the quantity of verjuice, until its quantity equalled that of the water. All coverings should be removed from the eyes, except a shade of green silk, and patients should be gradually habituated to a stronger light. Good air and exercise always tend to improve scrophulous constitutions, and thus, indirectly, the disease under consideration. Scrophula often disappears spontaneously, as children approach the adult state, and, if we only have it in our power to check its progress in the early stage of life, it seems to wear itself out afterwards, and whatever local effects, it may have produced, often disappear.

Chronic Ophthalmy.—Unfavourable peculiarities are met with in practice, which prevent the complete cure of the second stage of acute ophthalmy, or that connected with a weak vascular action in the part affected; whence the protracted disease becomes purely chronic, and threatens the slow destruction of the eye.

These peculiarities may be chiefly referred to three causes: 1. To an increased irritability continuing in the eye after the cessation of acute inflammation. 2. To some other existing affection of the eye, or neighbouring parts, of which the chronic ophthalmy is only an effect. 3. To constitutional disease.

1. That chronic ophthalmy may depend upon a morbid irritability of the eye is evinced, not only from its resisting topical astringents and corroborants, to which the disease from simple relaxation and weakness yields, but from its being exasperated by them, and even by cold water. The patient complains of a sense of weight in the upper eyelid, and restraint in opening it; the conjunctiva has a yellowish cast, and when exposed to the damp cold air, or a brilliant light, or when the patient studies by candle-light, its vessels become injected and turgid with blood. If, in combination with such symptoms, the habit of body be weak and irritable; subject to spasms; hypochondriasis, &c. then, it is manifest, that the chronic ophthalmy is connected with a general impairment of the nervous system.

2. Besides extraneous bodies, lodged between the palpebræ and eyeball, the inversion of the ciliæ, and hairs, growing from the caruncula lachrymalis; ulcers of the cornea; prolapsus of the iris; herpetic ulcerations of the margins of the eyelids; a morbid secretion from the Meibomian glands; a diseased enlargement of the cornea, or of the whole globe of the eye, &c. may occasion and maintain chronic ophthalmy. —It is only my part here to mention such remote causes; for, the particular treatment of them is described in other articles. (See *Cornea, Ulcers of; Iris, Prolapsus of; Lippitudo; Staphyloma; Hydrophthalmia; Trichiasis, &c.*)

3. The cure of the second stage of acute ophthalmy may be retarded by the prevalence of scrophula in the system; or by small-pox affecting the eyes. According to Scarpa, chronic ophthalmy is also sometimes a consequence of lues venerea; but, I know nothing certain on this subject, in addition to what has been stated in the foregoing columns.

When chronic ophthalmy depends upon preternatural irritability, the internal exhibition of bark with valerian is proper; animal food of easy digestion; gelatinous and farinaceous broths; wine in moderation; gentle exercise; living in salubrious and mild situations; are all severally productive of benefit. Externally, the applications should be of the sedative and corroborant kind; such as aromatic spirituous vapours (from the *spiritus ammon. comp.*) applied to the eye through a funnel, for half an hour, three or four times a day; and the eyelids and eyebrows may also be rubbed with the linimentum camphoræ.

Patients, both during the treatment, and after the cure, must refrain from straining the eye, and, immediately the least uneasiness is felt, must desist from exercising it. When they write, or read, it should constantly be in a steady, uniform light, and too little, as well as too much exercise of the organ, aggravates the disease. Having once begun to use spectacles, they should never study, or survey minute objects without them. (*Scarpa.*)

Intermittent Ophthalmy. It is the character of certain forms of ophthalmy, like the rheumatic and venereal, to be liable to periodical exacerbations; but, I am not certain, that there are any cases specifically claiming the name of *intermittent ophthalmy.* The late Mr. Ware, however, has noticed some examples, which intermitted, or, at least, remitted at stated periods. In these, he did not find bark so useful, as in scrophulous ophthalmy; but, he had seen the most beneficial effects produced by the oxymuriate of mercury, sometimes joined with the compound decoction of sarsaparilla. (See *Ware on Intermittent Ophthalmy.*)

Variolous Ophthalmy. As the small-pox inoculation has at present almost generally been abandoned by the faculty in favour of the vaccine disease, there seems less occasion now for detailing circumstantially a very obstinate species of ophthalmy, induced by the former complaint. When the small-pox eruption is very abundant in the face, it causes a considerable swelling of this part of the body; the eyelids become tumefied, the eyes redden, and there ensues a discharge of a very thick adhesive matter, which agglutinates the palpebræ together; so that, if no steps be taken, the eyes will continue closed for several days in succession. The matter, confined between the eyelids and globe of the eye, being perhaps of an irritating quality, and injurious from the pressure it occasions on the surrounding parts, seems capable of exciting ulceration of the cornea, and even of irremediably destroying vision. When the pustules of the small-pox in other parts of the body have suppurated, they cicatrize; but, those, which happen within the margin of the cartilage of the eyelids, are prevented from healing by the diseased secretion, which is then made from the Meibomian glands, and such ulcers result, as will sometimes last for several years, and even during life, if unremedied by art. (*St. Yves sur les Mal. des Yeux, p.* 216, *Edit.* 12*mo.*) After the employment of the antiphlogistic treatment, should the disease when treated with topical astringents and corroborants, yet baffle the efforts of the surgeon, setons in the nape of the neck, kept open for a long while, prove one of the most useful remedies. Scarpa has experienced much advantage from giving, every morning and evening, to a child ten years old, a pill, containing one grain of calomel, one grain of the sulph. aur. antim. and four grains of cicuta in powder. It is obvious, that so potent an alterative, if ever serviceable in this case, will soon evince its efficacy; nor would it be justifiable to sport with the patient's constitution by continuing its use beyond a certain period, unless sanctioned by evident signs of its salutary effects on the disease of the eyes.

When great irritability prevails, a mixture, of three drams of the vinum antimoniale, and one dram of the tinctura thebaica, given in doses of five, or six drops, in any convenient vehicle, and, at the same time, applying externally the vapours of the spiritus ammon. comp. to the eye, constitute an excellent plan of treatment. In other cases, saturnine collyria, with a little camphorated spirit of wine, or white wine, in which a little sugar is dissolved; tinct. thebaica; Janin's ointment, &c. avail most. This treatment is also applicable to the chronic ophthalmy from measles.

When inveterate ulcers remain upon the edges of the palpebræ, the disease may then be regarded as the psorophthalmy, described by Mr. Ware, and will demand the same method of cure. (See *Psorophthalmy.*)

Operation of discharging the aqueous humour. To this practice, some allusion has been already made in the preceding columns; and, as the proposal is intended to apply to several forms of inflammation of the eye, I have not given any particular account of it in treating of the various cases. Mr. Wardrop remarked, that if the eye of a sheep, or ox, be squeezed in the hand, the whole cornea instantly becomes cloudy, and whenever the pressure is removed, this membrane completely regains its transparency.—From this curious phenomenon in the dead eye, it was evident, that, in the living body, the transparency of the cornea might vary according to the degree of its distention; and that, in cases of opacity of the cornea, accompanied with fulness of the eyeball, its transparency might be restored by the evacuation of the aqueous humour. The cornea is little sensible, and, as every body knows, its wounds are free from danger. Mr. Wardrop soon met with a case, favourable for making the experiment; the cornea was milky and opaque, and the eyeball distended and prominent, attended with acute inflammatory symptoms. The aqueous humour was discharged by a small incision, and the operation produced not only a removal of the cloudiness of the cornea, but an abatement of the pain, and a sudden check to all the inflammatory symptoms. From the success of this case, Mr. Wardrop was led to perform the operation on others, not only with a view of diminishing the opacity of the cornea, but, also, of alleviating the inflammation. Four interesting cases are related by this gentleman, very much in favour of the practice, when the eye is severely inflamed, attended with fulness of the organ, a cloudy state of the cornea, and a turbidness of the aqueous humour. Mr. Wardrop also advises the operation, whenever there is the smallest quantity of pus, in the anterior chamber, accompanied with violent symptoms of inflammation. He thinks, that, the great and immediate relief, which the method affords, is imputable to the sudden removal of tension; and he performs the operation with a small knife, such as is used for extracting the cataract. The instrument is to be oiled, and introduced so as to make a wound of its own breadth, at the usual place of making an incision in the extraction of the cataract. By turning the blade a little on its axis, the aqueous humour flows out. (See *Edinb. Med. Surg. Journal, Jan.* 1807; *also Med. Chir. Trans. Vol.* 4.) Mr. Ware approved of Mr. Wardrop's operation in the *epidemic, purulent,* or *Egyptian Ophthalmy,* when, notwithstanding general evacuations, topical bleeding, mildly astringent lotions, and a strict antiphlogistic regimen, the symptoms still continue, and, especially, if the cornea begin to lose its transparency, and a white rim appear round its circumference. Mr. Ware did not object to using a small knife, of the kind employed in extracting the cataract; but preferred a lancet, or a sharp-pointed couching needle, with a blade somewhat wider than usual, and a groove in its middle. The instrument, he advises, to be introduced about one-tenth of an inch before the connexion of the cornea with the sclerotica, and pushed gently on, parallel to the plane of the iris, until the aqueous humour make its escape. (*On the Purulent Ophthalmy, p.* 41, 1808.) As already explained, Mr. Wardrop also recommends this practice in certain states of rheumatic ophthalmy. Consult *Avicenna, Canon. L.* 3, *Fen.* 3, *Tract.* 1, *cap.* 6. *Maître-Jan, Traité des Maladies de l'Œil,* 12*mo. Paris,* 1722. *St. Yves, Traité des Mal. des Yeux, p.* 176, *&c. Janin, Mém. sur l'Œil, &c.* 8*vo. Paris,* 1772. *L. F. Gendron, Traité des Mal. des Yeux,* 2 *T.* 12*mo. Paris,* 1770. *C. F. Reuss, Dissertationes Med. 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OSCHEOCELE. (from οσχεον, the scrotum, and κηλη, a tumor.) A hernia which has descended into the scrotum.

OSTEOSARCOMA, or **Osteosarcosis.** (from οστεον, a bone, and σαρξ, flesh.) This term signifies the change of a bone into a substance, of the consistence of flesh. Bones are sometimes converted into a soft, lardy, homogeneous substance, resembling a cancerous gland, and it is this affection, to which Boyer thinks, that the appellation ought to be confined.

Callisen seems also to regard the osteosarcosis as a disorder by which the texture of the bones is converted into a fleshy or fatty substance, accompanied with a tendency to carcinoma. (*System. Chirurgiæ Hodiernæ, p.* 204, *Vol.* 2, *Edit.* 1800.) We are to understand by osteosarcoma, says Boyer, an alteration of the osseous structure, in which, after more or less distention, the substance of the bone degenerates, and is transformed into a diversified mass, but, more or less analogous to that of cancer of the soft parts; while the local and general symptoms still more strikingly resemble those of the latter disease. (See *Traité des Mal. Chir. T.* 3, *p.* 587.)

According to this writer, all the bones are liable to such a disease; but, it has been more frequently observed in the bones of the face, those of the base of the skull, the long bones of the limbs, and particularly the ossa innominata, which are perhaps oftener affected than any other bones of the body. (*Op. cit. p.* 588.)

Foreign surgeons do not appear to entertain precisely the same ideas respecting cancer, which prevail in England: at least, they apply the term to many complaints in which there are no vestiges of a carcinomatous structure, and numerous diseases of an incurable nature receive abroad very indiscriminately the name of cancer. Thus, the French surgeons have not yet distinguished the strongly marked differences between carcinoma and fungus hæmatodes. (See *Roux*, *Parallèle de la Chir. Angloise, &c.*; and the article *Fungus Hæmatodes.*)

Fungous diseases in the antrum expand the bones of the face, make their way out, and present a frightful specimen of disease. This change of the bones, though known to have nothing to do with cancer, (see *Antrum*), is considered by Boyer as a kind of osteosarcoma, proceeding from carcinomatous mischief in the neighbouring soft parts; and this he adduces as an example of his first species of osteosarcoma, or that arising in consequence of previous disease in other parts. In the second species the disorder commences in the bones, and the soft parts are secondarily affected. In all cases, osteosarcoma comes on with deeply seated pain, which sometimes lasts a considerable time before any swelling is manifest. Sometimes the pain becomes more and more afflicting, and of the lancinating kind, impairing the health even before there is any change in the form of the limb. At length, the swelling takes place, occupying the whole circumference of the member. Its nature and situation are in some measure indicated by its hardness and depth. It is unequal and tuberculated, as it were. Pressure does not lessen its size, nor make the pain worse. The soft parts are still in their natural state. The tumor, however, grows more or less rapidly, and the lancinating pains become more severe. In time, the soft parts themselves inflame, and become painful. Sometimes, the skin ulcerates, and, in this very uncommon case, the sore presents a cancerous appearance. Hectic symptoms are induced, the patient gradually loses his strength, and, at length, falls a victim to the disease.

The alteration, which the structure of the bones undergoes in the osteosarcoma, (says Boyer), deserves great attention. Most frequently, when the disease has made considerable progress, and the tumor has existed a long while, the bony texture has disappeared more or less completely; in lieu of it, an homogeneous, greyish, yellowish, lard-like substance is found, the surface of a slice of which is smooth, much like that of a very hard white of egg, or old cheese, the consistence varying from that of cartilage to that of very thick bouillie. The surrounding soft parts, which have participated in the disease of the bones, are converted into a similar matter; muscles, tendons, periosteum, ligaments, vessels, cellular substance, all are confounded in the same homogeneous mass, and have undergone the same degeneration.

In some examples, the disease is less advanced: portions of the bone are then met with, whose texture and consistence are nearly natural, and which are merely somewhat enlarged. But, in proceeding towards the centre of the disease, the substance of the bone is found softened, and its consistence less than that of cartilage, still manifestly retaining, however, a fibrous texture; while, more deeply, it is converted into a lard-like substance, resembling (says Boyer) that of parts affected with carcinoma. In these tumors, cysts are often found, sometimes containing a fetid ichor,—sometimes a matter like clear bouillie; and, in certain cases, a quantity of semi-transparent, tremulous, gelatinous matter is found in the middle of the lard-like substance. Boyer records an instance, in which nearly the whole humerus was changed into a gelatinous mass. (See *Leçons sur les Mal. des Os. T.* 1, *Chap.* 22.)

The prognosis of this disease must always be unfavourable; for, it is equally incurable, and disposed to bring on fatal consequences, whether Boyer's opinion, concerning its being cancer of the bones, be true, or not. This author notices, that, even after amputation, the complaint almost always recurs. (*P.* 591.) The only chance of relief, however, obviously depends upon the possibility and success of the operation. In the *Traité des Mal. Chir. T.* 3, *p.* 594—605, Boyer records two cases of osteosarcoma; one of the thigh; the other, of the os innominatum. The first patient was saved by amputation. Osteosarcoma is the disease for which Dr. Mott successfully removed one half of the lower jaw, very nearly as far as the joint. (See *American Med. Recorder.*) And Dr. M'Clellan, of Philadelphia, has lately favoured me with the particulars of another case of osteosarcoma of the lower jaw, where the same operation was very skilfully executed. See *Boyer*, *Traité des Maladies Chir. T.* 3; *Haller's Element. Physiol. T.* 8, *p.* 2, *pag.* 5; *S. A. Kulmus*, *Diss. de Exostosi Steatomatode Claviculæ; Gedan.* 1732; *S. F. Hundertmark*, *Diss. sistens Osteosteatomatis Casum rariorem; Lips.* 1752; *S. G. Hermann*, *Diss. de Osteosteatomate*, *Lips.* 1767: *S. C. Plenck*, *de Osteosarcosi: Tub.* 1781, *&c.* *B. C. Brodie in Pathol. and Surgical Obs. on the Joints*, *p.* 301. *Dr. Cumin*, *in Edinb. Med. Journ. Jan.* 1825. See Preface to the present edition of this Dictionary.

OZÆNA. (from οζη, a stench.) An ulcer, situated in the nose, discharging a fetid purulent matter, and sometimes accompanied with caries of the bones. Some authors have signified, by the term, an ill-conditioned ulcer in the antrum. The first meaning is that which mostly prevails. The disease is described, as coming on with a trifling tumefaction and redness about the ala nasi, accompanied with a discharge of mucus, with which the nostril becomes obstructed. The matter gradually assumes the appearance of pus, is most copious in the morning, and is sometimes attended with sneezing, and a little bleeding. The ulceration occasionally extends round the ala nasi to the cheek, but, seldom far from the nose, the ala of which, also, it rarely destroys. The ozæna is often connected with scrophulous and venereal complaints. In the latter cases, portions of the ossa spongiosa often come away. After the complete cure of all venereal complaints, an exfoliating dead piece of bone will often keep up symptoms, similar to those of the ozæna, until it is detached. Mr. Pearson remarks, that the ozæna frequently occurs, as a symptom of the cachexia syphyloidea. It may perforate the septum nasi, destroy the ossa spongiosa, and even the ossa nasi. Such mischief is now more frequently the effect of the cachexia syphiloidea, than of lues venerea. The ozæna must not be confounded with abscesses in the upper jawbone. (See *Antrum.*)

The constitutional disease, on which the ozæna generally depends, and which acts as the remote cause, must be relieved, before a cure of the local effect can be expected. The internal medicines, which may be necessary, are preparations of mercury, and antimony; sarsaparilla, elm bark, Peruvian bark, muriated barytes, and muriate of lime. Sea-bathing may also do good, by improving the health. The best external applications are said to be, preparations of copper, zinc, arsenic, mercury, the pulvis sternutatorius, and diluted sulphuric acid. (*Pearson's Principles of Surgery*, *Chap.* 12. *F. A. Mayer*, *Commentatio de Ozæna*, *Frank. Del. op.* 11.)

OXYMURIATIC ACID. Besides the nitrous and nitric acids, other medicines, containing a large proportion of oxygen, and easy of decomposition, have been recommended to be tried as remedies for the venereal disease; viz. oxygenated vinegar, oxalic acid, oxygenated muriate of potash, &c. (See *Caldwell's Medical Theses*, *Vol.* 1, *p.* 111.) But, perhaps, nothing has been put to the test of experiment with greater expectation of success, than the oxygenated muriatic acid. Mr. Cruikshanks made a very early trial of it in syphilitic cases, and, as is alleged, with the utmost benefit. He also employed the nitric acid, and the oxygenated muriate of potash, and found them eligible remedies. The latter medicine was likewise given by M. Alyon in cases of chancre and secondary ulcers, who found the good effects from it more expeditious, and more certain, than those of any mercurial preparation. (*Essai sur les Propriétés Médicinales de l'Oxygène, &c. 8vo. Paris, an 7ième.*) On the other hand, as much contrariety of sentiment, respecting the real and permanent efficacy of all these medicines, prevails in the numerous reports about them, as in the accounts delivered of the effects of the muriatic and nitric acid; and, therefore, I do not think, that the reader, after the copious statements given in this book concerning the *nitric* and *nitrous acids*, (see *these words*) would be pleased to hear again a repetition of very similar contradictions, respecting the oxygenated muriatic acid. I may observe, however, that, if oxygen be the principle, on which the efficacy of many antisyphilitic remedies truly depend, this acid must possess greater virtue than the common muriatic acid. From ʒss. to ʒij. mixed in ℥viij. of water, sweetened with syrup, may be taken in divided doses in the course of the day.

Oxygenated muriatic acid was strongly praised by Guyton de Morveau, as a means of disinfecting sick-rooms, and purifying the air of crowded hospitals.

P.

PANA'RIS. (from ϖαρα, near, and ονυξ, the nail.) See *Whitlow.*

PANNUS. When two, or three pterygia, of different sizes, occurred on the same eye, with their points directed towards the centre of the cornea, where they met, and covered all the surface of this transparent membrane with a dense pellicle, the ancients named the disease *pannus.* (*Scarpa*, *Chap.* 14.)

PARACENTE'SIS. (from ϖαρακεντεω, to perforate.) The operation of tapping or making an opening into the abdomen, thorax, or bladder, for the purpose of discharging the fluid confined in these parts in cases of ascites, empyema, hydrothorax, and retention of urine. Effused blood may also require an opening to be made into the chest; and so may confined air in the instance of emphysema.

TAPPING, OR PARACENTESIS ABDOMINIS.

When the swelling extends equally over the whole abdomen, the fluid is usually diffused among all the viscera, and is only circumscribed by the boundaries of the peritonæum. The water is occasionally included in different cysts, which are generally formed in one of the ovaries; and, in this case, the tumor, which is produced, is not so uniform, and the fluctuation not so distinct, as in peritoneal dropsy, at least, while the disease has not made great progress. The difference also in the consistence of the fluid, may render the fluctuation more, or less difficult of detection. When the water is contained in different cysts, it is frequently thick, and gelatinous; but, when it is uniformly diffused all over the cavity of the peritonæum, it is generally thinner, and even quite limpid. Sometimes a considerable number of hydatids are found floating in the fluid. With regard to the symptoms of common ascites, the disease is attended with great uneasiness, from all kinds of pressure on the abdomen; a gradual swelling of this part of the body, not inclining more to one side, than the other; a fluctuation perceptible when the surgeon lays his hand on one side of the tumor, and gently taps, on the opposite side of it; considerable difficulty of breathing, caused by the collection of fluid interrupting the action of the diaphragm, and obliging the patient to lie with his chest very much raised; constant thirst, &c. According to Sir A. Cooper, the most common cause of ascites is disease of the liver, which has the effect of impeding the circulation of the blood, in the vessels of most of the other abdominal viscera. He also enumerates, as other causes, an enlargement of the spleen, which presses upon, and irritates the peritoneum, so as to determine an increased flow of blood to it, and an effusion of serum; great debility of the system, induced by fevers, or mercury; diseases of the heart and lungs, in which cases, the ascites is generally combined with hydrothorax. (See *Lancet*, *Vol.* 3, *p.* 2.)

Whatever may be the efficacy of digitalis, mercury, diuretics, and calomel, squills, and other evacuants, in ascites, they are rarely of any service in cases of local and encysted dropsies. When such swellings continue to enlarge, notwithstanding the adoption of a few measures which will presently be suggested, the sooner the fluid is evacuated, the better. It is also well known, that all efforts to produce a radical cure even of dropsies, which are not encysted, too frequently fail I am decidedly of opinion, however, with Dr. Fothergill, that physicians would meet with much more success, in the treatment of ascites, if they were to recommend paracentesis to be done sooner, than they generally do. This operation is, for the most part, much too long delayed; and during a long space, the bowels are continually suffering, more and more, from the effect of the large quantity of fluid which oppresses them. What ought to render the practice of early tapping more entitled to approbation, is, that the operation, when done in the situation, which will be presently advised, is perfectly free from danger, attended with very little pain, and need not interrupt the further trial of such medicines, as the physician may place confidence in. Paracentesis only becomes a serious measure, when the disease has existed for a great length of time, and the patient has been much weakened by it. Indeed, there seems much reason to suspect, that the operation should be done, as soon as the tension of the abdomen, and the fluctuation, leave no doubt, concerning the nature of the malady; especially, when the first trials, which have been made of internal remedies, seem to promise no success. Dr. Fothergill has demonstrated by facts, the advantages of this method. On the commencement of an ascites, this celebrated practitioner advises the trial of diuretics and other evacuants. He then adds, that, "if by a reasonable perseverance in this course, no considerable benefit accrues; if the viscera do not evidently appear to be obstructed, and unfit for the purposes of life; if the complaints have not been brought on by a long habitual train of intemperance, and from which there seems little hope of reclaiming the patient; if the strength and time of life are not altogether against us; I desist from medicine, except of the cordial kind; and let the disease proceed, till the operation becomes safely practicable. When this is done, by the moderate use of the warmer diuretics, chalybeates and bitters, also the preparations of squills, in doses below that point, at which the stomach would be affected, I endeavour to prevent the abdomen from filling again." (*Med. Obs. and Inq. Vol.* 4, *p.* 112.) The same author remarks, with regard to encysted dropsies, that tapping sometimes effects a radical cure.

The operation should not only be performed in as early a stage of the disease as is compatible with the safety of the parts within the abdomen, it should also be repeated as soon as the quantity of fluid accumulated again is sufficient to make the puncture practicable without danger. Desault used to tap dropsical patients once a week, and, in many cases, after he had performed the operation two or three times, the disease was stopped.

However, with respect to early tapping in ascites, one fact, mentioned by Sir A. Cooper in his lectures, ought to be known, namely, that dropsy, arising from the debility caused by fever, or a course of mercury, and attended with diseased liver, spleen, or disorganization of other important organs, may often be cured by medical treatment, without any operation at all, and he therefore disapproves of paracentesis in such cases, as long as the fluid is not sufficiently copious to hinder the risk of the bowels being hurt by the trocar. As soon as this risk ceases, however, the practice seems commendable, because it will rather promote, than retard, the good effect of any other means, which may be deemed advisable. At the same time, I ought to mention the opinion of the above distinguished practitioner, that the operation itself will never bring about a cure, except where the disease has proceeded from the debility left by some kind of fever, or the abuse of mercury.

The great number of times that the operation has been repeated in some individuals is surprising; for instance, twenty-nine times (*Schmucker, Wahrnehmungen,* 2 *B. p.* 102); forty one (*Med. Communications, Vol.* 2); fifty-two (*Schmucker, Vol. cit. p.* 187); sixty-five (*Mead*); one hundred (*Callisen, Syst. Chir. Hodiernæ, Vol.* 2, *p.* 55; one hundred and fifty-five (*Phil. Trans. Vol.* 69); and if it be possible to credit Bezard, even six hundred and sixty-five times upon one woman in the courses of thirteen years. When the patient died, the peritoneum was found to be three lines in thickness. The omentum, mesentery, and even the liver, gall-bladder, spleen, pancreas, kidneys, and bladder, had almost disappeared, a scirrhous mass containing pus occupying their place towards the right side. (See *Bulletin de la Société Med. d'Emulation, No.* 12. *Dec.* 1815.)

Whenever a considerable quantity of fluid is suddenly let out of the abdomen by tapping, the quick removal of the pressure of the water off the large blood vessels, and viscera, may produce swooning, convulsions, and even sudden death. These consequences led the ancients to consider paracentesis as a very dangerous operation, and, when they ventured to perform it, they only let out the water gradually, and at intervals.

Dr. Mead, after considering what might occasion the bad symptoms resulting from too sudden an evacuation of a large quantity of fluid from the abdomen, was led to try what effect external pressure would have in preventing such consequences. This practitioner thought, that, in this way, he might keep up the same degree of pressure, which the fluid made on the viscera. The success, attending some trials of this plan, fully justified the opinion Dr. Mead, had conceived; for when the compression is carefully made, the whole of the water, contained in the abdomen of a dropsical patient, may be safely discharged, as quickly as the surgeon chooses. For this purpose, however, the whole abdomen must be equally compressed, the pressure increased in proportion as the evacuation takes place, and kept up in the same degree, for several days afterwards. While the water is flowing out, the necessary degree of pressure is usually made with the sheet which is put round the abdomen. Two assistants, who hold the ends of the sheet, gradually tighten it, in proportion as the fluid is discharged. Immediately, after the operation, some folded flannel, sprinkled with spirit of wine, is laid over the whole anterior part of the belly, and covered with a broad linen roller. applied with due tightness round the body. Dr. Monro invented a particular kind of belt, for the purpose; but, though it may be well adapted to the object in view, it is, perhaps, unnecessary, as the above method seems to answer every end.

The instrument used for tapping the abdomen, is called a trocar. (See *Trocar.*)

Of this instrument there are several varieties; but, Richter and many other experienced surgeons, give a decided preference to the common trocar. Most of the modern alterations, which have been made in the construction of trocars, have only tended, says Richter, to render the employment of these instruments more difficult. There is no reason for the ordinary objection, that the common trocar cannot be introduced without considerable force. If the part, into which it is about to be passed, be made tense, very little force will be necessary, especially, if care be taken to rotate the instrument gently, as well as push it forward. Hence, all the inventions, which have originated from this supposed imperfection, are represented by Richter to be entirely useless. He condemns the trocar with a double-edged point, as a bad instrument. The proposal of Mr. Cline to make a puncture with a lancet first, and then to introduce into the opening a blunt-pointed trocar, is alleged to be superfluous. Nay—these innovations are declared to be worse than useless. A cutting instrument is liable to injure blood vessels, and bring on a weakening degree of hemorrhage; and it is said, that the wound thus made does not heal so readily, as that made with a common trocar. That sharp edged instruments are attended with the inconvenience of being apt to wound enlarged veins, and produce an unpleasant degree of hemorrhage, is a truth, of which I have myself met with a convincing example. A female, who had a strong aversion to being tapped with a trocar, prevailed upon me to make the opening with a lancet. The puncture was made in the linea alba, about three inches below the navel. A stream of dark-coloured venous blood continued to run from the wound, the whole time the water was flowing out of the cannula, and did not cease until a compress was applied. The quantity of blood lost could not be less than a pint, or a pint and a half. In many cases, the loss of so much blood would prove fatal to dropsical patients, and is what one must always feel anxious to avoid.

The position, commonly selected for the operation, is that in which the patient sits in an armchair. However, weakness and other circumstances frequently make it necessary to operate on the patient, as he lies on his side sufficiently near the edge of the bed; and this posture has one decided advantage, viz. that it tends to prevent the alarming syncope, which the sudden removal of the pressure of the fluid from the diaphragm and abdominal viscera almost always brings on in the erect position.

Until of late, the place, in which surgeons used to puncture the abdomen, in cases of ascites, was the centre of a line, drawn from the navel to the anterior superior spinous process of the ilium, and, on the left side, which was preferred, in consequence of the liver not being there. The place, for the puncture, was usually marked with ink, and was supposed to be always situated just over a part of the linea semilunaris, where there is no fleshy substance, nor any large blood vessel, exposed to injury. This calculation, however, was made, without considering, that, in dropsy, the parietes of the abdomen do not yield equally in every situation. On the contrary, it is known, that the front is always more distended, than the lateral parts, and that the recti muscles, in particular, are sometimes very much widened. In consequence of these alterations, induced by the disease, no dependence can be put on any measurement, made with the view of ascertaining the precise situation of the linea semilunaris. The surgeon, who trusts to his being able to introduce the trocar exactly in this place, from any calculation of the above kind, will frequently wound a great thickness of muscle, instead of a part, where the abdominal parietes are thinnest. But, a still stronger objection is to be urged against the practice of attempting to tap in the linea semilunaris. Men, well acquainted with anatomy, have frequently been deceived in their reckoning, and, instead of hitting the intended line with their trocars, they have introduced these instruments through the rectus muscle, and wounded the epigastric artery. Patients have died from this error, with large extravasations of blood in the cavity of the peritonæum. In a dropsical person, who has been tapped, it is to be observed also, that an effusion of blood in the abdomen will of course more readily take place, in consequence of the parts not being in the same close, compact state, in which they are in the healthy condition.

Let every prudent practitioner, therefore, henceforth abandon the plan of tapping in the linea semilunaris; and he may the more easily make up his mind to do so, as there is another place, where the operation may be done with the utmost facility and safety. The linea alba is now commonly preferred by the best surgeons; because, here no muscular fibres need be wounded, the place can be hit with certainty, and no large blood vessel can be injured. About the middle point, between the navel and pubes, is as good a situation for making the puncture, as can possibly be chosen. The surgeon should introduce the trocar in a steady, firm manner, never in an incautious, sudden way, lest parts contained in the peritonæum should be rashly wounded. For the same reason, immediately the point of the trocar has entered the abdomen, a thing always known at once, by the sudden cessation of resistance to its passing inward, it should be introduced no further, and its office of making a passage for the cannula is already accomplished. The surgeon, consequently, is now to take hold of the cannula with the thumb and index finger of his left hand, and gently insinuate it further into the cavity of the peritonæum, while with his right hand, he is to withdraw the stilette. The fluid now gushes out, and regularly as it escapes, the sheet, which is round the patient's body, is to be tightened. All the water having been evacuated, a piece of flannel and a roller are to be immediately applied, as above explained, a piece of lint and soap-plaster having been previously applied to the wound.

It is not uncommon for the water suddenly to stop, long before the full quantity is discharged. Sometimes, this happens from a piece of intestine, or omentum, obstructing the cannula. This kind of stoppage may be removed by just introducing a probe or director, and holding the portion of bowel back. When the water is very viscid, the only thing we can do is to introduce a large trocar, if doing so should promise to facilitate the evacuation. Also, when hydatids obstruct the cannula, a larger instrument might allow them to escape. In encysted dropsies, the practitioner, of course, can only let the fluid out of those cavities which he can safely puncture.

When a dropsy of the ovary is very large, it also admits of being tapped in the linea alba; but, in this particular case, it is generally best to make the puncture where the swelling is most prominent. In this disease, the ovary is either converted into one large cavity, filled with fluid, or else it contains several distinct cells. Sometimes the cyst consists of the membranous covering of the ovary; sometimes of an enormous hydatid. The contents are sometimes exceedingly viscid. In the early stages of the case, the tumor is situated towards one side of the abdomen, just above Poupart's ligament, and seems to ascend out of the pelvis. This kind of progress at once distinguishes the disease from a common ascites, which is attended, from the first, with an equal, gradual, universal swelling of the abdomen. The magnitude (which the disease may attain,) may be judged of by the fact, that twelve or fifteen gallons of fluid have sometimes been contained in the cavity, or cavities of the cyst. The cyst of the ovary, when it has attained a large size, generally adheres, in different places, to the inner surface of the peritonæum, and, in this state, the whole abdomen often seems uniformly swollen, in consequence of the immense magnitude of the disease. (See *G. D. Motz, de Structurâ, Usu, et Morbis Ovariorum,* 4to. *Jenæ*, 1788.) It is an observation made by Sir A. Cooper, that one of the principal differences between ascites and ovarial dropsy, is that the latter is in itself quite a local disease, just like a hydrocele. This observation, I believe, is perfectly correct, and, though great illness, frequently arises, it is generally the result of the pressure made by the swelling on the parts within the abdomen and pelvis. The impairment of the health, arising from the pressure of the viscera, and interruption of their functions and the great difficulty of breathing, produced by the pressure on the diaphragm, indeed make it necessary to et out the fluid, and paracentesis must be done, in the way already related. The disease is often attended with an almost total stoppage of the secretion of urine. Sometimes, the urine is duly secreted, but a retention occurs, so that the use of the catheter becomes indispensable. With few exceptions, tapping can only be regarded as a palliative measure; the water collects again, the same grievances recur, and the operation must be repeated. While an ovarial dropsy is recent, and even after it has been tapped, some attempts may be made to effect a radical cure. But, this is not to be done with mercury, or any other medicine yet known. Blistering the surface of the abdomen, keeping up a discharge with the savine cerate, and applying a tight roller, have been known to do good. In France, the celebrated Le Dran laid open the cysts of ovarial dropsies. His patients did not die of the consequent inflammation, and the dropsy, indeed, was cured; but, there remained either a sarcomatous enlargement of the ovary, which continued to increase till death, or else incurable fistulæ, leading into the cyst. The large size of a wound, necessary for this purpose, the danger of inducing inflammation in so extensive a surface, as the cyst of a large ovarial dropsy, and the events of Le Dran's cases, are circumstances, on the whole, which ought to keep the practice from ever being revived.

A still more absurd plan has been attempted, viz. to cure the disease by injections, like hydroceles. I formerly saw two cases, in which port wine and water were injected by the late Mr. Ramsden of St. Bartholomew's Hospital; one patient died very soon afterwards of inflammation. and the other perished more lingeringly from the same cause. Setons have been tried without success.

In the American Recorder a case is published, in which a cure was effected by the excision of the sac. Dr. N. Smith also performed such an operation with success: after exposing the tumor by an incision, and discharging seven pints of a dark ropy fluid with a trocar, he extracted the whole cyst, and the patient recovered. (See *Edinb. Med. and Surg. Journ. No.* 73.) The sac brought out with it a considerable portion of adherent omentum, which required to be separated with the knife, and two bleeding vessels were tied. The omentum was then reduced, and the adhesions of the sac to one point of the parietes of the abdomen also separated partly with the scalpel, and partly with the finger. These few particulars show, that though the operation may be practicable and even end well, it is liable to great difficulties in its execution, and dangerous and fatal consequences in its result. In fact, one surgeon, mentioned by Sir A. Cooper, who began the operation of this kind, was prevented by the extent of the adhesions from completing it. Whenever the attempt is made, it ought to be while the cyst is of moderate size. An instance in which the operation was attempted, while the disease did not exist, has been fairly and candidly laid before the public by Mr. Lizars, with other interesting observations and cases in favour of the practice of extirpating diseased ovaries. (*Edinb. Med. Surg. Journ. No.* 81.)

An example is mentioned by Dr. Granville in which several encysted tumors of the right ovarium, (one as large as a full grown fœtus's head,) were discharged, with a collection of matter, through an ulcerated opening in the parietes of the abdomen. (See *Med. Phys. Journ.*; *June*, 1822.)

PARACENTESIS OF THE THORAX.

The necessity for this operation is indicated, when the heart, or lungs, are oppressed by any kind of fluid confined in the cavity of the chest. Every body knows, that the free and uninterrupted performance of the functions of these organs is essential to the support of life. When their action is disturbed by the lodgment of any kind of fluid in the thorax, no internal medicines can be much depended upon for procuring relief. The only means, from which benefit can be rationally expected, is letting out the fluid, by making an opening in the parietes of the chest.

The nature of the effused fluid can make no difference, in regard to the propriety of discharging it in this manner; and, though some authors describe this operation, as only applicable to cases of hydrops pectoris and empyema, it may also be of the greatest service when air is confined in the chest (see *Emphysema*,) or blood extravasated there (see *Wounds of the Thorax*,) so as to make dangerous pressure on the lungs and diaphragm. The case, in which it is least likely to be followed by a perfect recovery is hydrothorax; and Sir A. Cooper, in his vast experience, has never seen an example where the patient recovered after paracentesis for hydrothorax, which, he considers by no means surprising, as the collection of fluid, is the effect of disease of the thoracic viscera, the heart, or lungs, &c. (*Lancet, Vol.* 3, *p.* 13.) A case of success, however, is mentioned in the references at the end of the present article.

In this place, I shall content myself with describing the best method of performing paracentesis thoracis, referring the reader to the above articles for the particular symptoms and circumstances, which may render the operation proper, and the rest of the surgical treatment peculiar to each affection.

The safest, and most convenient situation, for making an opening into the chest, is between the sixth and seventh true ribs, on either side, as circumstances may render necessary. The surgeon should always recollect, that the two cavities of the pleura are completely distinct from each other, and have no communication whatsoever, so that, if fluid were contained on the left side of the thorax, making an opening into the right cavity would not serve for discharging the accumulated matter. The practitioner should also remember, that, when there is a fluid on both sides of the chest, paracentesis must never be done for the relief of the two collections, at the same time; because, there is great reason to believe, that, as the lungs on one side usually collapse, when there is a free communication between the air and inside of the thorax, they would do so on both sides, were an opening made at the same time into each bag of the pleura. It is hardly necessary to remark, that in this condition, the patient could not breathe, and would die suffocated. The operation consists in making an incision, about two inches long, through the integuments, which cover the space between the sixth and seventh true ribs, just where the indigitations of the serratus major anticus muscle meet those of the externus obliquus. Here it is unnecessary to divide any muscular fibres, except those of the intercostal muscles, and, by putting the patient in a proper posture, the opening that is to be made, will be depending enough for any purpose whatsoever. The surgeon, avoiding the lower edge of the upper rib, where the intercostal artery lies, is then cautiously to divide the layers of the intercostal muscles, till he brings the pleura into view; when this membrane is to be very carefully divided with a lancet. The instrument should never be introduced in the least deeply, lest the lungs should be injured. The size of the opening in the pleura should never be larger than necessary. The discharge of blood and matter will of course require a freer aperture, than that of air or water. If requisite, a cannula may be introduced into the wound, for the purpose of facilitating the evacuation of the fluid, and it may even in some cases be proper to let this instrument remain in the part, in order to let the water, or pus escape, as often as another accumulation takes place. It is obvious, however, that a cannula, for this object, should only be just long enough to enter the cavity of the pleura, and should have a broad rim to keep it from slipping into the chest. A piece of sticking-plaster would easily fix the cannula, which might be stopped up with a cork, or any other convenient thing, or left open, according as the circumstances of the case, and the judgment of the surgeon, should direct.

Paracentesis of the abdomen, and that of the thorax, are described in all treatises on the operations, and systems of surgery. The works of Sharp, Le Dran, Bertrandi, Callisen, Richter, Sabatier, Larrey, and Boyer, are particularly deserving attention. A case, in which eleven pints of a fluid, resembling whey, were discharged from the chest by paracentesis, and the patient recovered, is detailed by Dr. Archer in the Trans. of the King's and Queen's Colleges of Physicians in Ireland, Vol. 1, *art.* 1. *N. Friedreich, Vorzüge des Bauchstiches in der Bauchwassersucht,* 12*mo, Wurzb.* 1816, 1817.

For an account of the paracentesis of the bladder, refer to *Bladder, Puncture of.* Consult also *Emphysema, Empyema,* and *Wounds of the Thorax.*

PARAPHYMO'SIS, or PARAPHIMOSIS. (from παρα, back, and φιμοω, to bridle.) This signifies the case, in which the prepuce is drawn quite behind the glans penis, and cannot be brought forward again. See *Phymosis,* with which it will be considered,

PARONY'CHIA. (from παρα, near, and ονυξ, the nail.) An abscess at the end of the finger near the nail. See *Whitlow.*

PAROTID DUCT. Every one acquainted with anatomy is aware, that behind the jaw, on each side, there is situated a large conglomerate gland, being the principal one of such as are destined to secrete the saliva, with which the cavity of the mouth, and the food, which we swallow, are continually moistened. The parotid duct crosses the cheek, being situated about one-third from the zygoma, and two-thirds from the basis of the jaw. After passing over the masseter muscle, it pierces the buccinator, and terminates in the mouth by a considerable orifice, opposite the space, between the second and third bicuspid grinders of the upper jaw. As soon as it has passed the masseter, it dives deeply into the fat of the cheek, and, as M. Louis observes, makes an angle before it opens into the mouth. (*Mém. de l'Acad. de Chir. T.* 3, *p.* 457.)

From the situation of the parotid duct it is liable to be wounded, and this has even been done with the surgeon's lancet, through ignorance. (See *Monro's Works, p.* 520.) In cases of this kind, the continual escape of saliva may prevent the wound from healing, and, what is called a *salivary fistula* would be the perpetual consequence, if no steps were taken to afford relief. The parotid duct has sometimes been ruptured by blows. (*Œuvres Chir. de Desault, T.* 2, *p.* 221.) Cases also occur, in which the face becomes considerably swollen, in consequence of the saliva insinuating itself into the cellular substance, just as air does in emphysema. Respecting the last circumstance, I shall only just mention, that mischief of this kind may always be prevented from becoming very extensive, by making a depending opening for the ready escape of the fluid.

With regard to the treatment of salivary fistulæ, if the division of the parotid duct is recent, the sides of the wound should be brought into contact, and a steady pressure maintained on that part of the cheek, by means of suitable compresses, and a roller. In this manner, a salivary fistula may often be prevented altogether; either the divided ends of the duct reunite, and the spittle resumes its original course into the mouth; or, what is more probable, the wound in the face heals at every part, with the exception of a small fistulous track, which serves as a continuation of the duct into the cavity of the mouth. The latter kind of cure, however, can only take place when the wound extends quite through the cheek; but the chance of the two portions of the duct uniting, and becoming continuous again, should always be taken in recent cases.

When a salivary fistula is actually formed, a seton, introduced from the external fistulous orifice into the mouth, is a method which has justly received considerable approbation. Monro adopted it with success; he kept in the seton till the channel, which it had formed, had become fistulous, after which it was withdrawn, the external orifice being touched with the argentum nitratum, healed up, and the saliva in future flowed through the artificial fistulous channel into the mouth.

Desault used to practise the seton as follows:—He introduced two fingers of his left hand into the patient's mouth, and placing them between the teeth and the cheek, opposite the fistula, thus kept the integuments tense, and the gums from being injured. He then introduced a small hydrocele trocar, with its cannula, just before the opening of the posterior part of the duct, and pushed it through the cheek, in a direction a little inclined forward. An assistant now took hold of the cannula, while Desault withdrew the perforator, and passed through the tube a bit of thread into the cavity of the mouth. The cannula was next taken out, and a seton, which was then fastened to the end of the thread n the mouth, was drawn from within outward; but not so far as to come between the edges of the external opening, where the thread alone lodged, and this was fastened with sticking-plaster to the outside of the cheek. The outer wound was dressed with lint and compresses. Desault used to change the seton daily, introducing regularly rather a larger one, and taking especial care not to bring it between the edges of the wound, which was afterwards covered with sticking plaster. He enjoined the patient not o move the jaw much, and only allowed him, for some time, liquid food. In about six weeks, he used to omit the seton, leaving in the thread, however, for a little while longer. This being taken away, he used to finish the cure, by touchng the little aperture remaining, with caustic.

The making of an artificial passage is one of he most ancient plans of curing salivary fistulæ. Every author has had his particular method of doing it, and numerous variations are to be met with, either in the instrument employed for piercing the cheek, or in the substance intended for maintaining the opening. For the first step of the operation, surgeons sometimes used the actual cautery, as Saviard furnishes us an instance of; sometimes an awl, as Monro did; sometimes a common knife, or lancet; sometimes a straight needle, which drew in the thread after it; but, Desault's trocar is to be preferred to such means, because the cannula, by remaining in the wound, after the perforator is withdrawn, allows the thread to be introduced, which in every other way is either difficult to accomplish, or requires the use of several instruments.

For the second step of the operation, viz. keeping the opening distended, cannulæ were employed by Duphenix, who used to make a suture over them; a plan objectionable, inasmuch as it was attended with the inconvenience of a solid body left in the parts, and also that of the instrument being apt to slip into the mouth. M. Beclard lately cured a salivary fistula by the formation of a new passage at the inside of the cheek, by means of a leaden style, which was made to reach the excretory duct, at the point, where its continuation was interrupted. The outer opening was then made a fresh bleeding wound, and united with the twisted suture. This is the second example of the success of the method in the hands of this able practitioner. When the case will admit of the employment of the twisted suture, Beclard's plan is a good one, because the cure will be more speedily effected by it, than the seton. (See *Monro's Works*; *Œuvres Chir. de Desault, par Bichat, T.* 2, *p.* 221. Also *Mém. de l'Acad. de Chir. T.* 3. *J. B. Siebold, Diss. sistens Historiam Systematis Salivalis physiologice et pathologice considerati, fol. Jenæ*, 1797. *Beclard, in Archives Gén. de Med. Juin*, 1823.)

PAROTID GLAND, EXTIRPATION OF. (See *Tumors.*)

PARU'LIS. (from ϖαρα, near, and ȣλον, the gum.) An inflammation, boil, or abscess in the gums.

PE'NIS, AMPUTATION OF. No part of the penis should ever be amputated, on account of a mortification, because the dead portion will be naturally thrown off, and the ulcer heal, without the least occasion for putting the patient to any pain by the employment of the knife. Some cancerous, and fungous diseases, are the cases, in which it is often really proper and necessary to amputate more or less of this organ.

However, before a surgeon ventures to do the operation, he ought to be certain that it is the substance of the penis, which is incurably diseased; for, as that judicious surgeon Callisen remarks, tumors, excrescences, ulcers, and gangrenous mischief, of the prepuce, sometimes present appearances, which may lead an inexperienced practitioner to fancy the whole thickness of the part affected with irremediable disorder, while the glans is actually in a sound state. Hence, whenever the least doubt exists, it is better to remove first the prepuce and skin, in order that the true condition of the glans may be detected. (*Systema Chirurgiæ Hodiernæ, pars posterior, p.* 420, *Hafniæ*, 1800.)

The old surgeons, fearful of hemorrhage, used sometimes to extirpate a part of the penis, by tying ligatures round it with sufficient tightness to make it mortify, and slough off. Thus, Ruysch once performed the operation. (See *Obs.* 30.) The plan, however, is exceedingly painful, and, notwithstanding the authority of Heister, has been most properly rejected from modern surgery.

The amputation may be done in the following manner:—A circular incision is to be made through the skin, about a finger-breadth from the cancerous part. As Callisen observes, it is hardly ever requisite to draw the skin back, before it is cut; because after the corpora cavernosa are divided, they retract so considerably, that there is always a sufficiency of the integuments. (*Syst. Chir. Hodiernæ, pars posterior, p.* 421.) As soon, therefore, as the circular incision through the skin has been made, the corpora cavernosa and urethra are to be cut through, by one stroke of the knife, on a level with the cut edges of the integuments. Sabatier even advises us to draw the skin towards the glans penis, before we employ the knife, so convinced is he of the inutility of saving any of it, and of the inconveniences which may result from its lying over and obstructing the orifice of the urethra. His mode of operating is also particularly simple, as he cuts through the integuments and penis together by one stroke of the knife, without making any preliminary circular division of the skin. (*Médecine Opératoire, T.* 3, *p.* 305, *Edit.* 2.)

The bleeding arteries are now to be immediately tied: the chief are, one on the dorsum of the penis, and one in each corpus cavernosum. When a general oozing from the wound still continues, some recommend (*White, Hey, &c.*) applying sponge to its surface; others (*Latta*) finely scraped agaric, with a small proportion of pounded white sugar, or gum arabic. Perhaps, however, finely scraped lint, supported with compresses, would be quite as effectual as any styptics, and, certainly, the latter applications should be avoided, if possible, because stimulating, and productive of pain and inflammation. A surer and preferable method of stopping the oozing of blood, and at the same time of healing the wound, might be to bring the skin forward over the end of the stump, with two strips of sticking plaster, after introducing a flexible gum catheter into the continuation of the urethra, so as to keep its orifice unobstructed, and the urine from coming into contact with the wound. There can be little doubt, that the gum catheter would be better than a silver one, or any metallic cannula, commonly advised for the above purposes, because it lies in the passage with less irritation. It is but justice to Callisen to state, that he seems to be one of the few good surgical writers, who have particularly recommended in these cases the elastic gum catheter, in preference to that made of silver. (*Op. cit. p.* 421.) The French method of fixing the catheter in the urethra is an excellent one, and has been described in the article catheter. In one case, in which Mr. Hey operated, he made a longitudinal division of the integuments, at the inferior part of the penis, so as to make them cover its extremity without puckering, or lying over the orifice of the urethra. The corpora cavernosa, however, do not readily granulate, and unite to the skin by the first intention. (*Hey, p.* 452.) After the first dressings are removed, the part should be dressed with the unguentum cetaceum.

In consequence of the introduction of a cannula being neglected, Le Dran saw the orifice of the urethra close a few hours after the operation, so that the patient could not make water. The orifice of the passage could not be discovered without great difficulty. A lancet being introduced at the point, against which the urine seemed to be forced, a quantity of it gushed out, and, as a cannula was not at hand, a sound was introduced till one could be procured. (*Traité des Oper. de Chirurgie.*)

Mr. Pearson advises the skin not to be drawn back, because, when saved in this manner, it impedes the free exit of the urine. He also disapproves of introducing cannulæ, as painful and unnecessary. (*On Cancerous Complaints, p.* 103;) but Le Dran's experience, and that of the best modern practitioners, will not justify the latter statement.

When the penis is amputated near the pubes, the remainder shrinks under that bone and within the integuments so far, that it is difficult to tie the arteries. In order to obviate this inconvenience, Schreger recommends the skin to be drawn forwards, and fixed with a band; then an incision to be made just deep enough to divide the dorsal arteries, which are to be tied, before the knife is used again. The incision is then to be continued perpendicularly, till the two arteries of the corpora cavernosa are cut. These are now to be tied. Then the corpus spongiosum and its two arteries are to be cut through, which last are to be secured. Lastly, the rest of the skin of the penis is to be divided. In this way Schreger amputated a diseased penis, of which only a part, about an inch in length, was sound.

(*Sharp, Le Dran, Bertrandi, and Sabatier's books on the operations, may be consulted.* Also, *l'Encyclopédie Méthodique; Partie Chir. Art. Verge. Hey's Practical Observations in Surgery, p.* 445. *Pearson on Cancerous Complaints, p.* 103, *&c. Warner's Cases in Surgery, p.* 278, *Edit.* 4. *E. C. Biener, De Extirpatione Penis per Ligaturam, 4to. Lips.* 1816. *J. H. Thaut, Diss. de Virgæ Virilis Statu sano et morb. ejusdem imprimis amputatione. B. G. Schreger's Chir. Versuche; Neue Methode den Penis zu Amputiren, B.* 1. *p.* 242, *8vo. Nurnberg*, 1801.)

PENIS, CANCER OF. A wart, or a tubercle, on the prepuce, the frænum, or the glans penis, is generally the first symptom, and it often remains in a quiet state for many years. When irritated, however, it becomes painful, and enlarges, sometimes enormously, in a very short time. At the same time, ulceration, and a discharge of sanious fetid matter, take place. The disease sometimes also occasions in the urethra fistulous openings, out of which the urine escapes, and the lymphatic glands in the groin may become affected as the disease advances. Mr. Pearson says, that "cancerous excrescences have a broad base, often more extensive than their superficies; they seem to germinate deeply from within, or rather to be a continuation of the substance of the part; and, in their progressive state, the contiguous surface has a morbid appearance." What he considers as a venereal wart, has a basis smaller than its surface; its roots have rather a superficial attachment. and the contiguous parts have a natural appearance (*p.* 97). Such are this gentleman's marks of discrimination. We might question, however, whether Mr. Pearson, notwithstanding his great opportunities, ever saw a really *venereal* wart. For many years past I never saw any excrescences of this kind in St. Bartholomew's hospital, which truly required mercury for their cure, or which, when cured without it, were followed by any inconvenience. If my memory does not fail me, Mr. Abernethy also disbelieves in the doctrine of venereal warts.

Foul, spreading, sloughy ulcers of the penis, should be discriminated from cancer; and likewise diseases produced, and kept up by local irritation of the prepuce. (See *Earle's Obs. in Med. Chir. Trans. Vol.* 12, *p.* 287, *&c.*) It is worthy of attention, that almost all the cases of cancer of the penis, recorded by Mr. Hey, were attended with a congenital phymosis. The same complication also existed in another example, in which Boyer performed amputation of the penis in La Charité on account of a cancerous affection of the part. In the only two opportunities of doing this operation, which M. Roux has had, the cases were likewise accompanied with a natural phymosis. Hence, this author considers such a state of the prepuce particularly conducive to cancer of the penis, and earnestly enjoins surgeons to recommend their patients to have the first inconvenience rectified, so that no risk of the other more serious affection may be encountered. (See *Parallèle de la Chirurgie Angloise, &c. p.* 306, 307.) In two out of three cases, which were reported to be cancerous, and for which amputation was done under my notice, it did not appear, that any degree of phymosis existed. (See *Pearson on Cancerous Complaints. Hey's Practical Obs. in Surgery. Roux, Voyage fait en Angleterre en* 1814, *ou Parallèle de la Chir. Angloise, &c. p.* 306.)

PERINÆ'UM, FISTULÆ OF. (See *Fistulæ in Perinæo.*)

PE'RNIO. (from ϖερνα, or ϖτερνα, the heel.) A chilblain, especially one on the heel. (See *Chilblain.*)

PESSARY. (from ϖεσσω, to soften.) The intention of pessaries, among the old practitioners, was to keep medicinal substances applied within the pudenda. They are now never made use of, except for preventing a prolapsus of the uterus or vagina, or for keeping up a very uncommon kind of rupture, explained in the article *Hernia.*

PHAGEDÆ'NA. (from φαγω, to eat.) An ulcer, which spreads, and as it were eats away the flesh. Hence the epithet, *phagedenic,* so common among surgeons. For an account of the *phagedæna gangrænosa,* see *Hospital Gangrene.*

PHARYNGOTOMY. (from φαρυγξ, the pharynx, and τεμνω, to cut.) See *Œsophagotomy.*

PHARYNGO'TOMUS. (from φαρυγξ, the throat, and τομη, an incision.) An instrument for scarifying the tonsils, and for opening abscesses about the fauces. It was invented by Petit, and is nothing more than a sort of lancet, inclosed in a sheath. By means of a spring the point is capable of darting out to a determinate extent, so as to make the necessary wound, without risk of injuring other parts.

PHLEBO'TOMY. (from φλεψ, a vein, and τεμνω, to cut.) The operation of opening a vein, for the purpose of taking away blood. See *Bleeding.*

PHLE'GMON. (from φλεγω, to burn.) Healthy inflammation. (See *Inflammation.*)

PHLOGO'SIS. (from φλογοω, to inflame.) An inflammation. A flushing.

PHRENI'TIS. (from φρενες, the diaphragm, supposed by the ancients to be the seat of the mind.) An inflammation of the brain. Phrensy.

Inflammation of the brain is a frequent consequence of injuries of the head. The symptoms are, an increased and disordered state of the sensibility of the whole nervous system; the retina cannot bear the usual stimulus of light; the pupils are contracted; the pulse is frequent and small; the eyes are red and turgid, and the iris sometimes actually inflamed, (*Wardrop, Essays on the Morbid Anat. of the Eye, Vol.* 2), the countenance is flushed, and the patient is restless, mutters incoherently, and grows wild and delirious.

Phrenitis is treated on the antiphlogistic plan. Copious bleedings, and other evacuations, are highly proper. Some of the blood should be taken from the temporal arteries. The skin ought to be kept moist with antimonials, and a counter-irritation should be excited on the scalp with blisters.

PHY'MA. (from φυω, to grow.) Tubercles comprehend eight genera, and we learn from Dr. Bateman, that, under the genus *phyma,* the late Dr. Willan intended to comprise the terminthus, the epinyctis, the furunculus, and the carbuncle. (See *Bateman's Synopsis of Cutaneous Diseases, p.* 270, *Edit.* 3.) According to Pott, this term was formerly applied to an inflammation near the anus. See *Anus Abscesses of.*

PHYMO'SIS, or rather PHIMOSIS. (from φιμος, a muzzle.) A case, in which the prepuce cannot be drawn back, so as to uncover the glans penis. It is of two kinds, viz. *accidental,* and *natural* or *congenital.* Both the accidental phymosis, and paraphymosis, according to Mr. Hunter, arise from a thickening of the cellular membrane of the prepuce, in consequence of an irritation, capable of producing considerable and diffused inflammation. A chancre is a frequent cause; but a mere inflammation and discharge from the glans and prepuce, and also a gonorrhœa, may bring on these affections. The inflammation often runs high, and is frequently of the erysipelatous kind. The cellular membrane being loose, the tumefaction becomes considerable, and the end of the prepuce being a depending part, the serum often lodges in it, and makes it œdematous. A congenital contraction of the aperture of the prepuce is very common, and persons so affected have a natural and constant phymosis. Such a state of parts (says Mr. Hunter) is often attended with chancres, and it produces very great inconveniences during the treatment. When there is considerable diffused inflammation, a diseased phymosis, similar to the natural one, unavoidably follows; and whether diseased or natural, it may produce a paraphymosis. simply by the prepuce being brought back upon the penis. This tight part, then acting as a ligature round the body of the penis, behind the glans, retards the circulation beyond the constriction, so as to produce an œdematous inflammation on the inverted part of the prepuce.

When the prepuce is very long, phymosis may also arise from the swelling of the glans penis, produced by sores on the latter part, or the irritation of a severe gonorrhœa. (*Travers, in Surgical Essays, Part* 1, *p.* 132.) My own observations lead me to consider an irritation and swelling of the prepuce itself as by far the most common causes of the accidental phymosis.

In some children, the *natural* or *congenital* phymosis is so considerable, that the urine cannot pass with ease; but the aperture of the prepuce generally becomes larger as they grow older, and the bad consequences which the phymosis might have occasioned in disease, are thus avoided.

In certain individuals, especially old men, the prepuce sometimes contracts without any visible cause whatever, and becomes so narrow as to hinder the water from getting out, even after it has got free of the urethra, and, consequently, the whole cavity of the prepuce becomes filled with urine, attended with great pain.

In phymosis, when the prepuce swells and thickens, more and more of the skin of the penis is drawn forwards over the glans, and the latter part becomes at the same time pushed backward by the swelling against its end. From such a cause, Mr. Hunter has seen the prepuce projecting more than three inches beyond the glans with its aperture much diminished.

Mr. Hunter also notices, that the prepuce often becomes, in some degree, inverted, by the inner skin yielding more than the outer, and the part seems to have a kind of neck, where the outer skin naturally terminates. From the tightness and distention of the parts, the prepuce now cannot be drawn more back, so as to expose any sores, which may be situated under it. This state is frequently productive of bad consequences, especially when there are chancres behind the glans; for, the glans being between the orifice of the prepuce and the sores, the matter sometimes cannot get a passage forward, between the glans and prepuce, and, consequently, it accumulates behind the corona glandis, so as to form a kind of abscess, which produces ulceration on the inside of the prepuce. This abscess bursts externally, and, the glans, often protruding through the opening, the whole prepuce becomes thrown towards the opposite side, and the penis seems to have two terminations. On the other hand, (says Mr. Hunter) if the prepuce is loose and wide, and is either accustomed to be kept back in its sound state, or is pulled back to admit of the chancres being dressed, and is allowed to remain in this situation, till the above tumefaction takes place, the case is then named a *paraphymosis.* Also, when the prepuce is pulled forcibly back, after it is swelled, it is then brought from the state of a phymosis to that of a paraphymosis. The latter case is often attended with worse symptoms than the former, especially when it has first been a phymosis. According to Mr. Hunter, the reason of this is, that the aperture of the prepuce is naturally less elastic than any other part of it; therefore, when the prepuce is pulled back upon the body of the penis, that part grasps it more tightly than any other portion of the skin of the penis, and more so, according to the inflammation. Hence, there are two swellings of the prepuce, one close to the glans; the other behind the stricture. The constriction is often so great, as to interrupt the circulation beyond it. This increases the swelling, adds to the stricture, and often produces a mortification of the prepuce itself, by which means the whole diseased part, together with the stricture, is sometimes removed, forming, as Hunter ably expresses himself, a natural cure. In many cases, the skin and prepuce are not the only parts affected; adhesions, and even mortification, may also take place in the glans, corpora cavernosa, &c. (See *Hunter on the Venereal Disease, p.* 221, *&c.*)

An accidental phymosis should always be prevented if possible, and therefore, says Mr. Hunter, upon the least signs of a thickening of the prepuce, which is known by its being retracted with difficulty and pain, the patient should be kept quiet; if in bed, so much the better, as in a horizontal position, the end of the penis will not be so depending. If confinement in bed cannot be complied with, the end of the penis should be kept up, though this can hardly be done when the patient is walking about. The object of this plan is to keep the extravasated fluids from gravitating to the prepuce, which they would hinder from being drawn back again even more than the inflammation itself.

When phymosis is recent, and attended with swelling of the glans, or prepuce, from inflammation, Mr. Travers recommends injections of tepid water, or milk and water, beneath the foreskin; and the immersion of the penis, three or four times a day, in a tepid bath, keeping the end of the penis upwards; and the use of leeches; which I think with him and other writers, (see *Dict. des Sciences Méd. T.* 41, *p.* 334), should never be put exactly on the swelled prepuce itself. As the inflammation subsides, injections of weak goulard, or the solution of alum, or liquor calcis and calomel, may be substituted. (*Travers, Surgical Essays, Part.* 1, *p.* 138.) Instead of warm applications, some practitioners prefer cold; and it is yet an unsettled question, which remedies answer best.

When the inflammation is of longer standing, the swelling compresses the urethra, and there is tendency to abscess, ulceration of the latter passage, extravasation of urine, and gangrene of the skin. Mr. Travers advises the employment of emollient poultices and fomentations (the common practice, I believe), and the introduction of a small elastic gum catheter into the bladder. "This (says he) is not a practice indicated by the degree of stricture, which is seldom considerable enough to require it: but, by the approaching danger of extravasation. *It should not, therefore, be taken up, unless the cellular membrane of the penis has advanced to suppuration.*"

As when there are sores, they cannot be

dressed in the common way, injections must frequently be thrown under the prepuce, or the operation for phymosis performed. Mr. Hunter advises mercurial injections; either crude mercury, rubbed down with a thick solution of gum-arabic; or calomel with the same, and a proportion of opium; or else a solution of one grain of the oxymuriate of mercury in one ounce of water. Mr. Hunter also recommends the application of emollient poultices, with laudanum in them, and to let the part, previously to the application being made, hang over the steam of hot water, with a little vinegar and spirit of wine in it.

When, in a case of phymosis, chancres bleed, Mr. Hunter recommends the oil of turpentine as the best stimulus for making the vessels contract; but, when the hemorrhage proceeds from irritation, he recommends sedatives. Whatever is used, he says, must be injected under the prepuce. Under such circumstances, it has always been a rule with me to avoid irritating applications, and on this account I have never used turpentine, particularly as any troublesome bleeding from chancres may always be effectually checked by covering the penis with linen kept well wet with very cold water. When the inflammation has abated, Mr. Hunter advises moving the prepuce occasionally, to prevent its becoming adherent to the glans. He says, he has seen the opening of the prepuce so much contracted, from the internal ulcers healing and uniting, that there was hardly any passage for the water. If the passage in the prepuce, so contracted, be in a direct line with the orifice of the urethra, a bougie must be used. If otherwise, the operation of slitting up, or removing part of the prepuce, becomes necessary.

When matter is confined under the prepuce, in the manner above described, Mr. Hunter recommends laying the prepuce open, from the external orifice to the bottom, where the matter lies, as in a sinus, or fistula. However, Mr. Hunter thinks laying open the prepuce for the mere purpose of applying dressings unnecessary, as the sores may be washed with injections, by means of a syringe.

I happened to serve my apprenticeship at St. Bartholomew's, at a time when the fashion of cutting every phymosis, inflamed or not, was far too common, and I had abundant opportunities of witnessing the irreparable gangrenous mischief frequently thus produced. It gives me pleasure, therefore, to find this villanous practice justly disapproved of by a modern writer. "It is not advisable (says Mr. Travers) to cut the inflamed prepuce, nor, indeed, any inflamed part. I lately saw a phymosis induced by a thickened and rigid state of the membrane of the prepuce, during the free use of mercury, constitutionally and locally, for the cure of two sores, each of the size of a split pea, situated one on each side of the anterior fold of the prepuce. It was the opinion of an eminent surgeon, that those sores, which were thoroughly intractable, would not heal unless the prepuce was freely divided; and, impressed with the same idea, after poulticing for some days, I slit it up. The sores immediately healed; but the wound as quickly assumed the same indolent and intractable character which had belonged to the sores, and was so slow in healing that it seemed to be only a transfer of the disease from one part to another." (*P.* 139.) I have not only witnessed the same fact, in several cases under the late Mr. Ramsden, and in St. Bartholomew's hospital, but have seen mortification brought on by the still more rash practice of cutting the prepuce, either when the part was in a state of acute inflammation, or there were ulcers within it, when the constitution was in a reduced and very disordered state from the injudicious and immoderate use of mercury.

The common operation, for the cure of phymosis, consists in slitting open the prepuce, nearly its whole length in the direction of the penis. This plan is certainly the most eligible, when the matter of a chancre cannot escape from under the prepuce; because circumcision, which many surgeons, since Mr. Hunter's time, have preferred, would not suffice for giving vent to the accumulated pus. In many cases of phymosis, says Mr. Hunter, an operation is improper; for, while the inflammation is very considerable, such a measure might bring on mortification. He acknowledges, however, that there are cases, in which a freedom given to the parts would prevent the latter event. When matter is confined under the prepuce, an opening is indispensable, and, if the patient should object to the common operation, an opening should be made with a lancet directly through the prepuce, or else with caustic. (See *Hunter on the Venereal Disease, p.* 232, *et seq.*)

When the prepuce is to be slit open, a director is first to be introduced under it, and the division is then to be made with a curved pointed bistoury, from within upward.

Many surgeons object to this operation, because the prepuce continues afterwards in a very deformed state; and they perform circumcision, or amputation of the prepuce, in the following manner. The prepuce is first taken hold of with a pair of forceps, as much of the part being left out, as is judged necessary to be removed. The removal is then accomplished by one sweep of the knife, which, directed by the blades of the forceps, is sure of making the incision in a straight and regular manner. A fine suture is next passed through the edges of the inner and outer portions of the skin of the prepuce so as to keep them together. The only necessary dressings are lint, and over it an emollient poultice.

At the period when I first entered the profession, it was the custom to salivate every patient who happened to have a phymosis. However, now that the fact of any irritation about the prepuce and glans penis, even that of common warts, being capable of producing the complaint is well known, such absurd practice has been relinquished, and the cause and condition of the disease are always considered previously to the determination for any particular method of treatment. Nay, even when phymosis does arise from chancres, if there be a great deal of inflammation, the use of mercury may rather do harm than good, and the practitioner should not be precipitate in its administration. On this point, I fully coincide with Mr. Travers:—"Upon many occasions (says he) practitioners are too anxious to contend with the specific character of the venereal disease, to the neglect of the inflammatory state of the affected parts exhibited during its height. The abuse of administering mercury for an acute gonorrhœa, and recent sores, accompanied by phymosis, or an approach to that state, is of common occurrence, and it is far from being recognized by the profession, as an established rule of practice, that its constitutional administration is inadmissible during the existence of active inflammation, in cellular textures." (*Surgical Essays, Part* 1, *p.* 131.)

In nine cases out of twelve, in which the experienced Mr. Hey had occasion to amputate the penis for cancerous disease, the patients were also affected with a natural phymosis. (*Pract. Obs. in Surgery.*) Roux has noticed the same thing in three similar examples, and, as he conceives that phymosis may be conducive to carcinoma of the penis, he thinks, that it should always be remedied in time. (*Parallèle de la Chir. Angloise, p.* 306.)

TREATMENT OF PARAPHYMOSIS.

The removal of the stricture in this case should always be effected, because its continuation is apt to produce a mortification in the parts, between the stricture and the glans. It may be done in two ways; either by compressing with the fingers all the blood out of the swelled glans, so as to render this part sufficiently small to allow the constricting prepuce to be brought forward over it, with the aid of the two fingers; or by dividing the stricture with a knife. In a former edition of this work, as Mr. Dunn of Scarborough has reminded me, the power of cold applications, in promoting the reduction of the glans, should have been mentioned. This method should always be put in practice, before the reduction by compression is attempted, as a preliminary measure, which sometimes succeeds of itself, and renders unnecessary any painful handling of the parts. From the great success which I have seen attend the first mode, I should not conceive the second one so frequently necessary, as Mr. Hunter seems to lay down. This operation is always troublesome to accomplish, because the swelling, on each side of the stricture, covers or closes the tight part, which cannot be got at without difficulty. Mr. Hunter says, the best way is to separate the two swellings as much as possible, where you mean to cut, so as to expose the constricted part; then take a crooked pointed bistoury, pass it under the constriction, and divide it. None of the swollen skin on each side should be cut. The prepuce may now be brought forward, unless it be thought more convenient, for the purpose of dressing the chancres, to let it remain in its present situation. (See *Hunter on the Venereal Disease, p.* 238, 239.)

The original disease producing phymosis and paraphymosis, must always be attended to, and the employment of mercury must be necessary or unnecessary, according to the nature of the affection, of which these are only effects.

One of the most interesting writers on Phymosis and Paraphymosis is J. L. Petit, Traité des Mal. Chir. T. 2; *many of whose valuable observations are contained in the 2d vol. of the First Lines of Surgery*, 8*vo.* 1820. Consult also *J. Hunter on the Venereal Disease. Sabatier, Médecine Opératoire, T.* 3, 8*vo. Paris*, 1810. *Travers, in Surgical Essays, Part* 1, 8*vo. Lond.* 1818. *There is also a valuable chapter on this subject in Richter's Anfangsgr. der Wundarzn. B.* 6.

PILES. (See *Hemorrhoids.*)

PILULÆ ARGENTI NITRATIS. ℞. Argenti Nitratis gr. iij. Aquæ Distillatæ gutt. aliquot. Micæ Panis q. s. ut fiant pil. xx. The author of the *Pharmacopœia Chirurgica* suggests the trial of these pills in obstinate leprous, and other cutaneous affections, and phagedenic, anomalous ulcers, connected with constitutional causes. Two or three may be given twice a day. Dr. Powell gave the argentum nitratum internally, in a case of hydrophobia, but without any sensible effect.

PILULÆ COLOCYNTHIDIS CUM HYDR. SUBM. ℞. Extracti Colocynth. comp. ℈ij. Hydr. Submur. gr. xii. Saponis ℈j. Misce ut fiant pilulæ duodecim. Two of these pills operate as a purgative, and they are often prescribed in various surgical cases.

PILULÆ CONII. ℞. Extracti Conii ʒss. Pulv. Herb. Cicutæ q. s. fiant pil. lx. These are the hemlock pills in use at Guy's Hospital. They are occasionally given in scrophulous, cancerous, and venereal cases. The surgeon should begin with small doses, and increase them gradually, till nausea and headach arise. From one to a greater number of these pills may be given, in this manner, every day.

PILULÆ CUPRI SULPHATIS. ℞. Cupri Sulphatis gr. xv. Olibani, Extracti Cinchonæ, sing. ʒij. Syrup. simpl. q. s. fiant pil. lx. From one to four of these pills may be given in a day, for gleets. (*Pharm. Chirurg.*)

PILULÆ HYDRARGYRI. Of these, I need only observe here, that the full dose is ten grains, (See *Mercury*), but, when prescribed as an alterative, from three to five grains will suffice.

PILULÆ HYDRARGYRI OXYDI RUBRI. One grain of this preparation in each pill is the dose, which is commonly taken at bedtime. (See *Mercury.*)

PILULÆ HYDRARGYRI CUM CONIO. ℞. Hydrargyri purificati drach. j. Arabici gummi pulverisati drach. ij. Extracti Conii drach. j. Conii foliorum, in pulverem tritorum, q. s. The quicksilver is to be first reduced by triture with the gum arabic, moistened with a little rain water. The inspissated juice of hemlock is afterwards to be added, and, lastly, the powdered leaves in sufficient quantity to make a suitable mass for pills. These with a slight variation in the proportion of the hemlock, are the *pilulæ mercuriales* of Plenck, who directs three or four pills, each of three grains, to be given every night and morning.

No doubt, there are many cases, to which this formula must be very suitable; for instance, the enlarged prostate gland, and some forms of bronchocele, &c. For such diseases, Dr. Saunders, in his *Formulæ Selectæ*, directs equal parts of pil. hydrarg. and extractum conii. (*Pharm. Chir.*)

PILULÆ HYDRARG. SUBMUR. ℞. Hydrarg. Submur. gr. xij. Conservæ Cynosbati quod satis sit. M. fiant pil. xii. These are the calomel pills in common use. Surgeons give one, or two of them daily, as alteratives, in numerous cases. At Guy's Hospital, they add three grains of the pulvis opiatus to each pill, using syrup, instead of the conserve.

PILULÆ HYDRARG. SUBMUR. CUM CONIO. ℞. Hydrarg. Submur. gr. vj. Extracti Conii ʒj. M. fiant pil. xii. One may be given thrice a day, in scirrhous, cancerous, scrophulous, and some anomalous diseases, resembling venereal diseases.

PILULÆ HYDRARGYRI SUBMUR. CUM ANTIMONIO TARTARIZATO. ℞. Hydrarg. Submur. ʒj. Antimon. Tart. gr. xv. Opii Pur. ʒss. Syrupi simpl. q. s. fiant pil. lx. One of these is given twice a day in St. Thomas's Hospital, in cases of diseased joints. As the author of the *Pharm. Chirurg.* adds, they are also of use in herpetic affections, and obstinate ulcers. The union of antimony with quicksilver, according to Dr. G. Fordyce, quickens the specific operation of the latter.

PILULÆ HYDRARG. SUBMUR. COMPOSITÆ. ℞. Hydrarg. Subm. Sulph. Antim. Præcip. sing. gr. xii. Guaiaci Gummi Resinæ gr. xxiv. Saponis q. s. M. fiant pil. xii. Similar to Plummer's pills. In porrigo herpetic affections, and many anomalous diseases, they are exceedingly useful. Some diseases of the breast, and testicle, seem also to be benefited by them.

PILULÆ OPII. These need only be mentioned among such as are of eminent utility in surgery.

PILULÆ OPII COMPOSITÆ. ℞. Opii Purif. Camphoræ, sing. ʒj. Antim. Tart. gr. xv. Syrup. simpl. q. s. fiant pil. lx. Used for alleviating pain, and keeping up a gentle perspiration; are particularly useful in preventing painful erections, in cases of gonorrhœa, chordee, &c. (See *Pharm. Chir.*)

PILULÆ SODÆ CUM SAPONE. ℞. Sodæ Subcarbonatis Exsiccatæ ʒi. Saponis ℈j. M. fiant pil. xii. Four may be given thrice a day, in cases of bronchocele, and indurations of the absorbent glands from scrophula.

PILULÆ ZINCI SULPHATIS. ℞. Zinci Sulphatis, ʒij. Terebinthinæ q. s. fiant pil. lx. One, or two, are occasionally given, in cases of gleets, thrice a day.

PLANTARIS MUSCLE. This long slender muscle of the leg is said to be sometimes ruptured, particularly in dancing and leaping. The surgeon can do little more than advise rest, antiphlogistic remedies, and the same posture of the limb, as in the rupture of the tendo Achillis. (See *Tendon.*)

POLYPUS. A tumor, generally of a pyriform shape, most commonly met with in the nose, uterus, vagina, and antrum, and named from an erroneous idea, that it has several roots, or feet, like polypi.

Polypi more frequently grow in the cavity of the nose, than in any other situation, and are visibly of different kinds. One polypus is red, soft, and sensible; but free from pain, and exactly like a piece of healthy flesh: it is the *fleshy polypus* of various writers. When this kind of polypus is of a softer consistence, semitransparent, and of a paler yellowish colour, in consequence of being less vascular, it is called the *gelatinous polypus*, and usually arises from the side of the antrum, or the middle of the cavity of the nostril, between the upper and lower turbinated bones. Other polypi are called *malignant*, being hard, scirrhous, and painful: the *carcinomatous* and *fungoid polypi*, as they are called by Sir A. Cooper. This distinguished surgeon likewise describes *hydatid polypi*, which generally occur in young people, and the cysts of which may be burst by pressure, and the fluid in them discharged. Richter describes another kind of nasal polypus, which is pale, very tough, and secretes a viscid discharge; which undergoes an alteration of its size with every change of the weather; and which is rather a relaxation, or elongation, of a part of the Schneiderian membrane, than a polypous excrescence. The whole membranous lining of the nostrils is sometimes thus relaxed, and thickened. (*Anfangsgr. der Wundarzn. B.* 1, *Kap.* 21.) Besides the preceding varieties of polypi, children are subject, as Sir A. Cooper has explained, to red projections within the nose, which are liable to be mistaken for polypi, but are of a different nature, and may be cured by touching them with the end of a bougie, armed with the argentum nitratum.

Mr. Pott has taken great pains to explain, that there is one kind of polypus, originally *benign*; another originally *malignant*. He states, that those, which begin with, or are preceded by considerable, or frequent pain in the forehead and upper part of the nose, and which, as soon as they can be seen, are either highly red, or of a dark purple colour; those, which from the time of their being first noticed, have never been observed to be sometimes bigger, sometimes less, but have constantly rather increased; those, in which coughing, sneezing, or blowing the nose, gives pain, or produces a very disagreeable sensation in the nostril, or forehead; those which, when within reach, are painful to the touch, or which upon being slightly touched, are apt to bleed; those which seem to be fixed, and not moveable by the action of blowing the nose, or of driving the air through the affected nostril only (when the polypus is only on one side); those which are incompressibly hard, and which, when pressed, occasion pain in the corner of the eye, and forehead, and which, if they shed any thing, shed blood; those which by adhesion occupy a very considerable space, and seem to consist of a thickening, or of an enlargement of all the membrane covering the septum narium; those which sometimes shed an ichorous, offensive, discoloured discharge; and those, round whose lower part, within the nose, a probe cannot easily and freely be passed, and that to some height, ought not to be attempted, at least by the forceps, nor indeed by any other means; and this for reasons obviously deducible from the nature and circumstances of the polypus. On the one hand, the very large extent and quantity of adhesion will render extirpation impracticable, even if the disease could be comprehended within the forceps, which it very frequently cannot; and, on the other, the malignant nature of the distemper may render all partial removal, all unsuccessful attacks on it, and indeed any degree of irritation, productive of the most disagreeable consequences.

But, the polypi, which are of a palish or greyish light-brown colour, or look like a membrane just going to be sloughy; which are seldom or never painful, nor become so upon being pressed; which have appeared to be at one time larger, at another less, as the air has happened to be moist or dry; which ascend and descend freely by the action of respiration through the nose; which the patient can make to descend by stopping the nostril which is free, or even most free, and then driving the air through that which the polypus possesses; which when pressed give no pain, easily yield to such pressure, become flat thereby, and distil a clear lymph; and round whose lower and visible part a probe can easily, and that to some height, be passed, are fair and fit for extraction; the polypus, in these circumstances, frequently coming away entire; or, if it does not, yet it is removable without pain, hemorrhage, or hazard, of any kind; the second of which circumstances, Mr. Pott can with strict truth affirm, he never met with when the disease was at all fit for the operation.

Of the benign kind of polypus, fit for extraction, there are (says Mr. Pott) two sorts, whose principal difference from each other consists in their different origin or attachment. That which is most freely moveable within the nostril, upon forcible respiration; which has been found to be most liable to change in size at different times and seasons; which has increased the most in the same space of time; which seems most limpid, and most freely yields lymph upon pressure, has its origin most commonly by a stalk or kind of peduncle, which is very small, compared with the size of the polypus. The other which, although plainly moveable, is much less so than the one just mentioned, which has been less liable to alteration from air and seasons; and which has been rather slow in arriving at a very troublesome size, is most frequently an elongation of the membrane covering one of the ossa spongiosa. These latter may be extracted with no kind of hazard, and with very little pain, and hemorrhage: but the former require the least force, and mostly come away entire; while the others often break, come away piecemeal, and stand in need of the repeated use of the forceps. (*On the Polypus of the Nose.*)

Mr. John Bell criticises the distinctions drawn by the preceding writer, and still adopted in the best schools of surgery: he says, that a polypus is never mild, and never malignant; time, and the natural growth of the tumor, and the pressure it occasions within the soft and bony cells of the nostrils and jaws, must bring every polypus to one invariable form, in its last and fatal stage. Polypus, says Mr. John Bell, is indeed a dreadful disease; but it becomes so by a slow progression, and advances by gradations easily characterized. Every polypus in its early stage is, according to this writer, a small moveable tumor, attended with a sneezing and watering of the eyes; swelling in moist weather; descending with the breath; but easily repressed with the point of the finger. It is void of pain, and not at all alarming; it may also be easily extracted, so as to clear for a time the passage for the breath. Yet this little tumor, simple as it may appear, is the germ of a very fatal and loathsome disease, and this easy extraction often the very cause of its appearing in its most malignant form. The more easily it is extracted, (says Mr. J. Bell) the more easily does it return; and whether carelessly extracted, or altogether neglected, it soon returns. But, when it does return, it has not really changed its nature; it has not ceased to be in itself mild; it is then to be feared, not from its malignity, but from its pressure, among the delicate cells and membranes of the nose. It soon fills the nostrils, obstructs the breathing, and causes indescribable anxieties. The tears are obstructed, and the eyes become watery from the pressure on the lachrymal sac; the hearing is in like manner injured, by the pressure of the tumor against the mouth of the eustachian tube; the voice is changed, and its resonance and tone entirely lost, by the sound no longer passing through the cells of the nose and face. The swallowing is in some degree affected by the soft palate being depressed by the tumor. The pains arising from such slow and irresistible pressure are unceasing. From the same pressure, the bones become carious, and the cells of the face and nose are destroyed by the slow growth of the swelling. It is not long before the tumor begins to project from the nostril in front, and over the arch of the palate behind. One nostril becomes widened and thickened; the nose is turned towards the opposite side of the face, and the whole countenance seems distorted. The root of the nose swells, and becomes puffy, the features tumid and flabby, the face yellow, and the parts round the eye livid. The patient is affected with headachs, which seem to rend the bones asunder, and with perpetual stupor, and dozing. The bones are now absorbed, and the membranes ulcerate; a foul and fetid matter, blackened with blood, is discharged from the nostrils, and excoriates them. The blood-vessels next give way, and sudden impetuous hemorrhages weaken the patient; the teeth fall from the sockets, and, through the empty sockets a foul and fetid matter issues from the antrum.

Now the disease verges to its conclusion. The patient has terrible nights, and experiences a sense of suffocation. The repeated loss of blood renders him so weak, that he cannot quit his bed, for several days together; and when he does get up, he is (to use Mr. Bell's words) pale as a spectre, his lips colourless, and his face like wax, yellow, and transparent. He now suffers intolerable pain, while his saliva is continually dribbling from his mouth, and a fetid discharge from his nose. In this state, he survives a few weeks; during the last days of his illness, lying in a state of perpetual stupor, and dying lethargic. Mr. J. Bell afterwards observes, that "if horrid symptoms could establish the fact of malignity, there is not to be found in all nosology a more malignant disease than this: but aneurism, though it destroys the thigh-bone, the sternum, or the cranium, is not accounted malignant; neither is polypus malignant, though it destroys the cells of the face, and penetrates even through the ethmoid bone to the brain. These consequences result merely from pressure." (*John Bell's Principles of Surgery, Vol. 3, Part 1, p. 90—92.*)

In April, 1817, there was a boy in St. Bartholomew's Hospital, only twelve years old, who had just fallen a victim to the ravages of the largest and most disfiguring disease within the nose which I have ever had an opportunity of beholding. The tumor before death had expanded the upper part of the nose to an enormous size, while below the left nostril was immensely enlarged. The distance between the eyes was extraordinary, being more than four inches. The left eye was affected with amaurosis, brought on by the pressure of the swelling; the right retained to the last the faculty of seeing. The tumor nearly covered the mouth, so that food could only be introduced with a spoon, and an examination of the state of the palate was impossible. About a fortnight before death, the legs became paralytic, and during the last week of the boy's existence, an incontinence of the urine and feces prevailed. On examination of the head after death, a good deal of the tumour was found to be of a cartilaginous consistence, and, what was most remarkable, a portion of it, which was as large as an orange, extended within the cranium, where it had annihilated the anterior lobe of the left hemisphere of the brain. Yet, notwithstanding this effect, the boy was not comatose, nor insensible, till a few hours before his decease. All the surrounding bones had been more or less absorbed, and the place from which the excrescence first grew could not be determined.

Richter has denied the validity of the objections, urged by Pott against attempting to relieve the patient: and he declares, that neither the malignant nature of a polypus, its adhesions, immoveableness, ulcerations, nor disposition to hemorrhage, &c. are any just reason for leaving the disease to itself. (See *Anfangsgr. der Wundarzn. B.* 1, *cap.* 21.) This declaration, however, at least, with reference to any operation, is quite repugnant to the advice delivered by all the most experienced surgeons in England, who, in cases of decidedly malignant polypi, always restrict their interference to palliative means.

Mr. J. Bell refutes the common notions, that polypi may be caused by picking the nose, blowing it too forcibly, colds, and local injuries. He asserts, that a polypus is not in general a local, solitary tumor: he has only found it so in three, or four instances. Both nostrils are usually affected. He states, that no finger can reach that part of the nostril, where the root of the swelling is situated, as it is deep and high in the nostrils, towards the throat, and near the opening of the eustachian tube. The finger cannot be introduced further, than the cartilaginous wing of the nose extends, and can hardly touch the anterior point of the lower spongy bone. The anterior and posterior chambers of the nostril are separated from each other by a narrow slit, which the finger can never pass, and which is divided, in consequence of the projection of the lower spongy bone into two openings, one above, the other below. Through these the heads of the polypus project. These tangible parts of the tumor, however, are very distant from its root, which is in the highest and narrowest part of the nostril. (See *p.* 103, 104.) Mr. J. Bell also says, that three or four polypi are often crowded together in one nostril, while more are formed, or forming, in the other.

He dwells upon the difficulty and impracticableness of tying the root of a polypus; and explains, that in all attempts to extirpate such tumors, the surgeon's aim should be to reach a point, nearly under the socket of the eye, in the deepest and highest part of the nostrils, and that instruments can only dō good when introduced beyond the narrow cleft, formed by the projection of the spongy bone. (*P.* 108.)

Though Mr. John Bell is probably right in his opinion, that polypi do not proceed from the several circumstances which have been above noticed, yet they are, in most instances, diseases of an entirely local nature. Certainly, in general, it is very difficult to describe what is the cause of a nasal polypus. Frequently the patient is, in other respects, perfectly well; and, after the removal of the tumor, no new one makes its appearance. In this circumstance, it must originate from a local cause, though it is generally difficult to define what the nature of this is. Sometimes several catarrhal symptoms precede the polypus, and, perhaps, constitute its cause. It is possible, they may only be an effect of the same cause which gives birth to the tumor; but, no doubt, they are sometimes the effect of the polypus itself. Sometimes, perhaps, a faulty state of the constitution really contributes to the disease; for several polypi frequently grow in both nostrils, and even in other situations at the same time; are reproduced immediately after their removal; and the patient often has an unhealthy appearance.

There are four modes of extirpating nasal polypi: viz. extracting them with forceps; tying them with a ligature; cutting them out; and destroying them with caustic.

Extraction is the most common and proper method. It is performed with the ordinary polypus forceps, the blades of which have holes in them, and are internally rather rough, in order that they may take hold of the tumor more firmly, and not easily slip off it. The front edge of each blade must not be too thin and sharp, lest, with its fellow, it should pinch off a portion of the polypus. The blades must necessarily have a certain breadth; for, when they are too small, they cannot properly take hold of and twist the tumor. When the handles are rather long, the instrument may be more firmly closed, and more conveniently twisted.

It is generally deemed of importance to take hold of the polypus with the forceps close to its root; and, indeed, when this rule is observed, the whole of the polypus, together with its root, is commonly extracted, and there is less reason to apprehend hemorrhage, which is naturally more profuse when the polypus is broken at the thick, middle portion of its body. It is also a rule, frequently easy of observance, especially when the polypus is not too large. With respect to common *fleshy*, or *gelatinous polypi*, it should be remembered, that they usually originate from between the upper and lower turbinated bones, on the side of the antrum; and the best plan is, first to endeavour to ascertain with a probe the precise situation of the pedicle, which the forceps, guided by the probe, will then more readily grasp. Sir A. Cooper has never known an instance of the growth of a gelatinous polypus from the septum narium; a fact, highly worthy of the practitioner's recollection. In many instances, the tumor is so large, and the nostril so completely occupied by it, that its root can neither be felt, nor taken hold of with forceps. The polypus should then be grasped as high as possible. The consequences are of two kinds. The tumor sometimes gives way at its root, though it be only taken hold of at its anterior part; and, in other cases, breaks where it is grasped, a portion being left behind, and a profuse hemorrhage ensuing. This is, however, void of danger, if the surgeon does not waste time in endeavouring to suppress the effusion of blood; but immediately introduces the forceps again, grasps the remnant piece, and extracts it. The most infallible method of diminishing the bleeding, is to extract what remains behind at its root. In this way, a large polypus is frequently extracted, piecemeal, without any particular loss of blood.

After the polypus has been propelled as far forward, into the nostrils, as it can be by blowing strongly through the nose, and the place of its root felt with a probe, its anterior part is to be taken hold of with a small pair of common forceps, held in the left hand; and is to be drawn gradually and slowly out, to make room for the introduction of the polypus-forceps into the nostril. The more slowly we proceed in this manœuvre, the more the polypus is elongated, the narrower it becomes, the greater is the space in the nostril for the introduction of the polypus-forceps, and the higher can this instrument grasp the tumor. After the root of the polypus has been taken hold of with the polypus-forceps, or if this cannot be done, after the tumor has been grasped with the latter forceps as high as possible, it is to be twisted slowly round, and, at the same time, pulled outward, till it breaks. When the body of the polypus, and not the root, is grasped, it is a very important maxim, rather to twist the instrument than to pull it, and thus, rather to writhe the polypus off, than to drag it out. The longer and more slowly the polypus-forceps is twisted, the more the part where the excrescence separates is bruised, the less is the danger of hemorrhage, and the more certainly does the tumor break at its thinnest part, or root. When the extraction is done with violence, and celerity, only a piece is usually brought away, and we run hazard of occasioning a copious bleeding. Sir A. Cooper recommends tearing polypi from their attachment with a sudden jerk, as the most likely mode to bring away the whole of the root, and even a portion of the Schneiderian membrane and bone, so as to hinder a relapse: a piece of advice, however, which he seems to intend for cases, in which the pedicle is grasped by the forceps, as it ought always to be, if possible; but, when circumstances oblige the surgeon to take hold of any other more accessible portion of the tumor, the rule of slowly and gradually twisting off the polypus, instead of using a sudden jerk, is what I consider the most likely method of extracting the tumor in a mass.

As soon as the polypus has given way, the surgeon is to examine whether any part remains behind. When the polypus is very narrow at the place where it has been broken, and the patient can breathe through the nose freely, there is reason to presume, that the polypus has given way at its root, and that none continues behind. The finger, if it can be introduced, procures the most certain information; or the probe, when the finger, for want of room, cannot be employed. When a piece of the root is left, it is best to introduce the forceps again, under the guidance of the finger, or probe, and thus pinch, and twist off, the remnant of the disease.

Some hemorrhage always follows the operation; and, by many writers it is represented as perilous and alarming. But this is not the case in common fleshy gelatinous polypi, which are not furnished with large vessels, and are the instances in which the operation is most proper. Cases are met with, however, in which the bleeding is really serious; and, therefore, the surgeon should always furnish himself, before the operation, with the most effectual means for its suppression. The danger of hemorrhage may always be lessened, as was before mentioned, by slowly twisting the polypus at its root, in preference to pulling it directly out. When only a portion of the tumor has been extracted, the surest mode of stopping the effusion of blood is to extract the remaining part without delay. After the polypus has given way at its root, if the bleeding should still be profuse, ice-cold water, or strong brandy may be sucked or injected into the nose. These applications mostly prove effectual. If the hemorrhage should still prevail, it may always be checked with certainty, how copious soever it may be, in the following manner. Roll a considerable piece of lint, as fast as possible, round the extremity of a probe; wet it completely through, with a strong solution of the sulphate of zinc; introduce it into the nostril, and press it as strongly as possible against the part whence the blood issues. When the nostril is very much dilated, the fingers may be used, for this purpose, with more advantage than the probe. The point from which the blood is effused, may easily be ascertained, by pressing the finger on various points. As soon as the blood ceases to flow, we may conclude, that the finger is on the situation of the hemorrhage.

When this method fails, a piece of catgut may be introduced into the nostril, and, by means of a pair of forceps, be brought out of the mouth. A roll of lint is then to be attached to it, and drawn through the mouth into the nose; thus the posterior aperture of the nostril may be stopped up. Then the nostril in front is to be filled with lint.

Sometimes, the greatest part of the polypus extends backward, hanging down behind the palatum molle, towards the pharynx. If there should be but little of the polypus visible in the nostril, its extraction must be performed backward, in the throat. This is usually done with a pair of curved polypus forceps, which is to be introduced through the mouth, in order to seize and tear off the tumor as high as possible above the soft palate. Care must be taken not to irritate the root of the tongue, or else a vomiting is produced, which disturbs the operation. When the polypus cannot be properly taken hold of, some surgeons divide the soft palate. But this can hardly ever be necessary. As, by this mode, the polypus is not twisted, but pulled away, the hemorrhage is, in general, rather copious. If a fragment of the tumor should remain behind, it may commonly be extracted through the nose.

Some recommend, for the extraction of polypi in the throat, a ring, consisting of two semicircular portions, with a kind of groove externally, which are capable of being opened and shut, by being fixed on the ends of an instrument constructed like forceps. A ligature is to be placed round the ring, and its end is to be brought to the handle of the instrument, and held with it in the hand. The instrument is to be introduced into the mouth, under the polypus, and expanded as much as the size of the tumor requires. Its ring is then to be carried upward. over the polypus, so as to embrace it; and afterwards is to be shut, whereby the noose, after being carried upward, is disengaged from the ring. The noose is to be pushed as high as possible over the tumor, by means of forceps, and the extremity of the packthread is then to be drawn, so as to apply the noose tightly round the polypus. When this is done, the ring of the instrument is to be turned round, firmly closed, and placed in front of the polypus, on the noose, in such a way, that the packthread is to lie between two little pegs, made for the purpose, at the ends of the ring. On drawing the packthread firmly, and pressing the instrument, at the same time, downward, so as to make it act like a lever, the polypus, in general, easily breaks. Another peg projects in the direction of the ring, so as to prevent the ligature from insinuating itself within the circle. (See *Theden's Bemerk. Part 2. and Plate 6, fig. 1. in Richter's Anfangsgr.*)

This instrument is at present rarely, or never employed, and Richter, who sets down its use as attended with difficulty, recommends the extraction to be performed with forceps through the mouth. When the tumor cannot be drawn completely out without considerable force, a spatula is to be introduced into the mouth, and to be carried as high as possible behind the polypus, in order to press it down towards the root of the tongue. When the tumor is now forcibly pulled out with the forceps, it usually gives way.

When the polypus is situated partly in the throat and partly in the nostril, it admits of being extracted, in the same way, through the mouth; but its anterior part often continues attached, and must afterwards be separately removed through the nostril. It is also frequently advisable to twist off the anterior portion of the polypus first, by which the mass in the throat is often rendered so loose, that it can be easily extracted. Whenever it is conjectured, that the polypus will come away in two pieces, it is always preferable first, to extract the part in the nostril, and afterwards that in the throat: because, the separation of the last is constantly productive of more bleeding, than the removal of the first. Sometimes, the following plan succeeds in detaching the whole polypus at once. Both the part in the nostril, and that in the throat, are to be firmly taken hold of with forceps, and drawn at first gently, and then more forcibly, backward and forward. By such repeated movements, the root is not unfrequently broken, and the whole polypus brought away from the mouth.

Frequently the polypus grows again. Policy requires that the patient should be apprised of this beforehand. Some of the root remaining behind, may often be a cause of the relapse. Hence, after the operation, the surgeon should carefully examine the part at which the root of the polypus was situated, and separate, and twist off, most diligently, with the forceps, any fragments that may still continue attached. Or, if in the operation itself, the root can be grasped with the forceps, it may be torn away with a sudden jerk, as recommended by Sir A. Cooper, for the express purpose of bringing away with the root the portion of Schneiderian membrane and even bone from which the tumor originates, so as to prevent its growing again. The recurrence of the disease, however, may arise from other causes. The tumor is occasionally reproduced, after it has been extracted in the most complete manner; and, doubtless, this circumstance is sometimes owing to the continued agency of constitutional causes, which so often remain undiscovered and unremoved. Sometimes, also, the recurrence of the disease is owing to a local morbid affection of the Schneiderian membrane, or of the bones situated beneath the root of the polypus. Richter, in this case, approves of the cautery; but few English surgeons will coincide with him. The polypus, sometimes observed subsequently to the operation, is frequently not, in fact, a new substance, but only a part of the original tumor, not previously noticed by the surgeon. Sometimes it occurs, that a smaller and a larger polypus are found in the nose at the same time. The larger one is extracted, while the other remains undiscovered; and, when it has increased in magnitude, it is apt to be mistaken for a reproduction of the one previously extirpated. (See *Anfangsgr. der Wundarzn. B. 1. Kap.* 21.)

Ligature. The hemorrhage that has occasionally arisen from attempts to extract certain polypi, and more especially from the imperfect removal of them in this manner, led to the proposal of extirpating them with a ligature. The plan is to tie the root of the tumor by which the polypus is thrown into the state of sphacelus, and, at length becomes detached. Many instruments have been invented for this purpose, but Levret's double cannula seems to be the best. Through this, a silver wire is to be introduced, so as to form a noose at the upper end of the instrument, proportioned in size to the anterior part of the tumor, situated in the nostril. The two ends of the wire are to hang out of the two lower apertures of the double cannula; and one of them is to be fastened to a small ring on its own side of the instrument. The other is to remain loose. The wire must be made of the purest silver, and ought to be as flexible as possible, that it may not readily break. It must, also, not be too thin, lest it cut through the root of the polypus. The cannula is to be somewhat less than five inches long. By the assistance of this cannula, the noose is to be introduced into the nose, and put round the polypus. But, as the cannula, which is usually constructed of silver, is straight and inflexible, while the inner surface of the nostril is preternaturally arched, especially when much distended by the polypus. its introduction must be attended with considerable difficulty. In fact, it can seldom be introduced as deeply as the root of the polypus.

The noose is to be applied in the following manner. The polypus is to be taken hold of with the forceps, and drawn a little out of the nose. The noose is then to be carried over the forceps and polypus, into the nostril. In order to carry it as high as possible, it is necessary not to push the cannula straight forwards into the nose, but to move it from one side of the polypus to the other. The more deeply the instrument has entered the nose, the more of the loose end of the wire must be drawn out of the lower aperture of the cannula, so as to contract the noose, which otherwise might stop in the nostril, and not be carried sufficiently high. The elasticity of the silver wire tends to raise it over the polypus, and, hence, it is more easy of application than a more flaccid kind of ligature. When there is cause to conclude, that the polypus is complicated with adhesions, they must be previously broken, in the way already mentioned.

As soon as the noose has been introduced as deeply as possible, the loose extremity of the wire is to be drawn out of the lower aperture of the cannula, and rolled round the ring on that side of the instrument. Thus the root of the polypus is constricted. The wire must not be pulled too forcibly, nor yet too feebly. In the first circumstance, it readily cuts through the root of the polypus; in the second, great tumefaction of the excrescence, and many inconveniences arise, which a tenser state of the wire prevents. As the noose gradually makes a furrow, where it surrounds the polypus, it grows slack, after a short time, and no longer constricts the tumor. One end of the wire, therefore, is to be daily unfastened, and drawn more tightly. The more tense it is kept, the sooner the separation of the polypus is brought about. Hence, when it is particularly indicated to produce a speedy detachment of the polypus, the wire should be tightened, at least, once a day.

In this manner, the cannula is to remain in the nose, until the noose is detached, together with the polypus. There is another method of tying the tumor, without leaving the cannula in the nose. After the noose has been introduced as far as possible into the nostril, the two ends of the wire are to be twisted round the two rings, and the cannula is to be turned round a couple of times. The wire is then to be unfastened from the rings, and the cannula withdrawn. In this way, the noose is made to embrace the polypus, round which it remains firmly applied. When it is wished to produce a greater constriction, the cannula is again introduced into the nose, the ends of the wire fastened to the rings, and the instrument turned round again; after which, it is taken away, as before.

When the tumor has begun to slough, and a fetid discharge has commenced, alum water should be repeatedly injected into the nostril, for the sake of cleanliness; and immediately the dead mass is sufficiently loose, it should be removed.

Although the ligature has been very much praised by some of the moderns, it is attended with so many difficulties, that, in the majority of cases, the use of forceps is infinitely preferable. Hemorrhage is the only inconvenience, for which extraction is abandoned for the employment of the ligature. But this is much less dangerous than is represented. The inconveniences of the ligature are far more serious, and numerous. The cure by the ligature is always accomplished with much less expedition than that by extraction. When the polypus is of such a size as to occupy the whole of the nostril, it is generally impracticable to introduce the noose to a sufficient depth. The figure of the polypus renders it almost impossible to tie its root; for, commonly, the tumor expands very much before and behind, and the wire must be brought over the posterior part of the polypus, ere it can be applied to its root. In general, also, the noose only includes the front part of the polypus, while the root, and back portion remain untied, and consequently, are not destroyed.

As soon as the noose is drawn tight, not only the polypus inflames, but the whole extent of the Schneiderian membrane. The pain, and inflammation, frequently extend even to distant parts, as the throat, eyes, &c. attended with a great deal of fever.

When the polypus is tied, it swells very much, and all the complaints which it previously caused are exasperated. But, in particular, the part situated in the throat sometimes obstructs deglutition, and respiration, in such a degree, that prompt relief becomes necessary; and one of the best plans for affording it, is to make a few punctures in the tumor.

The wire sometimes breaks off close to the lower aperture of the cannula, in consequence of being twisted so much, and thus the progress of the cure is interrupted. A new wire may be introduced; but it is difficult to apply it exactly in the situation of the other. A fresh place is commonly tied, which is almost the same thing as commencing the cure anew.

After enumerating so many inconveniences of the ligature, as a means of curing nasal polypi, I shall only remark, that it is not surprising, that the plan should now be hardly ever adopted by any good surgeons in this country. Amongst other authorities, I may cite that of Sir A. Cooper, who has tried the ligature unavailingly, and pronounces its application to these cases to be decidedly unadvisable.

Caustics. The cautery, formerly recommended for the cure of the polypus nasi, is now entirely rejected, and, indeed, in the manner it was customary to use it, little good could be done. It was applied to the anterior surface of the tumor in the nostril, and its employment was repeated every time the slough separated. Its operation could naturally be but of small extent, as it only came into contact with a trivial portion of the polypus. Its irritation augmented the determination of blood to the excrescence, and accelerated its growth; while as much of the tumor was reproduced, ere the slough separated, as was destroyed; and the design of completely extirpating the disease, in this way, seldom or never proved successful.

There are some nasal polypi much disposed to profuse bleeding. Touching them in the gentlest manner, and every trivial concussion of the body gives rise to hemorrhage. The patient is exceedingly debilitated by repeated loss of blood; his countenance is pallid; his feet swollen; he is affected with hectic fever; and faints whenever any considerable bleeding arises. Doubtless extraction, in this case, is a very precarious method, as the patient is so circumstanced, that any copious effusion of blood must be highly perilous. Sometimes the polypus is, at the same time, so large, and the nostril so completely occupied and distended, that it is impossible to apply a ligature. Such is the only case, to which even Richter sanctions the use of the cautery.

In employing the cautery, (says the latter author,) the object is not to effect, by its direct agency, a gradual destruction of the polypus; but to excite such an inflammation, and suppuration, of the whole of it, as shall lead to this event. To fulfil this purpose, a common trocar, three inches long, may be used. The cannula ought to be two inches shorter than the trocar, whereby the latter may protrude from it so far; and it should be constructed with a handle. The cannula should be made wider than it is in common, so as to allow the trocar to be introduced, and withdrawn with facility. It is to be wrapt round with a piece of wet linen, and applied to the polypus. The red hot trocar is then to be pushed into the tumor, as far as the cannula will allow, which is, of course, two inches.

When the patient entertains a dread of the actual cautery, Richter recommends the introduction of a tent of the emplastrum cantharidum, or a tent smeared with butter of antimony, into the puncture of the unheated trocar, and as soon as suppuration has taken place, emollient and detergent lotions are to be injected. (*Richter's Anfangsgr.*) In England, actual and potential cauteries are never used for the destruction of common nasal polypi; but red projections, not of a polypous nature, sometimes noticed within the nostrils of children, Sir A. Cooper cures by touching them with a bougie armed with the argentum nitratum. The cysts of the hydatid polypus, the same gentleman also destroys by applying the muriate of antimony to them with a camel-hair pencil.

Excision. In the treatment of the polypus, the use of cutting instruments has always been reprobated, because they usually occasion a profuse hemorrhage, and can hardly ever be passed, without mischief, to a sufficient depth into the nose to divide the root of the tumor. Yet, there are instances, in which their use might be productive of advantage. The anterior part of the polypus, situated in the nostril, is sometimes so thick and hard, that it is utterly impracticable to introduce the forceps for the performance of extraction, or the cannula for the application of the ligature. In such a case, it might be a judicious step to cut off the front of the polypus, with a sharp instrument, of a suitable shape, in order to make room for the use of the ligature, or forceps.

Sir A. Cooper sometimes removes polypi by dividing their pedicle with a pair of probe pointed scissors; but, his experience has taught him, that the disease, when thus extirpated, is more likely to return, than when cured by extraction. When a polypus is very large, and the pedicle grows from the side of the antrum, he also sometimes cuts through the root with a pair of curved scissors, and presses down the polypus at the back of the mouth with his finger, from over the velum pendulum palati, and thus removes it.

Mr. Whately, after failing in several attempts to extract, and tie, a considerable polypus of the nose, succeeded in cutting it out. He used "a narrow, straight bistoury, with a probe-point, having a sheath fixed upon its edge, by a screw put into a hole in the handle. An eye was made at its point, to receive one end of a thread intended to be passed round the polypus, for the purpose of directing the knife to the extremity of the tumor. There was also a contrivance by which the knife could be unsheathed at its extremity, the length of three quarters of an inch. This was done by means of the screw, which might be fixed in another hole, by drawing back the sheath. By exposing such a length of edge only, the anterior parts of the nose were defended from the danger of being wounded." Whoever wishes a particular account of the manner of using the instrument, must consult Mr. Whately's *Cases of two extraordinary Polypi, &c.* 1805.

In the polypus, which arises from a relaxation of the Schneiderian membrane, external astringent applications may be first tried; such as ice-cold water, solutions of acetate of lead, alum, muriate of ammonia, &c. These remedies (says Richter) commonly lessen it, and frequently, when it is not very large, accomplish its entire removal. If this should not happen, there is no reason against putting a ligature round it. Here, also, we may venture to employ a cutting instrument, if it be in our power to do so; which, as far as my experience goes, will very rarely be the case. But the practice of extraction is here prohibited.

POLYPI OF THE UTERUS.

Polypi of the uterus is of three kinds, in respect to situation: they grow either from the fundus, the inside of the cervix, or the lower edge of the os uteri. The first case is the most frequent; the last, the most uncommon. Polypi of the uterus are of a pyriform shape, and have a thin pedicle. They are almost invariably of that species, which is denominated fleshy, hardly ever being scirrhous, cancerous, or ulcerated. Sometimes, they contain a cavity, filled with fluid, resembling mucus, or lymph. They originate under the mucous membrane, which still covers them; a circumstance, in which they differ from sarcoma and steatoma of the uterus, which are situated in its substance, or on its external surface.

A polypus of the fundus uteri, is very difficult to detect in its incipient state. While small, it produces not the smallest perceptible change in the organs of generation. As it enlarges, it distends the uterus, and often excites a suspicion of pregnancy, which, however, an attentive inquiry soon dispels. The swelling of the abdomen does not take place in the degree and space of time, which it does in pregnancy; the menstrual discharge generally continues, though often irregular and profuse; the breasts do not become full; and, in the progress of the case, no motion is to be felt. While the polypus lies in the uterus, its growth is slow. At this early period, it frequently occasions profuse bleeding. Women, afflicted with the disease, are seldom pregnant, and when they are so, a miscarriage mostly follows. However, they sometimes hold out till the end of the regular time, and the labour is easy and safe. Levret, Bach, and Jörg have recorded cases, in which the fœtus reached its full term. In Bach's case, the placenta was attached to the polypus: a fact, I should think, quite sufficient to dispel all doubt about the vascularity of uterine polypi.

In some instances, however, the case is more perplexing; the catamenia disappear, and other marks of pregnancy are present, such as nausea, vomiting, and enlargement of the breasts. By degrees, the uterus, and sometimes even the abdomen, is distended. The cervical portion of the uterus is shortened, and becomes thick and tumid, but, instead of the softness, peculiar to pregnancy, it retains a solid feel. A sensation of weight about the genitals, and of bearing down is also experienced; frequently the bowels are constipated, and there is difficulty in voiding the urine. (*Mayer, De Polypis Uteri, Berolini*, 1821.)

As the polypus increases, it expands the os uteri, and, at length, protrudes into the vagina. This change happens sooner, or later, according as the polypus is attached to the cervix, or the fundus uteri; for, in the first case, the polypus generally protrudes, when it has attained the size of a finger, but in the second, it may remain in the uterus several years, and be as large as a child's head before its protrusion commences. The dilatation of the os uteri by the swelling is also mostly attended with a discharge of mucus mixed with blood, and sometimes with dangerously profuse bleeding. The protrusion happens either suddenly, from an accidental concussion of the body: or slowly and gradually, attended with pains similar to those of labour. As soon as is has arrived in the vagina, and is no longer confined and compressed by the uterus, it begins to grow more rapidly, and gives rise to far more troublesome complaints; for it presses the bladder and rectum, and seriously disturbs the evacuation of the urine and feces. But, in particular, it causes repeated and profuse hemorrhages; which weaken the patient exceedingly, and often bring her to the brink of the grave. The root of the polypus is situated in the os uteri, and is there so compressed, that the blood in the tumor is prevented from returning through the veins; consequently, all the vessels become turgid, and the above effusions of blood are the result. Though they generally cease spontaneously, the least circumstances cause their recurrence; such as slight concussions of the body in riding, walking, &c. In the meanwhile, a quantity of mucous and aqueous fluid is voided, by which the patient's strength is more reduced; and at length hectic fever and anasarca come on. The polypus, the source of the bloody and mucous discharge, as well as of all the patient's illness, is frequently misunderstood, and the case is really attended with great danger, from its nature not being comprehended by the practitioner: so necessary is it in cases of preternatural discharge from the uterus, always to examine with the finger, *per vaginam*.

At length, after the polypus has been some time in the vagina, it begins to protrude externally. This happens gradually or suddenly from some effort, or concussion of the body. Additional grievances are now excited. As the polypus cannot descend so low, without dragging the fundus of the uterus downward with it, and occasioning a prolapsus of this organ, the patient, in walking, or standing, commonly experiences a very painful sense of dragging, or stretching, in the pelvis. As the bladder and ureters are also forced into a deranged position, the evacuation of the urine is more or less disturbed, or rendered difficult. Lastly, the dribbling of the urine over the polypus, and the friction which the part accidentally suffers, frequently cause it to inflame, and become painful, and ulcerated.

A polypus, situated in the vagina, or protruding from it externally, may easily be mistaken for a prolapsus uteri: an error, which, though not difficult to avoid when a careful examination is made, may have very perilous consequences. The polypus is softer and less sensible than the uterus in the state of a prolapsus. The imperfect prolapsus uteri, in which this viscus is not turned inside out, is betrayed by the os tincæ, at the lower part of which it is plainly perceptible. In this situation, the polypus may occasionally have a depression, resembling the mouth of the womb, but easy of discrimination from it. A probe can be passed deeply into the os uteri; but not so into this other opening. The polypus resembles an inverted pear, that is, it is thickest below, and becomes gradually thinner upward. The above species of the prolapsus uteri is thinnest below, and gradually increases in width upward. The fallen uterus may easily be pressed back, and when it is so, the patient experiences relief. The polypus does not admit of being pressed back, and, during an attempt to do this, the patient is put to much inconvenience. A probe may be introduced by the side of the polypus deeply to the fundus uteri. When passed by the side of the fallen uterus, it is very soon stopped at the upper part of the vagina, which has sunk down with the cervix of this organ.

A polypus, protruding externally from the vagina, may be much more easily distinguished from a perfect prolapsus uteri, without inversion. The os uteri at once characterizes the uterus, as it can not only be felt, but seen. A probe may be passed deeply into the vagina, along the side of the polypus; but, not so by the side of the uterus, for reasons easy of comprehension. The figure of the tumor, and the state of the patient, on an effort being made to reduce the protruded part, also betray its real nature.

With the exception of a few examples, in which an inversion of the uterus is caused by the descent of a large polypus into the vagina, it happens only in women who have been recently delivered, and has generally been preceded by a very rapid delivery, or the use of too much violence in the extraction of the placenta. While the inverted uterus lies in the vagina, its shape is broad above, and narrow below; whereas the polypus is thin above, and broad below. Hence, in cases of very large polypi in the vagina, the os uteri is but little dilated; while it is extremely distended by the incomplete descent of the inverted uterus itself. Here, likewise, the reduction of the part is attended with relief; while every effort to push back a polypus causes an aggravation of all the complaints.

When the inverted uterus hangs out of the vagina, its figure, like that of the polypus, is thin upward, and broad downward; and, like the latter tumor, has no aperture at its lowest part. An attentive observer, however, will easily avoid a mistake. The inverted uterus includes a circular fold at its upper part, next to the orifice of the vagina. This fold is nothing less than the os uteri itself, through which the body of this viscus has descended. There is nothing of this kind to be felt in cases of polypi. By the side of a polypus the finger or probe may be passed deeply into the vagina; but not so by the side of the uterus. The root of the polypus is firm and hard to the touch; the upper thin part of the uterus, which is hollow, has a soft flabby feel. Useful light is also generally thrown on the case, by the common occasional cause of prolapsus uteri with inversion. The symptoms of a complete inversion are a red, fleshy tumor, as large as a fist, or a child's head, protruding from the genitals, with violent pains, and profuse hemorrhage, often causing syncope, convulsions, and death. The uterus feels rough, elastic, and painful; the uterine tumor, ordinarily felt above the pubes, is wanting; the inversion, though with difficulty, may be returned. On the other hand, a polypus is insensible, hard, and smooth; it may be returned into the vagina with considerable pain, but is immediately expelled again. On the inverted uterus the mouths of the bleeding vessels, and the placenta, or place of its insertion, may be seen. (*Mayer, see Quarterly Journ. of Foreign Med. Vol.* 4, *p.* 476.) However, in particular cases, the diagnosis is much more difficult, and the observations of a modern writer fully prove, that it is always difficult, and perhaps sometimes impossible to distinguish a *partial* and *chronic* inversion of the uterus from a polypus. (*W. Newnham, on Inversio Uteri, with the History of the successful Extirpation of that Organ, during the Chronic Stage of the Disease, p.* 82, *&c.* 8*vo. Lond.* 1818; *also First Lines of the Practice of Surgery, Vol.* 2, *p.* 317.)

Under Professor Siebold, however, Mayer has had several opportunities of seeing *chronic incomplete inversion*, and he mentions the following circumstances, in addition to some others already specified, as forming the diagnosis between it and polypus. Polypus not unfrequently occurs in women who are barren, inversion in those who have borne children. The symptoms of polypus, commencing with disorder of the menses, and frequently with their suppression, increase constantly, and when the tumor is passing into the vagina, are accompanied with pains like those of labour. On the contrary, the symptoms of inversion date their origin from the time of delivery; menorrhagia, unusually violent pains, and excess of the lochia in quantity and duration, succeeding to a very rapid labour, or to a rough and violent extraction of the placenta. In cases of polypus, a discharge of mucous fluids, mixed with blood and membranous fragments, is always present, occasionally alternating with copious hemorrhage; while, in examples of inversion, there is, in fact, an excess of the menses; the hemorrhage appears every second or third week, is very copious for some days, and is succeeded by a serous, thin discharge, as clear as spring water. A polypus is altogether insensible, but the uterus, however its sensibility may be lessened by the duration of the disease, the effect of astringent applications, &c. is always capable of sensation when gently scratched with the nail. (See *Mayer's work and the Quarterly Journ. of Foreign Med. &c. Vol.* 4, *p.* 477.)

In cases of uterine polypi, situated either on the inside of the cervix, or at the margin of the os uteri, the disease is, as it were, from its commencement in the vagina, and the tumor, when large, produces all the complaints attending polypi of the first kind, except frequent profuse bleedings. These seldom occur, and when they do, are slight, because the root of the polypus suffers no constriction in the os uteri. The discharge of mucus, however, is more profuse, than when the polypus is attached to the fundus uteri. As the tumor descends out of the vagina, it occasions a prolapsus uteri without inversion, in addition to the other inconveniences. Cases sometimes occur, in which polypi of the uterus are detached by sphacelation, and a cure is thus spontaneously produced. These are facts well calculated to obviate the doubts, entertained by Mayer, respecting the vascularity of tumors. Indeed, the mode of cure by ligature can only be explained by its interrupting the supply of blood to them.

With regard to the treatment of uterine polypi, no attempt can be made to extirpate them, until the os uteri is sufficiently dilated to permit the application of a ligature, or the practice of excision. In the meantime, the attacks of hemorrhage are to be checked by strict repose; the supine posture; small doses of opium; mineral acids, particularly the phosphoric; alum; and cold injections of vinegar. When these means fail, however, and the hemorrhage endangers life, the os uteri should be artificially dilated, and the polypus immediately removed. Constipation and retention of urine may also sometimes require special attention, before the os uteri has become dilated enough for the extirpation of the tumor. (*Mayer.*)

According to the latter experienced practitioner, the best period for undertaking either to tie, or cut away a polypus of the uterus, is soon after the menses, or after hemorrhage, the genitals being then lax, and the flow of blood to them diminished.

Experience proves, that uterine polypi, when once extirpated, have not that propensity to be reproduced, which those of the nose have. Here, for obvious reasons, extraction is not the right practice.

For the extirpation of polypi of the uterus, all the methods mentioned for the eradication of nasal polypi, have been proposed; but, modern practitioners hardly ever employ more than two, viz. the ligature and excision.

The ligature is generally the most proper means for extirpating uterine polypi, and is here much more easy of application, than in the nose. Large as the polypus may be, there is always abundance of room for the introduction of the necessary instruments. The polypus of the uterus has, commonly, a thinner pedicle, than that of the nose; hence its cure by the ligature is more expeditious; and on account of the greater room, and more yielding nature of the parts, the swelling of the tumor, after the ligature is applied, produces less inconvenience, than in the same mode of treatment of nasal polypi. The inconveniences which do arise, are easy of removal; for instance, the retention of urine may be relieved by the catheter; costiveness by glysters, &c. Uterine polypi are also less sensible, than those of the nose, and hence, less pain and fever follow the application of a ligature to them. The fetid matter, formed as soon as the polypus sphacelates, has a free vent out, and may easily be washed away by injections.

That the polypus cannot be tied, while it lies in the uterus, is easily comprehensible. But, immediately it has descended into the vagina, the operation may be undertaken, and may be performed with the same kind of double cannula, as was employed in the nose. However, here it is extremely requisite, that the cannula should be rather longer, than that already described, and somewhat curved. But, as the silver wire sometimes breaks, two other very convenient instruments have been invented.

The first is Levret's instrument. It consists of two silver cannulæ, which are curved in such a manner, and so united by a joint, that they are shaped like a pair of forceps. After introducing a ligature through the two tubes, so that its ends hang out of their lower apertures, the instrument is to be shut, and passed upwards into the vagina, over the polypus, on whichever side seems most convenient. Then it is to be opened, and the polypus is to be pushed through the two branches of the instrument, which is to be brought over the opposite side of the tumor. In doing this, the ligature becomes applied round the root of the polypus, and forms a noose. The extremities of the ligature are next drawn as tightly as possible out of the lower openings of the cannulæ, and tied first in a surgical knot, and then in a slip-knot. The instrument is then shut, and the ligature constricts the root of the polypus. Afterwards it is to be tightened daily, until the tumor separates.

Another instrument described by Nissen, *De Polypis Uteri*, (see *Richter's Chir. Bibl.* 9. *B. S.* 613) is sometimes preferred. It consists of two silver tubes, twelve inches in length, and as thick as an ordinary writing pen. Both are curved about as much as the os sacrum; but, as they are made of pure silver, the curvature may easily be increased or diminished, according to circumstances. Through each of the cannulæ a strong ligature is to be passed, so that its ends hang out of the lower apertures, while its middle portion forms a noose between the upper apertures of the cannulæ.

The tubes are to be kept together, until they have been introduced into the vagina, as far as the root of the polypus. One is then to be held fast, while the other is to be carried round the tumor, to the opposite side of the cannula that remains stationary. Thus the ligature becomes applied round the root of the polypus. After introducing the finger into the vagina, to ascertain that the ligature lies in its proper situation, its ends are to be drawn through a small double cannula, which is only one-third of an inch long, but so wide that it can be pushed over both the tubes a certain way with the finger, and the upper end of the long cannulæ with the aid of a sort of long probe, with a forked extremity. Then a third double cannula, through which the ends of the ligatures have likewise been passed, and the width of which is sufficient, is to be pushed over the lower ends of the long cannulæ, so as to unite them. The ligatures are next to be drawn tight in the ordinary way, and fastened to the rings. The management of this instrument is so easy, as to need no further explanation.

Besides the above instruments, many others have been devised, and recommended for tying polypi of the uterus. In particular, one invented by Desault, and another, which is preferred by Mayer, claim the attention of such surgeons as wish to be informed of others.

The ligature sometimes brings on acute symptoms of an inflammatory, or spasmodic kind. The former require antiphlogistic treatment. Sometimes fever arises, and the polypus becomes exceedingly painful: in this case, venesection is necessary. Spasmodic symptoms require the exhibition of opium. When this is ineffectual, and the symptoms are severe, it may be proper to slacken the ligature a little. As the polypus at first always swells, it produces great pressure on the adjacent parts. For this reason, it is generally necessary, for the first few days, to draw off the urine with the catheter, and to open the bowels with glysters. Sometimes hemorrhage takes place. This may generally be suppressed by the means already specified; but, when they prove ineffectual, the ligature must be tightened.

During the sphacelation and separation of the polypus, the frequent use of injections will be necessary for the sake of cleanliness, and, as soon as the mass is loose enough, it should be removed with a suitable pair of forceps.

Richter, in common with most practical writers, disapproves of cutting instruments as generally improper for polypi of the uterus, because likely to injure the vagina, and occasion a dangerous hemorrhage. He sanctions the use of the knife, however, when the polypus has a ligamentous pedicle, and cannot be made to separate with a ligature. In this instance, he says, the surgeon may either cut off the polypus closely to its root in the vagina; or he may first draw it gradually downward out of this situation, and then remove it: perhaps the first object might be performed with a sharp hook, somewhat curved at its side, and similar to what is used for tearing the fœtus piecemeal in the uterus; or, with what seems better, a pair of long curved, blunt-pointed scissars. The last object may be accomplished with an instrument resembling Smellie's midwifery forceps, which is to be introduced into the vagina in the ordinary way. The polypus is then to be taken hold of, and very gradually drawn so far out of the vagina, that its pedicle may be divided with a knife. This is, indeed, not done without pain, and a forcible inversion of the uterus; but it has been successfully practised. (See *Herbiniaux*, *Parallèle des differens Instrumens pour la Ligature des Polypes.*)

When a polypus, with a pedicle attached to the fundus uteri, suddenly falls downward, it occasions a sudden inversion of this viscus. In order to relieve, as speedily as possible, the great pain and danger of this case, the surgeon must tie the root of the polypus, as soon, and as firmly as he can, and pass the ligature, by means of a needle through the pedicle, before the place where it is tied, allowing the ends afterwards to hang down for some length. Then the polypus is to be amputated below the ligature, and the uterus immediately reduced.

Siebold and Mayer, of Berlin, only approve of the ligature in two cases; 1st, when an artery can be felt pulsating in the neck of the polypus; 2ndly, when the neck of the tumor is so thick, that it probably contains large vessels. In all other examples, they prefer excision, on the ground of the difficulty of applying a ligature, and, because, when applied, the symptoms are apt to be more severe, and the annoyance greater, than after excision. They operate with round pointed scissors, curved like a Roman S both in the blades and handles, and from 9 to 10½ French inches in length. The division of the neck of the tumor is to be effected not all at once, but by repeated strokes of the instrument. In Mayer's work, six cases are related, in which polypi of the uterus were thus successfully removed by Siebold and himself.

Fleshy excrescences occasionally form in the vagina, some of which have a broad basis, and others a thin pedicle. The last merit the appellation of polypi. Their existence is easily ascertained by the touch. By making pressure on the bladder, and rectum, they occasion several impediments to the evacuation of the urine and feces. They may be conveniently tied, by means of the double cannula. Should the polypus be situated at the lower part of the vagina, this instrument would not be required. The ligature might be applied with the hand, and the tumor cut off below the constricted part.

A polypus in the œsophagus renders deglutition difficult; and, when of large size, puts an entire stop to it. When an inclination to vomit is excited by irritating the throat with the finger, or a feather, the polypus, if situated towards the upper part of the tube, ascends into the mouth, so as to become visible. But, as it impedes respiration during its residence in the mouth, the patient is soon necessitated, as it were, to swallow it again. When it is situated far down the œsophagus, of course, it cannot be brought into the mouth, and is very difficult to detect. The difficulty of swallowing, its only symptom, may result from other causes. In this case, it is also incurable; for it is impossible to take hold of it with instruments. An operation can only be practised, when the polypus is situated at the upper part of the œsophagus. The tumor cannot be extracted; and the tying of it is difficult.

Polypi in the rectum may be tied with the aid of the cannulæ. Excrescences in the meatus auditorius externus, resembling polypi, have been successfully extirpated by extraction, or rather by twisting them off.

Richter, Ansfangsg. der Wundarzn. B. 1, *Kap.* 21. *J. B. de Lamsweerde, Historia Naturalis Malorum Uteri*, 12*mo. Lugd.* 1700. *P. G. Schacher, Programma de Polypis, Lips.* 1721. *C. F. Kaltschmid, De Mola scirrhosa in utero inverso extirpata, Jenæ*, 1754. *C. Schunck, De polypo post febrem Epidemicum ex utero egresso. Wittemb.* 1739. *A. Levret, Obs. sur la Cure radicale de plusieurs Polypes de la Matrice, de la Gorge, et du Nez*, 8*vo. Paris*, 1749. *M. G. Herbiniaux, Traité sur divers Accouchemens laborieux, et sur les polypes de la Matrice, &c.* 2 *Tom.* 8*vo. Bruxelles*, 1782—1794. *E. Grainger, Medical and Surgical Remarks, including a description of a simple and effectual method of removing polypi from the uterus, &c.* 8*vo. Lond.* 1815. *Denman's Plates of a Polypus, with an Inversion of the Uterus, and of a Polypus of the Uterus, fol.* 1801. *F. A. Walter, Annotationes Academicæ*, 4*to. Berol.* 1786. *W. Newnham, An Essay on the Symptoms, &c. of Inversio Uteri, with a History of the successful Extirpation of that Organ*, 8*vo. Lond.* 1818. *Wenzel, Krankheiten des Uterus: Mainz*, 1816. *C. G. Mayer, De Polypis Uteri*, 4*to. Berol.* 1821. *Pott's Remarks on the Polypus of the Nose. Whately's Two Cases of extraordinary Polypi*, 8*vo. Lond.* 1805. *John Bell's Principles of Surgery, Vol.* 3, *Part* 1. *Encyclopédie Méthodique, Art. Polype. J. G. Haase, De Narium Morbis Comment. Lips.* 1794—1797. *Lassus, Pathologie Chir. T.* 1, *p.* 528—538, *&c. Edit.* 1809. *Callisen's Systema Chirurgiæ Hodiernæ, Vol.* 2, *p.* 169, *&c. J. L. Deschamps, Traité des Maladies des Fosses Nasales, et de leur Sinus*, 8*vo. Paris*, 1804. *Nauche, des Mal. de l'Uterus*, 8*vo. Paris*, 1816. *S. Schmeider, Schediasma de Polypo Œsophagi vermiformi rarissimo, &c. Delitii*, 1717.

PORRIGO, TINEA CAPITIS, (called also *Ringworm of the Scalp, Scald-head, &c.*) is, according to Dr. Bateman's excellent account of the subject, a contagious disease, principally characterized by an eruption of the pustules denominated *favi* and *achores*. The *achor* is defined to be a small acuminated pustule, containing a straw-coloured matter, which has the appearance and nearly the consistence of honey, and is succeeded by a thin brown, or yellowish scab. The *favus* is larger, flatter, and not acuminated, and contains a more viscid matter; its base, which is often irregular, is slightly inflamed; and it is succeeded by a yellow, semitransparent and sometimes cellular scab, like a honey-comb; whence it has obtained its name. (See *Bateman's Synopsis of Cutaneous Diseases, p.* xxiv. *and* 159, *Edit.* 3.)

This intelligent physician has noticed six species of Porrigo, of which my limits will allow me to give only a very abridged description.

1. The *Porrigo larvalis*, or *crusta lactea* of authors, begins with an eruption of numerous minute whitish *achores*, upon a red surface. These pustules soon break, and discharge a viscid fluid, which concretes into thin yellowish or greenish scabs. The disease increases in extent, and the scabs become thicker and larger, until the forehead and cheeks, even the whole face, excepting the eyelids and nose, become enveloped, as it were, in a mask, whence the epithet *larvalis*. Small patches of the disease sometimes appear about the neck and breast, and on the extremities; and the ears and scalp are usually affected in the progress of the case. The infant suffers more or less from the itching and irritation. When the discharge is copious and acrid, Dr. Bateman recommends the part to be washed two or three times a day with tepid milk and water, and the application of the unguentum zinci alone, or mixed with the saturnine cerate. The latter, he says, will be useful for the relief of the excoriation left after the cessation of the discharge. Small doses of the submuriate of mercury, either alone, or in combination with a testaceous powder, will also expedite the cure. If the bowels are very irritable, the hydrargyrus cum creta, or the cinereous oxide, may be exhibited instead of the calomel. When the health is good, soda, precipitated sulphur,

and the testacea, will lessen the local inflammation and discharge.

When the irritation is removed, and the crusts are dry and falling off, the unguentum hydrarg. nitrat. much diluted, may be used, and the decoction of bark, or the vinum ferri, prescribed.

2. *Porrigo furfurans* begins with an eruption of small *achores:* The excoriation is slight, and the discharge, which is not abundant, soon concretes, and falls off in innumerable thin laminated scabs. At irregular periods fresh pustules arise, and follow the course of the preceding. The complaint is confined to the scalp, which is affected with itching and soreness; and the hair, which partly falls off, becomes thin, less strong, and sometimes of a lighter colour than natural. This species of porrigo occurs principally in adults, and it is sometimes attended with swelling of the glands in the neck. Dr. Bateman observes, that the treatment requires the hair to be closely cut off the scalp. The branny scabs are then to be gently washed away with some mild soap and water twice a day; and an oil silk cap should be worn. In the beginning, when the surface is moist, tender, and inflamed, the zinc ointment, or one made with ʒij. of the cocculus indicus and ℥j. of lard. Afterwards, when the scalp is dry and free from irritation, it may be washed with common soft soap and water; or with a mixture of equal parts of soft soap and unguentum sulphuris. Then the unguentum hydrargyri nitrati, the ung. hydrarg. nitrico oxydi, the tar and sulphur ointments, or the ung. acidi nitrosi of the Edinb. Pharm. may be employed. These last stimulant applications, however, must be left off, if the inflammation and discharge return.

3. *Porrigo lupinosa* is characterized, according to Dr. Bateman, by dry, circular, yellowish white scabs, set deeply in the skin, with elevated edges, and a central depression, and somewhat resembling, on the whole, the seeds of lupines. These scabs are formed upon separate clusters of *achores*, and attain on the scalp the size of a sixpence; but, when on the extremities, they are not more than two lines in diameter.

In the treatment of the porrigo lupinosa the scabs are first to be gently washed off with some soap and water, and the scalp is to be shaved, if it be the part affected. When the scabs are difficult of removal, the liquor potassæ, or a weak lotion of muriatic acid may be used for loosening them. Then the ointment of cocculus indicus is to be applied to the red cuticle, and afterwards any of the more stimulant ointments above enumerated

4. *Porrigo scutulata*, or *Ringworm of the Scalp*, as Dr. Bateman has observed, makes its appearance in separate patches, of an irregular circular shape, upon the scalp, forehead, and neck. It commences with clusters of small, light yellow pustules, which soon break, and form thin scabs, which, if neglected, become thick and hard. If the scabs are removed, however, the surface underneath is left red and shining, but studded with slightly elevated points, or pustules. When the disorder is neglected, the patches become confluent, and the whole head affected. Where the disease is situated, the hair becomes lighter in its colour, it falls off, an its roots are destroyed. The porrigo scutulata generally occurs in children three or four years old and upwards, and frequently proves exceedingly obstinate. According to Dr. Bateman, it seems to originate spontaneously in children of feeble and flabby habit, and who are ill fed, uncleanly, and not sufficiently exercised; but he thinks that it is chiefly propagated by contagion, *i. e.* by the actual conveyance of the matter from the diseased to the healthy, as may happen in the frequent contact of the heads of children, the use of the same towels, combs, caps, and hats.

While the patches are inflamed and irritable, it is necessary to limit the local applications to washing the parts with warm water. Even shaving the scalp, which must be repeated at intervals of eight or ten days, produces a temporary irritation. Nothing but a light linen cap is now to be worn, and it must be often changed.

The disease afterwards forms dry scabs, and becomes for a time less irritable; but a fresh eruption of achores soon follows, and the inflammation and redness return.

In the inflamed states, Dr. Bateman recommends the use of ointments, made either with the cocculus indicus, submuriate of mercury, oxide of zinc, superacetate of lead, opium, or tobacco; or else the infusion of poppy heads, or tobacco. Where there is an acrimonious discharge, Dr. Bateman prescribes the zinc, or saturnine ointments, the ung. hydrarg. præcip. calomel ointment, or a lotion of lime water and calomel.

In the less irritable stages, the ung. hydrarg. præcip. the ung. hydrarg. nitrico-oxydi, and especially the ung. hydrarg. nitrat. are often effectual remedies. So are the ointments of sulphur, tar, hellebore, and turpentine, and lotions of the sulphates of zinc and copper, the oxymuriate of mercury. I have often seen a solution of ʒj. of the sulphuret of potassa in a pint of lime water, succeed when most other applications, had failed. In the very dry and inert state of the patches, Dr. Bateman has seen the disease removed by a lotion, containing from three to six grains of the nitrate of silver in an ounce of distilled water. The application of the diluted mineral acids, or of a blister, has also been known to put a permanent stoppage to the morbid action.

In general, no local application agrees well, if long continued, and it is necessary to have several, which must be alternately employed.

The cure may often be expedited by cinchona, chalybeate, and alterative medicines; and attention must be paid to the patient's diet, exercise, &c.

5. *Porrigo decalvans* consists in bald patches, surrounded by hair, which is as thick as usual. It is not known, whether any eruption of minute achores actually precedes the detachment of the hair.

Dr. Bateman remarks, that if the scalp is regularly shaved, and some stimulating liniment be applied to it, this obstinate affection may at length be overcome, and the hair will regain its usual strength and colour. Two drams of oil of mace in three or four ounces of alcohol, are said to make an excellent liniment.

6. *Porrigo favosa* consists of an eruption of the large, soft, straw-coloured flattened pustules,

denominated *favi*, which may occur on any part of the body; but most commonly spread from the scalp, especially behind the ears, to the face, or from the lips and chin to the scalp. They are attended with considerable itching, and are most frequently seen in children from six months to four years of age, though adults are also often affected. The pustules pour out a viscid matter, which concretes into greenish or yellowish semi-transparent scabs. When the hair and moist scabs are matted together, pediculi are often generated in great numbers, and aggravate the itching and irritation. If the disease be allowed to increase, the scabs are thickened into irregular masses, not unlike honey-comb; and considerable ulcerations sometimes form, especially when the heel and toes, or other parts of the lower extremities, are affected. The ulcerating blotches are generally soon followed by irritation and swelling of the lymphatic glands, which sometimes slowly suppurate. The contact of the discharge inoculates the disease; thus, in young children the breast is inoculated by the chin; and the arm and breast of the nurse may be infected in the same way; though adults do not take the complaint so quickly as children.

The porrigo favosa requires the same alteratives internally as the porrigo larvalis. The diet should consist of milk, puddings, and a little plain animal food. When the habit is bad, and the glands swelled, bark, chalybeates, and a solution of the muriate of barytes, are proper.

As local applications, Dr. Bateman prefers the unguentum zinci, or the ung. hydrarg. præcip. mixed with this or the saturnine ointment, especially when the discharge is copious. He also speaks favourably of the ung. hydrarg. nitrat. the strength of which is to be diminished by an addition of simple cerate, according to the degree of irritation present.

For the preceding particulars I am indebted to Dr. Bateman's valuable Synopsis of Cutaneous Diseases, where the reader, desirous of additional information respecting porrigo, will be amply gratified.

POTASSA ARSENICATA. *Kali Arsenicatum*, *Arsenias Kali.* ℞. Oxydi albi arsenici, potassæ nitratis sing. ℥j. Crucibulo amplo igne candenti injice nitrum, et liquefacto adde gradatim arsenicum in frustulis donec vapores nitrosi oriri cessaverint. Solve materiam in aquæ distillatæ ℔iv. et post idoneam evaporationem sepone ut fiant crystalli. These crystals may be given in the dose of one-tenth of a grain, thrice a day. (*Pharm. Sancti Barthol.* 1799.) Justamond strongly recommended the internal exhibition of arsenic in cases of cancer. (See *Cancer.*)

POTASSÆ CARBONAS. Sometimes given as a palliative in cases of stone: the dose is ʒij. in ℔j. of distilled water, twice a-day.

POTASSA FUSA. *Caustic Potassa.* One of the most useful caustics for destroying fungi and making issues; and it was recommended to be used in a particular manner, by Mr. Whately, for the cure of strictures in the urethra. When surgeons prefer opening buboes, or any other abscesses, with caustic, the caustic potassa is very commonly employed. When surgeons used to cure hydroceles, by destroying a part of the scrotum and tunica vaginalis with caustic, the potassa fusa, either alone, or mixed with quicklime, was made use of. (See *Vertebræ*, *Urethra, Strictures of, &c.*)

POTASSÆ SULPHURETUM. *Sulphuret of Potash*, *Liver of Sulphur.* Two drams, dissolved in a pint of lime or distilled water, make an excellent lotion for the cure of porrigo. Many other cutaneous affections yield also to the same remedy. When arsenic has been swallowed as a poison, twenty grains of the sulphate of zinc may be given as an emetic of the quickest operation: and, after keeping up the vomiting by drinking warm water, and, what is better, sweet oil, some authors recommend making the patient drink as much as possible of a solution of the sulphuret of potash.

PREGNANCY is set down by some writers as preventive of the union of broken bones; but many exceptions to the remark present themselves in practice: I have attended myself a female, six months gone with child, who broke both bones of her leg, yet they grew together again in the usual time. (See *Fractures.*) Pregnant women also frequently bear operations much better than might be expected. Thus M. Nicod has recently published a successful amputation of the left leg during pregnancy, in a case where the right tendo Achillis was also ruptured. Both the wound and the broken tendon united very well. (See *Annuaire Méd. Chir. des Hôpitaux de Paris*, *p.* 509, *4to. Paris*, 1819.)

PROBANG. A long slender bit of whalebone, with a bit of sponge at its extremity, intended for the examination of the œsophagus, or the removal of obstructions in it.

PROCIDE'NTIA. Prolapsus. A falling down of any part. (See *Anus, Prolapsus of. Uterus, Prolapsus of, &c.*)

PROSTATE GLAND, DISEASES OF. It is an observation, made by Mr. Hunter, that the use of this gland is not sufficiently known to enable us to judge of the bad consequences of its diseased state, abstracted from swelling. Its situation (says he) is such, that the bad effects of its being swelled must be evident, as it may be said to make a part of the canal of the urethra, and, therefore, when it is so diseased that its shape and size are altered, it must obstruct the passage of the urine. (*On the Venereal Disease*, *p.* 169.) A swelling of the prostate gland, however, may be of very different kinds: thus it may depend either upon common inflammation of the part, abscesses, calculi formed within its substance, a varicose enlargement of its vessels, or a scirrhous chronic induration. (See *Œuvres Chir. de Desault par Bichat*, *T.* 3, *p.* 220.)

Modern anatomists describe the prostate gland as not being itself a very sensible part, and hence it is more subject to chronic than acute disease, to which, however, it is also liable. We have the authority of Desault, Hunter, and Dr. Baillie, for setting it down as subject to scrophula. The latter physician, after stating that he has seen a common abscess situated in it, adds, that it is also subject to scrophulous disease, as, on cutting into it, he has met with the same white curdy matter which is formed in a scrophulous absorbent gland; he has likewise forced out of its duct scrophulous pus. (*Morbid Anatomy, &c.*)

Mr. Lloyd has met with fleshy enlargements of the gland, in the substance of which several small abscesses were formed, containing " a complete scrophulous matter." He has also known enormous enlargements of this gland happen in young men, who were labouring at the same time under other scrophulous disease. Other instances of supposed scrophulous swellings of the same part in young patients are likewise cited by this author, one of which is particularly remarkable, as in it the gland was found after death to be of the size of a child's head, though its natural consistence was not much changed. (*On Scrophula, p.* 107.) Other chronic, or, as they are more often called, scirrhous enlargements of the prostate gland, rarely occur in subjects under the age of fifty. To these cases I shall presently return.

Like every other part of the body, the prostate gland is sometimes, but not often, the seat of common phlegmonous inflammation. Mr. Wilson has known two or three instances of this kind take place soon after puberty: one case was from a fall; the others arose without any assignable cause. (*On the Male Urinary and Genital Organs, p.* 327.) There is also a phlegmonous swelling of the prostate gland, sometimes an effect of strictures, as will be presently noticed. As Desault observes, the retention of urine, arising from such a cause, comes on very suddenly, and rapidly increases. The patient at first complains of a sense of heat and weight about the perinæum; and, soon afterwards, of a continual throbbing pain about the neck of the bladder. The pain is severely increased when the patient goes to stool; and there is tenesmus, and frequent inclination to make water. However, according to Mr. Wilson, the desire to evacuate the urine is here less constant than in cases where the inner membrane of the bladder is inflamed. (*Vol. cit. p.* 327.) The patient feels also as if a large mass of excrement filled the extremity of the rectum, and were ready to come out. If a finger be introduced within the rectum, the swelling of the gland is plainly distinguishable; and, according to J. L. Petit, the projection of the prostate gland in the bowel makes a corresponding hollow groove along the concave side of the excrement, as may be noticed when what is voided is hard. However, Bichat conceives that such an appearance must generally be obliterated as the excrement is passing through the sphincter. When the patient attempts to make water, it is a long while before the first drops come out; and as straining has the effect of propelling the swelled prostate more against the neck of the bladder, it only increases the difficulty, and no urine will come out until such efforts are discontinued. The more violent the inflammation is, the smaller is the stream of urine, and the more acute the pain felt during its expulsion. According to Desault, it is likewise particularly remarkable in such cases, that if an attempt be made to introduce a catheter, the instrument passes without the least resistance as far as the prostate gland, where it stops, and causes great pain. The pulse is hard and frequent; and the patient is exceedingly thirsty and feverish. Desault considered the retention of urine in cases of this kind, and, indeed, in all enlargements of the prostate gland, or other obstructions of the urethra, as generally more dangerous than other retentions, merely depending upon weakness of the bladder, where there is little risk of this organ giving way. When the urethra is free from obstruction, the urine, after distending the bladder in a certain degree, generally oozes through that canal, and the patient may live in this condition for years without any alarming symptoms. But the case is different when the retention of urine depends upon any stoppage or stricture in the urethra. The urine does not then partially escape, but stagnates in the bladder; the distention increases; and, if speedy relief be not afforded, a perilous extravasation follows. The danger, however, of such a retention of urine depends very much upon the extent and severity of the inflammation. However, this statement will not apply to the chronic scirrhous enlargement of the prostate, because, as will be presently explained, in this affection some of the urine begins to dribble away after the bladder has become distended in a certain degree.

In cases of phlegmonous inflammation of the prostate gland, antiphlogistic treatment is indicated; especially venesection, leeches to the perinæum and near the anus, the warm bath, emollient clysters, poultices, and fomentations, and a low regimen. However, as Desault admits, the efficacy of these means is often too slow, and the symptoms too urgent, to allow the surgeon to wait for the urine to flow of itself. Frequently, also, the distention has so weakened the bladder, that this organ cannot expel its contents; in which event, the catheter must be used, though the diminished diameter and altered course of the prostatic portion of the urethra sometimes render its introduction difficult, and always very painful. The practical observations, respecting the best kind of catheters, and the mode of introducing them in cases of swelled prostate gland, will be more conveniently introduced when the chronic enlargement of this part is considered. (See also *Catheter* and *Urine, Retention of.*) In every instance of retention of urine from acute inflammation about the neck of the bladder, whether the case be an abscess forming near the anus, or a phlegmonous inflammation of the prostate gland, or other adjacent part, it has always appeared to me that antiphlogistic and anodyne remedies should first be fairly tried, and the catheter, which always increases the pain and irritation, only used where such means do not afford relief with sufficient expedition.

When a catheter has been introduced, ought it to be left in the bladder, or withdrawn, after the discharge of the urine? Its presence, no doubt, will increase the irritation about the neck of the bladder; but, on the other hand, if it be taken out, the surgeon may not be able to introduce it again. No general precept, says Desault, can be laid down on this point. The course which the practitioner will pursue must depend upon the difficulty he has experienced in getting the instrument into the bladder, and upon the confidence which he may have in his own skill, and which must be founded upon constant success in analogous instances.

According to Desault, when an abscess follows inflammation of the prostate, the body of the gland itself does not suppurate, but only the surrounding parts, and the cellular substance, which connects its lobes together. This, at least, was what was observed in examining several dead subjects, who were publicly opened in the amphitheatre of the Hotel-Dieu.

When the symptoms of inflammation have lasted a week, and all this time have continued to increase; when, after this period, they have abated a little, and then become violent again; and when the febrile symptoms grow worse in the evening, and have been preceded by shiverings; there is reason to suspect the formation of matter. It cannot be known whether the pus is collected in one particular place, or diffused. When the matter is external to the gland, the case is less serious than when it occupies the cellular substance connecting the lobes. According to Desault, the latter form of the disease seldom gets well. There are no peculiar symptoms which denote it; the matter does not readily make its way outward; and the state of things is not clear enough to admit of an incision being made. Besides, Desault doubted whether an incision could be of much use, since it would probably only discharge the matter in its vicinity.

Things are different when the pus is collected in one place, and is more superficial. If situated between the gland and neck of the bladder, Desault says, it will often spontaneously burst into this viscus, or it may be let out with the point of the catheter. It will then either be discharged through the instrument, or come away with the urine. However, according to Mr. Wilson, abscesses of the prostate gland generally burst into the urethra behind the caput gallinaginis, but sometimes before it; and he has seen more than one instance, in which they have burst in the perinæum. (*On the Male Urinary and Genital Organs*, p. 329.) Should the abscess lie near the rectum and perinæum, and admit of being distinctly felt, Desault conceived, that a free opening would expedite the cure.

In all these cases, the use of the catheter is requisite in order to let out the urine, and as the instrument must be left in the passage some time, Desault preferred one made of elastic gum. As Mr. Wilson has remarked, soothing means should also be employed; internal narcotic medicines, anodyne clysters, the mixtura amygdalarum, &c.

Morgagni has taken notice of the retentions of urine arising from the presence of calculi in the prostate gland. The nature of these concretions will be described in the article *Urinary Calculi.* Calculi also sometimes form in or about the prostate gland, when, after lithotomy, the outer part of the wound heals sooner than the bottom. A kind of urinary fistula then ensues; and, as the extraneous substance is constantly exposed to the contact of fresh urine, it may increase to a very large size. The diagnosis of prostatic calculi is seldom very clear. A retention of urine, and an impediment to the emission of the semen, are said to be the only symptoms, and these are common to several other affections of the prostate gland and urethra. When the finger is introduced into the rectum, the gland may indeed be felt to be enlarged; but the nature and cause of such enlargement cannot in general be distinguished. In one instance, however, recorded by Dr. Marcet, the calculi could be plainly felt through the coats of the rectum, and a proposal was made to extract them by an incision in that situation; but the patient did not accede to so judicious a measure. (*Med. and Chem. Hist. of Calculous Disorders*, 8vo. 1817.) When a calculus projects from the prostate gland into the urethra, the end of a sound will strike against it; but then it can rarely be known whether the extraneous substance may not be a calculus that has passed out of the bladder into the urethra, or lies close to the neck of this viscus.

Whether the case be of one description or the other, however, the treatment should be the same; viz. the calculus should be extracted by an incision; and, if the situation of the calculi will admit of their being taken out without the bladder itself being cut, this plan should undoubtedly be pursued.

A considerable varicose affection of the vessels of the prostate gland, which is also itself generally somewhat enlarged, is another disease treated of by writers as one cause of a retention of urine. In this case, the water should be drawn off with an elastic gum catheter, which should be kept in the urethra; and a large instrument is to be preferred to a smaller one. For an account of the symptoms of this case I must refer to *Les Œuvres Chir. de Desault, T.* 3, *p.* 234. The practice of this author was gradually to dilate the portion of the urethra which passes through the prostate with bougies, or elastic catheters, which were worn a long while, and cleaned and changed at proper intervals. I am not aware, that these cases are recognized in the practice of surgery in England.

The most frequent disease of the prostate gland, and, of course, that which is most interesting to the practical surgeon, is a slow hardening and enlargement of it, sometimes denominated *scirrhus*, whereby its natural size, which is that of a common chesnut, is sometimes gradually changed to that of a man's fist. (*J. L. Petit.*) According to the observations of Hunter, Desault, and Sir Everard Home, this chronic swelling of the prostate gland is most common in the decline of life; one circumstance in which it differs from scrophulous diseases of the same part, which are well known to happen chiefly in youngish persons. It is observed by Mr. Hunter, that, when the prostate gland swells, "it does not lessen the surface of the urethra at the part, like a stricture; on the contrary, it rather increases it; but *the sides of the canal are compressed together, producing an obstruction to the passage of the urine, which irritates the bladder, and brings on all the symptoms in that viscus, usually arising from a stricture or stone.* From the situation of the gland, which is principally on the two sides of the canal, and but little, if at all, on the fore-part, as also very little on the posterior side, it can only swell laterally, whereby it presses the two sides of the canal together, and, at the same time, stretches it from the anterior edge or side to the posterior, so that *the canal,* instead of being round, *is flattened into a narrow groove, and sometimes the gland swells more on one side than the other, which makes an obliquity in the canal passing through it.*

"Besides this effect of the lateral parts swelling, *a small portion of it, which lies behind the very beginning of the urethra,* swells forwards, like a point, as it were, into the bladder, *acting like a valve to the mouth of the urethra,* which can be seen even when the swelling is not considerable, by looking upon the mouth of the urethra from the cavity of the bladder in a dead body. *It sometimes increases so much as to form a tumor, projecting into the bladder some inches.* This projection *turns or bends the urethra forwards, becoming an obstruction to the passage of a catheter, bougie, or any such instrument; and it often raises the sound over a small stone in the bladder, so as to prevent its being felt.*" (*Hunter on the Venereal Disease, p.* 169.) The valvular production just behind the beginning of the urethra, here described, particularly merits attention, because it is represented by Sir Everard Home as arising from the enlargement of what he considers a newly discovered part in anatomy, viz. a *third*, or *middle lobe*, of the prostate gland. (See *Phil. Trans.* 1806.) In the dissections which Sir Everard mentions as having led to this discovery, "the urinary bladder was distended with water, and the surfaces of the prostate gland, vesiculæ seminales, and vasa deferentia, were fairly exposed. This being done, the vasa deferentia and vesiculæ seminales were carefully dissected off from the bladder, without removing any other part. These were turned down upon the body of the prostate gland. An accurate dissection was then made of the circumference of the two posterior portions of the prostate gland, and the space between them was particularly examined. In doing this, *a small* rounded substance was discovered, so much detached, that it seemed a distinct gland, and so nearly resembling Cowper's glands in size and shape, as they appeared in the same subject, in which they were unusually large, that it appeared to be a gland of that kind. It could not, however, be satisfactorily separated from the prostate gland, nor could any distinct duct be found leading into the bladder.

"A similar examination was made of this part in five different subjects. The appearance was not exactly the same in any two of them. *In one, there was no apparent glandular substance, but a mass of condensed cellular membrane;* this, however, on being cut into, differed from the surrounding fat. In another there was a lobe, blended laterally with the sides of the prostate gland. These facts, (says Sir Everard Home) are mentioned, in proof of its not being always of the same size, or having exactly the same appearance."

This is found also to be the case with Cowper's glands: they are sometimes large and distinct; in other subjects, they are scarcely to be detected; and, in others again, are in all the intermediate states. The most distinct and natural appearance of this part was in a healthy subject, twenty-five years of age, of which the following is an account. On turning off the vasa deferentia and vesiculæ seminales, exactly in the middle of the sulcus, between the two lateral portions of the prostate gland, there was a rounded prominent body, the base of which adhered to the coats of the bladder. It was imbedded, not only between the vasa deferentia and the bladder, but also, in some measure, between the lateral portions of the prostate gland, and the bladder, since they were in part spread over it, so as to prevent its circumference from being seen, and they adhered so closely as to require dissection to remove them; nor could this be done, beyond a certain extent, after which the same substance was continued from one to the other. This proved it to be a lobe of the prostate gland; its middle had a rounded form, united to the gland at the base next the bladder, but rendered a separate lobe by two fissures on its opposite surface. Its ducts passed directly through the coats of the bladder, on which it lay, and opened immediately behind the verumontanum. By means of this lobe, a circular aperture is formed in the prostate gland, which gives passage to the vasa deferentia. "Previous to this investigation (says Sir Everard), it was not known to me, that any distinct portion of the prostate gland was situated between the vasa deferentia and the bladder." (*On Diseases of the Prostate Gland, p.* 9, 8*vo. Lond.* 1811.) Notwithstanding this explanation, to the correctness of which most English anatomists have acceded, it is worthy of notice, that Langenbeck, the present distinguished Professor of Anatomy and Surgery at Gottingen, in a review of Sir Everard's account, declares, that he has never, *in the natural state of the parts*, found the middle lobe, as it is called, which he considers as a partial induration, rising up in the shape of a lobe. (*Neue Bibl. B.* 1, *p.* 360, 12*mo. Hanover*, 1818.) This dissent would seem extraordinary, if it were not possible to suppose, that it may proceed, not from all the subjects at Gottingen differing from Londoners in being destitute of, what Sir Everard Home has named, the *middle lobe of the prostate gland*, but from Langenbeck's not having traced *in the healthy state of the gland*, any portion which *he thought* deserving of that name. But though differences of opinion may be entertained about the name, none I presume can remain about the thing itself, which appears to have been long ago mentioned, though not perfectly described, by Morgagni. (*Adversaria Anat.* 4, *Animad.* 15.) The paper by Mr. C. Bell, illustrating how far our predecessors had a knowledge of this portion of the gland, seems to me one of his best productions; and it is therefore with pleasure that I refer to it. (See *An Account of the Muscles of the Ureters, in Med. Chir. Trans. Vol.* 3, *p.* 171, *&c.*) However, as this author impartially acknowledges, it is not because a fact was anciently known, or perhaps only cursorily noticed, that there may not be great merit in reviving the recollection, or perfecting the description of it; and as far as I can learn, none of the anatomical teachers in this city, previously to Sir Everard's paper, particularly adverted, in the healthy original state of the prostate gland, to the structure, which he has pointed out, by whatever name it be distinguished.

According to Sir Everard Home, this lobe, in the earlier periods of life, when the body of the gland is in a sound state, is small; nor does it appear to become enlarged, even when the body and the lateral lobes have been considerably increased in size; but, in subjects of advanced age, this part, as well as the rest of the gland, is usually found somewhat enlarged, even in cases where no disease has been suspected during life. (*P.* 17.) When the middle lobe begins to enlarge, it presses inwards towards the cavity of the bladder, putting the internal membrane upon the stretch, and communicating to it by immediate contact the inflammation, which occasioned its own enlargement. Hence, pain in making water, particularly after the last drops are voided, and a desire and straining to discharge more, after the bladder is empty.

As this organ cannot now retain much urine, the desire to make water becomes frequent, and there is commonly more or less constitutional disturbance, or symptomatic fever. In proportion as the middle lobe increases in size, it projects into the cavity of the bladder in the form of a nipple; but after a further augmentation, it loses the nipple-like appearance, becomes broader, and forms a transverse fold by pushing forward, and stretching, the membrane, connecting it to the lateral lobes. "*As the tumor, and the transverse fold, are situated immediately behind the orifice of the urethra, they are pushed forwards before the urine in every attempt that is made to void it, acting like a valve, and closing up the opening, till the cavity of the bladder is very much distended, when, the anterior part of the bladder being pushed forward, and the tumor being drawn back, in consequence of the membrane of the posterior part of the bladder being put on the stretch, the valve is opened, so that a certain quantity of water is allowed to escape, but the bladder is not completely emptied.*" (*P.* 19.) Sir Everard Home afterwards explains, that, as the tumor enlarges, the quantity voided at each time becomes smaller, and that which is retained is increased, until at length, the disease becomes so much aggravated, that there is a complete retention of urine. The body of the gland, and the lateral lobes, though less disturbed than the middle lobe by the patient's repeated efforts to void the urine, become more or less enlarged; but, it is remarked, that they do not preserve either their natural, or any regular proportion, to the middle lobe, nor do they always swell equally together, the left in some instances becoming much larger than the right. (*P.* 22.) When he published his first vol. on diseases of the prostate gland, he had seen only the left lobe form the greatest projection within the bladder; but, in his second vol. published in 1818, there is an engraving, representing the right lobe thus altered; and he mentions two instances, in which a similar enlargement of the same lobe had taken place. Mr. Wilson has also more than once met with this greater swelling of the right lobe. (*On the Male Urinary and Genital Organs, p.* 336.) The recollection of these facts will often enable the practitioner to incline the beak of a catheter in the direction, by which it may be conducted into the bladder; and thus, as Sir Everard Home has remarked, the surgeon, after trying gently on the left side, and not succeeding, is not to persevere in that direction, but try whether the passage will offer less resistance on the opposite side.

The diseased state of the body of the prostate gland, and of the lateral lobes, here alluded to by Sir Everard Home, he says, is very different from that, which is met with in the earlier periods of life, in consequence of strictures of the urethra, and which subsides when the obstruction in that canal is removed. This enlargement of the prostate gland from strictures, he observes, may not be unaptly compared to the swelling of the testicle in gonorrhœa, a case of accidental inflammation in a healthy testicle; while the other disease of the prostate is analogous to the more permanent disease of the latter organ. This author adverts, however, to a few instances, in which the enlargement of the body of the prostate gland from strictures, in persons 50 years of age, did not subside immediately the latter affection was cured, a common bougie stopping at the neck of the bladder, although a catheter, which had a regular curve, readily passed. According to Sir Everard Home, as in such cases, the patients were able to empty their bladders, it is evident, that there could be no enlargement of the middle lobe. In cases like these, no symptom of importance is produced, and, whether the swelling of the prostate readily subsides, or not, is of no consequence; though, if the stricture do not return, it will always ultimately diminish. (*On Diseases of the Prostate Gland, Vol.* 1, *p.* 24.) In patients under 50 years of age, Sir Everard Home has rarely found the middle lobe so swelled as to produce retention of urine, or an inability to empty the bladder, notwithstanding the rest of the gland might be much enlarged. (*P.* 23.) When the middle, and one of the lateral lobes, project considerably into the bladder together, their surface is sometimes excoriated, and has an ulcerated appearance. Under such circumstances, the pain, after voiding the last drops of urine, is said to be very severe, and attended with spasmodic affections of the neck of the bladder, of the most distressing kind.

According to Sir Everard Home, another effect of a similar enlargement of the prostate gland is to render its secretion extremely viscid and very abundant. A question might arise about the real source of this ropy mucus, and some might infer, that it was secreted by the bladder; but that it comes entirely from the inflamed prostate gland is proved, says this gentleman, by its having been found in one instance with one extremity floating in the bladder in the dead body, while the other extremity appeared divided into small filaments, terminating in the orifices of the excretory ducts of the gland at the verumontanum. The quantity of secretion is observed to depend more upon the degree of irritation, than the actual enlargement of the gland, and, as this increased secretion happens in cases of swelling of this part from strictures, where the body and lateral lobes are alone affected, it is inferred, that the disease of the middle lobe only contributes to this effect by keeping up a straining, and disturbance of every part of the gland. (*P.* 32.) The internal membrane of the bladder inflames, and becomes extremely irritable, so that, even when the quantity of urine is small, there is a great deal of straining. When the size and form of the tumor are such as to allow the greater part of the urine to pass, though with great effort, Sir Everard states, that the symptoms may continue nearly the same for months; liable, however, to occasional aggravations from slight causes, and becoming more or less relieved, when these are removed. Nay, he observes, that the symptoms may even lessen, although the disease is not at all diminished; a circumstance, which is ascribed to the muscular coats of the bladder having acquired greater strength, and the internal membrane having lost, from habit, the sensibility which it possessed in the earlier stage. (*P.* 34.) He further explains, that, in this disease, when the inside of the bladder is inflamed, filamentous portions of coagulating lymph are thrown off from it, which, when the inflammation increases, subside in the urine evacuated, looking not unlike white hair-powder; and, when the irritation is very violent, perfectly formed pus is met with in the urine. (*P.* 35.) After the inflammation subsides, the bladder becomes again capable of retaining a larger quantity of urine, though its power of completely emptying itself is still further diminished.

According to Mr. Wilson, the symptoms, which generally attend an enlarged prostate gland, are similar to those of an irritable bladder:—constant, heavy, dull pain in the gland, and sometimes sharp lancinating pains, darting from it to the urethra, and occasionally to the bladder and ureters. Frequent calls to void the urine, which is passed with difficulty, only a small quantity being discharged at a time, as more or less always remains behind in the bladder. A complete retention of urine may be produced, so that not one drop will pass, although much straining is used. Great difficulty in expelling the feces, and after each evacuation, a feeling is still experienced, as if the gut were not yet emptied. During the efforts to expel the urine and feces, a quantity of the mucous secretion of the prostate gland is not unfrequently forced out. Most of these symptoms, as Mr. Wilson observes, are similar to those produced by stone, and, therefore, when they occur, the gland should be examined by the rectum, and, if it be not found diseased, a sound should be introduced into the bladder. (*On the Male Urinary and Genital Organs, p.* 339.) The particular differences, between the symptoms of stone, and those arising from disease of the prostate gland, are explained in the article *Lithotomy.*

Mr. Hunter first pointed out a fact, which the practical surgeon should never forget, viz. that the swelling of what is now called the middle lobe of the prostate gland. often raises the sound over a small stone in the bladder, and prevents it from being felt. (*On the Venereal Disease, p.* 170.) Hunter also first noticed another circumstance well deserving recollection, viz. that an enlargement of the same part may account for the disappearance of all the symptoms of stone in patients, who have already suffered greatly from them, as the swelling prevents the calculi from falling down upon, and irritating, the neck of the bladder. These truths are exemplified by cases, which are highly interesting. It appears also probable, from the observations of Sir Everard Home, that an enlargement of the middle lobe conduces to the formation and lodgment of calculi in the bladder, partly by preventing the evacuation of small ones through the urethra, and partly by hindering the bladder from completely discharging its contents. (*Vol.* 1, *p.* 40.) Lastly, it is explained, that, in disease of the prostate gland, patients secrete less urine, than natural, and that death is sometimes produced by the retention of urine suppressing the secretion altogether. In cases of enlargement of the middle lobe, one symptom, on which Sir Everard Home lays great stress, is hemorrhage produced by riding on horseback. (*Vol.* 2, *p.* 27.) Inflammation and even ulceration of the membrane covering the middle lobe, he says, are more frequent, than he was at first aware of, and are produced by the rough introduction of instruments. Hence, the burning heat at the neck of the bladder, the great pain and distress attending the passage and the continuance of an instrument, the occasional necessity of taking it out, and the duration of the pain for some time afterwards. (*Vol. cit. p.* 29.)

According to Mr. Wilson, in a case of what is named scirrhous prostate gland, the enlargement at first takes place slowly, attended with pain, and no particular alteration of the structure is apparent in the gland, when examined in this stage after death, nor is any change discoverable, when the part is felt from the rectum in the living patient. As the disease proceeds, the structure of the whole gland changes, and the part enlarges, sometimes regularly so as to preserve its shape, to the size of a moderate orange; sometimes very irregularly, projecting in a lobulated manner. When the gland in this state is cut into, its substance feels firm, the cut surface is of a whitish brown colour, and the membranous septa, extending through it in various directions, are often very strongly marked. In general, before the urethra and bladder are opened, the gland appears most enlarged laterally. It also swells backwards towards the rectum, producing that appearance of the excrement particularly noticed by J. L. Petit, and already mentioned in speaking of common inflammation of the gland. Mr. Wilson further states, that its anterior part is generally least enlarged, because its connexion with the pubes prevents it from passing far forward. However, this gentleman has seen some instances, in which the enlargement above, or in front of the urethra, was considerable. The extent of the lateral and posterior swelling may be readily felt with the finger, introduced within the rectum. That these very irregular windings in the prostatic portion of the urethra are frequently occasioned by the disease, is also confirmed by Mr. Wilson's experience, and numerous preparations in the Museum of the College of Surgeons. "In the progress of the enlargement, the two sides do not always swell equally; one often enlarges most, and often swells more in one particular part than another. This produces a lateral bend, or obliquity in the passage, which will of course increase the difficulty of passing the urine, and of introducing the catheter. I have seen, from the irregularity of the lateral swelling, the passage through the gland bend in succession to both sides." (*On the Male Urinary and Genital Organs, p.* 332, 335.)

As every considerable enlargement of the prostate gland is attended with great difficulty of voiding the urine, the muscular coat of the bladder always becomes more or less thickened, in consequence of the efforts, which it is obliged to make.

In relation to the third, or middle lobe, it is to be observed, that from some dissections made by Mr. Shaw, it would appear, that, in many cases, the enlarged portion of the prostate, projecting into the bladder, is not the third lobe, but a part of the gland situated more forwards. (See *Bell's Surgical Obs. Vol.* 1, *p.* 223, *&c.*)

According to Sir Everard Home, a stricture may be distinguished from an enlargement of the prostate gland, by the following circumstances: The distance of the obstruction from the external orifice is to be determined by passing a soft bougie, which is to be left in the canal for a minute, so as to receive an impression from the obstruction. If the bougie does not pass further than seven inches, and the end is marked by an orifice of a circular form, (it is immaterial as to the size of the orifice,) the disease is certainly a stricture; but, if it passes further on, and the end is blunted, a disease in the prostate gland is to be suspected. This in general may be ascertained by the possibility of passing into the bladder a flexible gum catheter with a stilet, very much curved, which in most cases of enlargement of the gland may be accomplished.

On the subject of the causes of a scirrhous enlargement of the prostate gland, it appears to me, that little certain is known, excepting that it is a disease seldom met with under the age of fifty. Desault suspected, that it was sometimes venereal, and common in individuals, who had repeatedly had gonorrhœa. (*Traité des Mal. Chir. T.* 3, *p.* 238.) I believe, neither of these sentiments is entertained by the best surgeons of the present day. According to Sir Everard Home, it is a rare occurrence for a man to arrive at 80 years of age, without suffering more or less under disease of this part. "The more common causes (says he) of inflammation of the prostate gland, are full living of every kind, inebriety, indulgence to excess with women, a confined state of the bowels, and exposure to the effects of cold; indeed, whatever increases the circulation of the blood in these parts (the genitals, I suppose) beyond the healthy standard, may become a cause of inflammation in this gland, the blood vessels of which lose their tone in the latter periods of life." (*On Diseases of the Prostate Gland, Vol.* 1, *p.* 18, 19.) If we are to credit another statement, the disease occurs most frequently either in persons, who have not used the genital organs so much as nature intended, or in others who have led a life of excess. (*Wilson on the Urinary and Genital Organs, p.* 332.) It seems to me better to confess, that the etiology of this complaint is unknown. Nor are we rendered much wiser by conjectures about the effects of horse exercise, or those of a retarded venous circulation in old subjects, in creating a tendency to the disease. I have known several persons afflicted, who had led very sedentary lives.

I am afraid, that the observation formerly made by Mr. Hunter still continues true, which is, that a certain cure for the scirrhous enlargement of the prostate gland is not yet discovered. But, though such is the fact, surgery is undoubtedly capable of affording a great deal of relief, so as to lengthen the patient's days, and render them much more comfortable. This is accomplished principally by anodyne medicines, and drawing off the patient's water, when he cannot void it himself either at all, or but imperfectly, and with considerable straining and suffering. As a temporary relief from pain, and also as a means of removing spasm, opiate clysters should be administered once, or twice a day. (*Hunter, p.* 174.) Scrophulous enlargements of the prostate gland, occurring in younger subjects, are probably more under the control of judicious treatment. Thus, Mr. Hunter informs us, that, in several cases, he had seen hemlock of service. "It was given upon a supposition of a scrophulous habit. On the same principle (he adds), I have recommended sea-bathing; and have seen considerable advantages from it, and, in two cases, a cure of some standing." In one case, burnt sponge had reduced the swelling; and, in another the same effect was produced, and the irritability of the bladder lessened, by means of a seton in the perinæum. After the healing of the seton, however, the symptoms returned, and on a trial of the plan again, the former good effects were not experienced from it. Some time ago, I attended a gentleman under Mr. Lawrence, who was trying the effect of an issue in the same situation. In these cases, the pilulæ hydrargyri cum conio (see *Pilulæ*) have been very commonly prescribed, as an eligible alterative. Sir Everard Home mentions an instance, in which suppositories of opium and hemlock, passed up the fundament, and allowed to dissolve there, gave more relief, than any other plan, not only lessening the irritation, but producing a diminution of the projection of the gland.

In the first stage of the enlargement of the middle lobe, when there is no absolute obstruction to the passage of the urine, Sir Everard recommends bleeding from the loins, opiate glysters, and the pulv. ipecac. comp. (*On Diseases of the Prostate Gland, Vol.* 1, *p.* 70.) The tepid bath, the use of which he formerly advised, he now condemns as a practice "as little applicable to this disease, as putting the head in warm water would be to remove the symptoms of apoplexy; if any applications are to be made to the parts, they should be such as produce cold." (*Vol.* 2, *p.* 83.) In this stage, he observes, that catheters and bougies should on no account be introduced, more especially those of the metallic kind, since they produce a degree of disturbance, which the parts are not in a state to bear, and, if unskilfully employed, they will increase the swelling, and bring on a complete retention of urine. Sir Everard is an advocate for keeping the bowels open, for which purpose he prefers the infusion and tincture of senna, with the tartrate of potash. (*Vol.* 2, *p.* 84.) If, in defiance of these means, the patient becomes unable to make any water, or, although able to pass a few ounces, is every hour obliged to make the attempt, and after much straining, discharges only the same quantity, Sir Everard directs a flexible gum catheter, without a stilet, to be passed into the bladder, in the gentlest manner possible. This instrument is to be kept introduced with the catheter bracelet, or retainer, made and sold by Mr. Weiss of the Strand, and the water drawn off at regular intervals, not only till the first symptoms go off, but till the bladder can retain the urine for the usual length of time, and what is voided has the appearance of healthy urine. If, when the catheter is withdrawn, the patient should not be able to empty his bladder, it must be re-introduced, and after six or seven days, taken out again. When the disease is somewhat more advanced, and the patient cannot keep himself quiet, the above practice of course cannot be adopted, and it becomes necessary to pass the catheter three or four times a day. But, even under such circumstances, when irritation is brought on by accidental circumstances, Sir Everard recommends keeping the instrument in the bladder until the attack has subsided. (*Vol.* 2, *p.* 92, 96.) This gentleman finds, that, for cases of diseased prostate gland, common flexible gum catheters, originally made straight, are disadvantageous, as it is a long while before they can be made to keep a permanent curved form. "When (says he) the curvature of the catheter is no part of its original formation, although it may have been produced by being long kept in a curved state, yet when allowed to remain in the bladder, it gradually returns to its straight form by being moistened, and, when it has acquired it, the point is no longer kept directed upwards in the cavity of the bladder, but is constantly pressing against the posterior coats, pushing itself out of the urethra, and the irritation it gives the muscular coat of the bladder will often be the means of its being expelled by a spasm with considerable violence." (*On Diseases of the Prostate Gland, Vol.* 2, *Chap.* 5.) Sir Everard further informs us, that Mr. Weiss, No. 33, in the Strand, has at length succeeded in making flexible gum catheters, originally curved, so that they always retain their shape. Their polish is great, and they can be had of any size: they are also made particularly strong, a quality necessary to secure them from being broken in violent attacks of spasm. Sir Everard states, that he has kept them fifteen days in the bladder, without their being spoiled by the urine, or mucus; whereas, common French and English catheters become in a shorter period so rough as to be unfit for further use. Metal catheters, he asserts, should never be employed but in cases of necessity, where the patient cannot be relieved by milder means. (*Vol.* 2, *p.* 87.) To such instruments, he ascribes the frequently noticed ulceration of the middle lobe, the abrasion of its surface, the wounds through its substance, the general inflammation of the whole internal membrane of the bladder, and quick destruction of the patient's life. The gum catheter, however, is to be as large as the urethra will easily admit, in order that it may more readily disengage itself at the turns into the bladder. (*Vol.* 1, *p.* 75.)

According to Desault, a large catheter generally answers better than a small one, and it may either be of silver, or elastic gum. The latter, though the best for the purpose of being kept in the passage, he says, has not always sufficient firmness to get through the obstruction in the canal, not even with the aid of a stilet. In this respect, a silver catheter is sometimes preferable. But, whatever may be the kind of catheter employed, it generally passes as far as the prostate with perfect facility, where it is stopped, not only by the narrowness, but also by the new curvature of the passage. For the prostate cannot be enlarged, without pushing forward and upwards, or to one side, that portion of the urethra behind which it is situated. This circumstance ought never to be forgotten, in regulating the length, and direction of the beak of the catheter, which should also be longer, have a more considerable curvature, and be more elevated, at the time of its introduction, than in other cases of obstruction in the urethra.

In swellings of the prostate gland, Mr. Hey has particularly pointed out one advantage, which belongs to elastic catheters, viz. that their curvature may be increased while they are in the urethra. This gentleman was introducing an elastic gum catheter in a patient, whose prostate gland was much enlarged, and finding some obstruction near the neck of the bladder, he withdrew the stilet, in doing which, he accidentally repressed the tube, which then went into the bladder. In fact, he found, that the act of withdrawing the stilet increases the curvature, and lifts up the point of the catheter. (*Pract. Obs. in Surgery, p.* 399, *Edit.* 2.) For further remarks, connected with this subject, see the articles *Catheter*, and *Urine, Retention of.* Sir Everard Home states, with confidence, that, if the symptoms of the foregoing disease be prevented in their early stage from increasing, by the treatment which he has recommended, the disease will get well. (See *J. Hunter's Treatise on the Venereal Disease, p.* 169, *&c.* 2*d Ed.* 4*to. Lond.* 1788. *Baillie's Morbid Anatomy. P. J. Desault, Œuvres Chir. T.* 3, *p.* 220, *&c.* 8*vo. Paris*, 1803. *Sir Everard Home, On Diseases of the Prostate Gland,* 2 *Vols.* 8*vo. Lond.* 1811—1818. *Also, On Strictures,* 3 *Vols.* 8*vo.* 3*d Ed.* 1805—1821. *C. Bell, On the Muscles of the Ureters in Med. Chir. Trans. Vol.* 3. *J. Shaw, On the Structure of the Prostate Gland, in C. Bell's Surgical Obs. Vol.* 1, 8*vo.* 1816. *E. A. Lloyd, on Scrophula, p.* 107, *&c.* 8*vo. Lond.* 1821. *J. Howship, Practical Obs. on Diseases of the Urinary Organs, &c.* 8*vo. Lond.* 1816. *J. Wilson, On the Male Urinary and Genital Organs,* 8*vo. Lond.* 1821. *J. Howship, On Complaints affecting the Secretion and Excretion of Urine, Lond.* 1823.

PSEUDOSYPHILIS. (from ψευδης, false, and *Syphilis*, the venereal disease.) Disease, resembling the venereal, but not really of this nature. (See *Venereal Disease.*)

PSOAS ABSCESS. (See *Lumbar Abscess.*)

PSORIASIS. *Scaly Tetter.* A disease of the order Squamæ, in Dr. Bateman's Synopsis. It is attended with more or less roughness and scaliness of the cuticle, with a subjacent redness. The skin is often divided by deep fissures; and the complaint is generally attended with constitutional disorder, and liable to cease and return at certain seasons. For a particular account of its varieties and treatment, see the above work.

PSOROPHTHALMY. (from ψωρα, the itch, and οφθαλμια, an inflammation of the eye.) An inflammation of the eyelids, attended with ulcerations, which itch very much. Beer actually understands by the expression, such a disease, from the sudden repression of the itch, or the infection of those parts with psoric matter. (*Lehre von den Augenkr. B.* 1, *p.* 566.) Weller not only adopts the same notion, but makes an addition to it, by extending the term also to cases, in which the eyelids are affected with psoriasis, porrigo, and impetigines. (*Manual of the Diseases of the Eye, Vol.* 2, *p.* 264.) By psorophthalmy, the late Mr. Ware meant a case, in which the inflammation of the eyelids is attended with an ulceration of their edges, upon which a glutinous matter lodges, incrusts, and becomes hard, so that, in sleep, when they have been long in contact, they become so adherent, that they cannot be separated without pain. He has remarked, that "the ulceration in the psorophthalmy is usually confined to the edges of the eyelids; but, sometimes, it is seen to extend over their whole external surface, and even to excoriate the greater part of the cheek. In cases of the latter kind, the inflammation which accompanies, has often much the appearance of an erysipelas, and will receive most relief from cooling applications. The use of the citrine ointment, which will hereafter be recommended, must, in such instances, be deferred until the irritability of the skin is in a good degree abated.

"This disorder is also, sometimes, attended with a contraction of the skin of the lower eyelid; in consequence of which, that lid is drawn down, and the inner part turned outward, so as to form a red, fleshy, and most disagreeable appearance, called ectropium. Whenever this happens, it proves the complaint to be of the most obstinate nature; though it is generally removed by the cure of the psorophthalmy, which is the occasion of it." (*Remarks on Ophthalmy, &c. p.* 112.) Mr. Ware recommended for the cure of this disease, the unguentum hydrargyri nitrati, melted, and rubbed with the end of the fore-finger, or the point of a small pencil brush, into the edges of the affected eyelids, every night at bed-time. A plaster of ceratum album was then put over the eyelids to keep them from adhering together. If they still adhered in the morning, they were cleaned with milk and butter, well mixed together. In a few cases, it is necessary to touch the ulcers, formed on the edge of the eyelid, after the small-pox, with the argentum nitratum. When the globe of the eye is inflamed, the vinous tincture of opium is applied, as directed in the article *Ophthalmy.* In scrophulous subjects, alterative medicines; an issue, or perpetual blister; and attention to diet, &c. are necessary. (See *Ware on Ophthalmy, &c.*)

In the treatment of psorophthalmy, Beer lays considerable stress upon the necessity of cleanliness. The itchy places he directs to be frequently washed with a tepid infusion of scordium, and afterwards well dried. When the uneasiness and tension of the skin are thus quite removed, Beer adds to the preceding infusion some of the sulphuret of potash, the proportion being at first small, and gradually increased. This plan is to be followed, until the ulcerations dry, and the scabs fall off of themselves, leaving the subjacent skin yet red and sensible, and sometimes moist; in this state, a small bit of the annexed salve may be smeared with a camel-hair pencil along the edges of the eyelids, and upon the affected points of the skin: ℞. Butyri recentis insulsi, ℥ss. Cupri Sulphatis, gr. x. Camphoræ, gr. iv. Tutiæ ptt. gr. vj. Misce. If the disease prove obstinate, Beer recommends Hufeland's salve, which consists of equal parts of fresh butter, yellow wax, and the pulv. hydrarg. nitrico-oxydi rubr.; and, in still more inveterate cases, Janin's eye salve, which, he says, must rarely be used oftener, than every other day. In the psorophthalmy, conjectured by Beer to depend upon the sudden cure of the itch, he states, that internal medicines are necessary, as antimonials, joined with sulphur and camphor. He also praises sulphur baths, and irritating the part of the skin, where the itch has receded, by the application of antimonial ointment; or, if such part should be very far from the eyes, he advises such ointment to be rubbed on the skin behind the ears. Attention to diet is particularly enjoined, and eating pork, lard, and substances difficult of digestion, is prohibited. (*B.* 1, *p.* 569, *&c.*)

PTERYGIUM. (dim. of ϖτερυξ, a wing.) As Scarpa remarks, surgeons usually apply the term "*pterygium*" to that preternatural, reddish, ash-coloured, triangular little membrane, which most frequently grows from the internal angle of the eye, near the caruncula lachrymalis, and gradually extends over the cornea, so as to cause considerable impediment to vision.

The disease, however, presents itself sometimes in the form of a semitransparent thin greyish membrane, not furnished with many visible vessels; and sometimes as a thick, red, fibrous mass, very like muscle, being very prominent even on the cornea, where it seems to terminate in a substance like tendon, and it is observed to be pervaded by numerous blood-vessels. The first is the *pterygium tenue*, of Beer; the second, the *pterygium crassum* (*Lehre von den Augenkr. B.* 2, *p.* 636), or, the membranous and fleshy pterygia of other writers.

Though the pterygium most commonly proceeds from the internal angle, (*also Beer, B.* 2, *p.* 637), sometimes it arises from the external one, and, in rare instances, from the superior or inferior hemisphere of the eyeball. But, whatever be its origin, its figure is invariably that of a triangle, with its base on the white of the eye, and its apex more or less advanced over the cornea, towards its centre, and that of the pupil. Indeed, there are a few cases, in which two or three pterygia of different sizes occur on the same eye, and are arranged round its circumference at interspaces of various breadths. Their points are directed towards the centre of the cornea, where, if they unfortunately conjoin, the whole of that transparent membrane becomes covered with an opaque veil, and a total loss of sight is the consequence. The occurrence of more than one pterygium on the same eye, is very rare: Beer, in all his practice, met with but two cases of double pterygium, and with only one of three pterygia on the eye. (*B.* 2, *p.* 638.)

According to Scarpa, (whose observations apply chiefly to the membranous form of the disease) chronic varicous ophthalmy, with relaxation, and thickening of the conjunctiva; opacity of the cornea; and the pterygium; only differ in the degree of the disease. In reality, all the three complaints consist of a more or less extensive varicous state of the vessels of the conjunctiva, combined with a degree of preternatural relaxation, and thickening of that membrane.

In chronic varicous ophthalmy, the extraordinary amplitude, and knottiness of the vessels; the flaccidity, and thickening of the conjunctiva; are limited to the white of the eye. In opacity of the cornea, certain veins even dilate, and become knotty, for some way, over that delicate layer of the conjunctiva, which is continued over the surface of the cornea. In the pterygium, an extraordinary swelling of this subtle membranous expansion is added to the varicous state of its veins. Hence, the pterygium seems at first like a new membrane formed on the cornea, while it is really nothing more than the delicate continuation of the conjunctiva just mentioned, deprived of its transparency, and degenerated, in consequence of chronic ophthalmy, into a thick, opaque membrane, on which there is a plexus of varicous blood-vessels. Consequently, in the case of pterygium, there is no new production, but only an alteration of one of the thin transparent membranes, which naturally cover the eye. The following circumstance illustrates, says Scarpa, the veracity of the preceding statement. The incipient pterygium may be cured in the same manner as opacity of the cornea, viz. by merely cutting off that portion of it, which is situated at the junction of the cornea with the sclerotica, without detaching the whole of it from the surface of the former membrane; just as is practised in the opacity of the cornea, in order to destroy the communication of the varicous veins of the conjunctiva with their trunks, the ramifications of which produce, and maintain the disease.

That the pterygium is only the natural, delicate, transparent expansion of the conjunctiva, on the cornea, converted, for a certain extent, into a pulpy flaccid varicous membrane, may be inferred (continues Scarpa) from the folds which the pterygium and conjunctiva form at the same time, when the morbid eye is turned towards the origin of the disease. The same inference is equally deducible from the tension occasioned in both these parts, whenever the eye is moved in the opposite direction. We become still more convinced of the fact on observing, that in the first position of the eye, both the pterygium and the corresponding portion of the conjunctiva (which is equally relaxed, varicous, and reddish,) may be easily taken hold of with a small pair of forceps, and raised together in the form of a fold.

Mr. Guthrie does not agree with Scarpa, that chronic varicous ophthalmy with relaxation and thickening of the conjunctiva, nebula of the cornea, and pterygium, are diseases differing only in degree. On the contrary, he asserts, that a true pterygium is very rarely the consequence of chronic inflammation. The nebula, he observes, is never of the spear-formed shape of the pterygium, but always irregular, its progress rather from, than towards the cornea, and the width of its base not equal to that of the latter disease. (See *Operative Surgery of the Eye, p.* 128.)

The pterygium is observed by Mr. Travers to be most prevalent in warm climates. (*Synopsis, &c. p.* 101.) It is also said to be most frequent in old people, though Mr. Wardrop and Dr. Monteath have seen it in very young infants.—(*Weller's Manual of the Diseases of the Eye, Vol.* 1, *p.* 218.)

The constancy of the triangular figure of the pterygium, with its basis on the white of the eye, and its apex on the cornea, is one of its principal diagnostic characters, by which the true disease may be discriminated from every other soft, fungous, reddish excrescence, obscuring the cornea.

Another distinguishing character of pterygium, as Scarpa has observed, is the facility, with which the whole of it may be taken hold of with a pair of forceps, and raised into a fold on the cornea. Every other kind of excrescence, attached to this membrane, continues firmly adherent to it, and cannot be folded, and raised from the surface of the cornea, in any manner whatever. This particularity is of the highest importance in the treatment; for, the genuine pterygium may be cured by simple means, while fungous excrescences of the cornea, can only be radically removed, and perfectly cicatrized with the utmost difficulty.

Scarpa's belief in the reality of a *malignant* or *cancerous* pterygium must appear a doctrine requiring confirmation, when it is considered, that Mr. Travers makes no mention of the disease assuming this character, and Beer distinctly states, that, in a practice of thirty-two years, he has cured 376 pterygia, of various sizes and thickness, without one bad symptom, or consequence. And, hence, he justly concludes, that the disease is strictly local. (*B.* 2, *p.* 641.)

The true benign pterygium, says Scarpa, which has a triangular figure, is ash-coloured, or pale-red, is free from pain, and admits of being raised in the form of a fold on the surface of the cornea, may be cured by cutting the opaque triangular little membrane accurately from the surface of the cornea, which is in part covered by it. But, as the pterygium is nothing, but a portion of the delicate, transparent layer of the conjunctiva, converted into a thick, opaque tunic, it follows, that the pterygium cannot be removed in any way, without the spot, which it occupies, on the cornea, being bereft of its natural external covering, and this part of the membrane rendered more or less opaque.

Scarpa's experience enables him to state, however, that the superficial, indelible speck, remaining on the cornea, after the removal of the pterygium, is always less extensive, than the space previously occupied by the disease.

It is customary (says Scarpa) to remove the pterygium by making the incision on the cornea, and extending it over the white of the eye, as far as the base of the disease reaches on the conjunctiva; so that when the pterygium grows from the internal angle of the eye, most surgeons continue the section as far as the caruncula. This practice is disadvantageous, first, because it denudes too much of the white of the eye; secondly, because, in consequence of the large portion of the conjunctiva removed at the base of the pterygium, and, in consequence of the direction of the wound, the cicatrix in the white of the eye, forms an elevated frænum, which, like a little cord, keeps the eyeball approximated to the caruncula lachrymalis, and destroys the freedom of its motions, particularly, towards the external angle.

In the treatment of pterygia with bases extending far in the white of the eye, Scarpa prefers detaching them at their apex, as far as the junction of the cornea with the sclerotica, and then to separate them at their base by a semicircular incision, comprehending one line in breadth of the substance of the conjunctiva, and made in a direction concentrical with the edge of the cornea. Scarpa has observed, that in this mode of operating, the subsequent cure takes place sooner, than when the common method is adopted; the cicatrix occasions no sort of frænum, and the conjunctiva, circularly stretched by the cicatrix, lies smoothly over the white of the eye, and loses that relaxation, and varicous state, which he considers as the ground-work of the pterygium. Such attention, however, is not requisite, when the pterygium is small, and its base does not extend far in the white of the eye.

The operator, after desiring the patient to move his eyeball towards the part corresponding to the base of the pterygium, is to take hold of the membrane with a pair of forceps held in his left hand, and pinch it into a fold, at about one line from its apex. The duplicature is now to be raised, and drawn out gently until a sensation of something giving way is felt, which indicates the detachment of the pterygium from the delicate cellular texture, by which it is connected with the subjacent cornea. Next, by means of a pair of scissars, the surgeon must dissect this fold, as closely as possible, from the cornea, proceeding from the apex towards the base of the pterygium. The section being completed to where the cornea and sclerotica meet, the fold is to be again elevated still more, and, with one stroke of the scissars, the pterygium, and the relaxed portion of the conjunctiva, forming its base, are to be detached, as concentrically, and closely to the cornea, as possible. This second incision will have a semilunar shape, the horns of which ought to extend two lines beyond the relaxed part of the conjunctiva in following the curvature of the eyeball.

When the operation is finished, the surgeon must promote the hemorrhage, by washing the part with warm water, and then cover the eye, with dry lint, or lint moistened in the liquor plumbi acet. dilutus, kept on with a bandage, that does not make too much pressure.

If no particular symptoms arise, such as pain, tension of the eye, considerable tumefaction of the eyelids, it is sufficient to wash the eye, and inside of the eyelids, three or four times a day with a warm lotion of mallows, and carefully keep these parts from being exposed to the air, without compressing them. If the symptoms just mentioned should occur, antiphlogistic treatment must be adopted.

On the fifth or sixth day, at latest, after the operation, all the surface, from which the pterygium was cut, appears yellowish, and covered with a fluid, like mucus. The edges of the wound, and the adjoining part of the conjunctiva, assume a reddish colour. Afterwards, the surface of the wound contracts more and more daily, and, at length, completely closes.

All local stimulants are to be avoided, and it is not till the wound is healed, that the zinc collyrium, containing a few drops of camphorated spirit of wine, should be used, three or four times a day, for the purpose of obviating the relaxation of the conjunctiva and its vessels.

In the early stage of pterygium, while the membrane is as thin as a cobweb, Scarpa considers it unnecessary to deprive the cornea of its natural covering; and that it is quite enough to cut off a portion of it, in order to intercept all communication between the dilated venous ramifications of the pterygium, and the varicous trunks in the white of the eye. This is accomplished, by cutting out, with a pair of forceps and scissars, a semilunar piece of the conjunctiva, at the point where the cornea and sclerotica conjoin, and exactly at the base of the incipient pterygium, just as is practised for opacity of the cornea. The recent pterygium is observed to disappear gradually after the operation, or to change into a slight dimness of the cornea, extending over a part of the space previously occupied by the disease. This opacity is commonly much more trivial, than what follows a cicatrix. Acrel, in his *Surgical Observations*, mentions having successfully treated an incipient pterygium in this manner. Scarpa has also tried the plan several times with success. Such treatment must be better, than merely making two or three deep cuts, or scarifications, in the membrane, near the edge of the cornea, as advised by Beer. (*B.* 2, *p.* 641.) And, in proof of the uncertainty of the latter method, we find Beer himself speaking of the necessity of using stimulating applications, like powdered sugar, alum, the vinous tincture of opium, &c. if the operation is not of itself sufficient. In the *pterygium crassum*, Beer recommends the knife, as the best means of cure; but, he differs essentially from Scarpa, not merely in preferring a knife to the scissars, but in beginning the operation by making a deep cut through the base of the pterygium in the white of the eye, from which point he continues the dissection of the pterygium, till this is all removed as far as its apex on the cornea, when he uses either the knife, or scissars, as most convenient. (*B.* 1, *p.* 643.)

Mr. Guthrie, who acknowledges the correctness of Scarpa's objections to removing a large pterygium to a great extent towards the caruncula lachrymalis, adopts a middle course, between the methods of Beer and Scarpa, and removes half of the pterygium from the apex, towards the base. (*Vol. cit. p.* 130.)

Beer mentions, that it sometimes happens, especially in cases of thin pterygia, that the disease stops at the edge of the cornea, and spreads no further, as long as the patient lives. (*B.* 2, *p.* 641.) Under such circumstances, of course, the complaint will give no trouble, and may be left to itself, as particularly advised by Mr. Travers. (*Synopsis, &c. p.* 274.) When, however, it encroaches upon the sight, this gentleman says, that "it should be raised by dissection, as close as possible to the margin of the cornea, and the relaxed portion of the membrane removed by an incision, *midway between the base of the pterygium, and the cornea*, and concentric to that membrane." For further information, consult *J. Wardrop, Essays on the Morbid Anatomy of the Human Eye, Vol.* 1, *p.* 22, *&c* 8*vo. Edinb.* 1808. *Scarpa sulle Malattie degli Occhi, cap.* 11. *Richter's Anfangsgr. der Wundarzneykunst, B.* 3, *p.* 141, *&c. Göttingen,* 1795. *Beer's Lehre von den Augenkr. B.* 2, *p.* 636, *&c.* 8*vo. Wien.* 1817. *B. Travers, Synopsis of the Diseases of the Eye,* 8*vo. Lond* 1820. *Weller's Manual, Vol.* 1, 8*vo. Glasgow,* 1821. *G. J. Guthrie on the Operative Surgery of the Eye, p.* 124, *&c.* 8*vo. Lond.* 1823.

PTOSIS. (from ϖιπτω, to fall down.) *Blepharoptosis.* An inability of raising the upper eyelid. According to Beer, ptosis always arises from a considerable relaxation and extension of the common integuments of the upper eyelid, which hang down in a kind of fold over the fissure of the closed palpebræ, and, when the levator muscle has been more or less weakened by the same causes, which have produced this state of the skin, the weight of the redundant integuments prevents the eyelid from being properly opened. Hence, when the patient tries to raise the eyelid, the efforts of the levator muscle may be seen; but, the object cannot be perfectly accomplished. With the exception of the inability of raising the upper eyelid, the patient has not the slightest ailment; the eye is not at all red, though, when opened, it does not bear the light well, on account of not being accustomed to the stimulus; no stillicidium lachrymarum is observable; and the edge of the eyelid, with all the eyelashes quite dry, is seen directly the part is elevated with the thumb. When the relaxed fold of the skin is taken hold of between the thumb and forefinger, without pulling or stretching it, but only just so as to take off the weight opposed to the levator muscle, by the redundance of skin, the patient is immediately able to raise the eyelid without any difficulty; but, as soon as the surgeon relinquishes his hold of the skin, the part falls down again. The relaxed fold of skin is sometimes situated rather over the outer commissure, than the middle of the eyelid, in which case, the latter part can be opened towards the nasal commissure, and the eyeball becomes habitually rotated towards the nose for the purpose of vision, whereby strabismus, and if the disorder be not soon rectified, an obliquity of sight, are occasioned.

A prolapsus of the upper eyelid, Beer observes, may be the consequence of any inflammation of the part, accompanied with considerable œdema, or ecchymosis, as happens from severe wounds of the forehead, eyebrow, or the eyelid itself, particularly when no attempt is made to unite the parts by the first intention. The infirmity may also be the consequence of ophthalmy, that has been either long neglected, or badly treated with relaxing poultices, and it is said, that scrophulous patients have a disposition to the complaint. (*Beer, B.* 2, *p.* 109—111.)

The case, as described by this author, may be cured by the excision of a long slip of skin from the eyelid, just broad enough for the removal of the redundant quantity. For taking hold of the portion of integuments, Beer employs forceps, the extremities of which are broad, with a somewhat concave edge. As much of the superfluous skin is to be taken hold of, and raised, as will enable the patient to open the eyelid, which circumstance is the criterion of the quantity selected for the removal, being enough. The excision may then be performed with scissars, as Beer directs, or with a knife, as others may prefer; and the wound is to be closed with a suture. The slip of skin chosen for removal, should not be too near the edge of the eyelid, for then the skin of the lower edge of the wound would be too narrow for the application of the suture. (*Beer, B.* 2, *p.* 115.) Some writers refer particular cases of ptosis altogether to paralysis of the levator; and other instances to spasm of the orbicular muscle.—When the disease depends on paralysis, it is mostly an effect of apoplexy, upon the relief of which, its cure also depends. The treatment, directed particularly against the paralytic affection of the levator, consists in frequently bathing the eye and surrounding parts with cold spring water, and rubbing the eyelid and eyebrow with the camphor liniment, to which a little of the tinctura lyttæ is added. The shower bath, bark, and other tonics are also indicated. If these means fail, an issue may be made with the moxa, or potassa, between the mastoid process and angle of the jaw, and kept open two or three weeks. The cure of spasmodic ptosis, which is rather a symptom of other diseases, like hysteria, chorea, worms, &c. than a distinct affection, consists in the removal of the original complaint. However, generally speaking, antispasmodic medicines; blisters on the temple, or behind the ear; an issue between the mastoid process and angle of the jaw, as recommended by J. A. Schmidt, on account of some nervous ramifications of the third branch of the fifth pair, which give twigs to the eyelids lying in that situation; and fomenting and bathing the eye, eyelids, and face, with a decoction of poppy heads and cicuta; are the means, which merit the consideration of the practitioner. (See *Richter's Anfangsgr. der Wundarzn. B.* 4, *p.* 488, *8vo. 3d Edit. Gött.* 1802. *J. A. Schmidt; in Abhandl. der Konigl. Med. Chir. Jos. Acad. Zu Wien. B.* 2, *p.* 365, 1801. *Weller's Manual, Transl. by Monteath, Vol.* 1, *p.* 97, *&c. 8vo. Glasgow,* 1821. *G. J. Beer, Lehre von den Augenkr. B.* 2, *p.* 109, *&c. 8vo. Wien.* 1817. *G. J. Guthrie, Operative Surgery of the Eye, p.* 41, *&c. 8vo. Lond.* 1823.)

PUNCTURED WOUNDS. See *Wounds.*

PUPIL. When the opening in the centre of the iris is preternaturally large, and this organ more or less deprived of its power of motion, the disease is technically named *mydriasis,* which is either *symptomatic,* or *idiopathic.* The first form of the complaint, as Weller observes, is exemplified in cases of hydrocephalus, hydrophthalmia, pressure on the brain from various causes, worms, amaurosis, &c. The second often presents itself as a paralytic affection of the iris; a state, frequently induced by the application of certain narcotics, like belladonna and hyosciamus. *Congenital* cases of mydriasis are also met with, as well as instances brought on by a long residence in darkness. A dilatation of the pupil may likewise be the consequence of an adhesion of the uvea to the anterior capsule of the lens. When the retina continues sensible, the inconveniences, produced by mydriasis, are intolerance of light, complete blindness in the day-time, and in the end amaurotic mischief, occasioned by the irritation of the immoderate quantity of the rays of light, admitted within the eye. The kind of prognosis, and the mode of treatment, must often depend entirely upon the primary affection, of which many cases of mydriasis are only symptomatic. Of course, the original disorder must always be cured, if possible. When mydriasis appears, to rise from paralysis of the iris, blisters may be applied over the eyebrows, and the same remedies tried, which are usually employed in other local paralytic disorders.—The entrance of too much light into the eye may be moderated with shades, and tubulated spectacles.

The case, which is the reverse of the preceding, is a preternaturally contracted, more or less immoveable state of the pupil, termed *myosis.* According to Weller, it is sometimes congenital.

It is often met with as a symptom of other disorders, especially ophthalmy, inflammation of the dura mater, phrenitis, concussion of the brain, &c. Persons, whose business is to be looking at small shining objects, as watchmakers, often acquire a myosis from habit, and they cannot be cured of it, unless they avoid the causes, which brought it on, keep themselves in a darkish room, and use a green shade, or tubulated spectacles. (See *Weller's Manual, &c. Transl. by Monteath, Vol.* 2, *p.* 54.) It is noticed by Beer, that myosis, when a sequel of ophthalmy, is less obvious than most other consequences of ocular inflammation; for though the iris is motionless, and the pupil considerably diminished, this opening is perfectly clear and black, and not drawn out of its usual position, nor its pupillary edge in the slightest degree angular. The patient, though he is continually complaining of weakness of sight, is able to distinguish (with some trouble indeed) even the smallest objects in the day-time, and in very light situations; but, his sight is evidently worse in the evening, and in darkish places in the day-time; for, when both his eyes are affected, he is in the dusk nearly blind, and can scarcely find his way. Beer remarks, that almost every considerable internal ophthalmy, or iritis, however favourably the disorder may be cured, and the eyesight restored, always leaves after it more or less contraction of the pupil, which affection, though not the least portion of coagulating lymph can be perceived in the posterior chamber, is combined with a partial, or complete immobility of the iris. Beer assures us, that every expedient, which he has yet tried for the permanent removal of this complaint has failed, the dilatation of the pupil thus produced being but temporary. And, with respect to the most powerful narcotics, he states, that, in two cases, they were worse than useless, as they caused a still greater contraction of the pupil, which, however, after a few hours, resumed its former diameter. Hence, this experienced oculist is disposed to set down the myosis, following internal ophthalmy, as an incurable complaint. (See *Lehre von den Augenkr. B.* 2, *p.* 261, *&c.*)

The next case, demanding some notice in this work, is a *closure of the pupil (atresia pupillæ.)* According to Beer's observations, there is only one exception, in which in the adult patient a closure of the pupil is not the consequence of ophthalmy, and the case, here signified, is termed a *collapse of the pupil*, or *synizēsis pupillæ*, the causes of which are said to be, either a very considerable loss of the vitreous humour from a wound of the eye, or else a dissolved, or rather disorganized, state of the same humour, known under the name of *synchisis.* (*Lehre, &c. B.* 2, *p.* 190.) Every internal ophthalmy, extending to the retina and choroides, when in its highest degree, is apt to produce a complete closure of the pupil. However, the obliteration of this opening is not the only cause of blindness; for, long before this state of the iris happens, the sight is destroyed by considerable, and frequently irremediable, injury of the retina, and neighbouring textures, in which the inflammation is directly situated. An incomplete closure of the pupil, Beer says, is still more disposed to take place at the period, when iritis passes from its first into its second stage, and syphilitic iritis is said to be particularly apt to leave after it this disagreeable consequence. (*Vol. cit. p.* 191.) In cases of the latter description, vision is not always quite prevented, but only more or less diminished, the coagulating lymph, effused in the posterior chamber, having formed only a delicate, semitransparent web. However, if in the second stage of the inflammation, such lymph should be converted into a dense membrane, with opacity of the lens and its capsule, the eye then only retains more or less perfectly the faculty of just distinguishing the light. But, when in such a case, the patient is completely insensible of the difference between light and darkness, the blindness, as in the examples mentioned above, is not owing to the closure of the pupil, or to the cataract, but to other morbid changes, resulting from the same inflammation, which caused the defect in the pupil itself, and capable of being ascertained by peculiar appearances in the eye. Passing over obstructions of the pupil by the unabsorbed matter of hypopium, and by the continuance of effused blood in the chambers of the eye, I come to the case, next noticed by Beer, in which a closure of the pupil arises from a partial adhesion of the iris to the cornea, *(synechia anterior,)* and will inevitably happen, when a considerable portion of the iris, or a great part, or the whole, of its pupillary edge protrudes through an opening in the cornea, and becomes adherent to it. However, sometimes, in these cases, the pupil becomes completely obstructed, though the protrusion of the iris is inconsiderable, and its pupillary edge not engaged in the cicatrix; a circumstance exemplified, when the cicatrix over the adherent part of the iris expands very much, and has an extensive leucomatous surface, so that, though the pupil may be of considerable size, it is concealed, and vision impeded. And, even when there is no adhesion of the iris to the cornea, no synechia anterior, as it is termed, and no distortion of the pupil, a large dense cicatrix of the cornea may obstruct vision by lying exactly over that aperture.—Lastly, as Beer has explained, the greater part of the cornea may be in an opaque, spoiled condition, so that the healthy iris can be discerned only at certain points behind its circumference, no vestige of the pupil itself being distinguishable; and such concealment of this opening may be either combined, or not, with a partial adhesion of the iris to the cornea. In such cases, the patient can frequently perceive the light very well.—(*B.* 2, *p.* 194—95.)

From what has been stated, it is manifest, says Beer, that, in many cases of atresia iridis, the prognosis must be highly unfavourable, and that no attempt to form an artificial pupil should ever be made, when the patient's blindness proceeds from other causes, besides the imperforate state of the iris. Such an operation, Beer observes, can only be proper when the blindness is entirely owing to the closed, or concealed state of the pupil; when the different degrees of light can be plainly distinguished; when the case is uncomplicated with any disease of other important textures of the eye, capable of rendering the manual proceedings difficult, or impracticable;

when the eye has been for a long time perfectly free from inflammation; when the patient is healthy, without any tendency to scrophula, syphilis, or gout; and both his eyes are completely blind. (*B.* 2, *p.* 196.) Some questions may be entertained, respecting this absolute prohibition of the operation in unhealthy subjects, because the line between the degree of health, requisite for the success of the operation, is difficult to specify, and gout, syphilis, and scrophula, are often vague expressions. Yet, no doubt can exist, I think, about the propriety of Beer's advice never to attempt the formation of an artificial pupil, when the patient enjoys vision with one of his eyes; for, when the new opening is made, as it is not in the axis of vision, the sight is confused in the other eye, unless the imperfect eye be kept closed, and the operation can never be done, without exposing the patient to the risk of more or less inflammation in the eye, which is at present so useful to him. Whatever may be the differences of opinion, about operating in cases of single cataract, I believe that all surgeons will unanimously join Beer in the foregoing advice, respecting the imprudence of attempting to make an artificial pupil, when the patient can see with one eye.

When vision is totally lost in one eye, and materially impaired in the other, Mr. Guthrie very judiciously observes, that the question, whether an operation ought to be performed, or not, is important; for, if the patient still enjoys sufficient power of vision to guide himself, the surgeon would be more than hardy, who could put that portion of the faculty of sight in jeopardy by attempting an operation, which may fail, however skilfully done. Yet, Mr. Guthrie does not absolutely denounce the operation; he adds, "in such circumstances, the operation should not be attempted upon any grounds, unless the case is so simple as to require only an opening in the cornea, and the removal of a portion of the iris, for the purpose of enlarging the natural pupil. If the patient cannot see sufficiently well to guide himself, the conditions are very essentially altered, since an unsuccessful operation involves the loss of very little, whereas much is to be gained by the successful issue of it. Where opacities in the centre of the cornea occasion the impediment to vision, it is prudent to dilate the pupil beyond the edge of the opacity, by the daily application of the belladonna, which may possibly enlarge the sphere of vision so as to supersede, in a doubtful or dangerous case, the necessity of an operation." (See *Operative Surgery of the Eye*, *p.* 444.)

Beer represents the event of the operation as being very uncertain, when the patient cannot plainly discern the various degrees of light; when the cornea is affected with leucoma, or scarred and spoiled nearly to its very circumference; when there is only a partial staphyloma of it; or the constitution is unhealthy, or impaired by the effects of former attacks of scrophula, syphilis, or gout. Lastly, Beer sets down the operation as certainly useless, or even as likely to cause an entire destruction of the eye, when the patient is quite insensible of light; when the iris and neighbouring textures, such as the corpus ciliare, corona ciliaris, the membrane of the vitreous humour, this humour itself, and the blood vessels of the organ, are in a morbid state or the whole eyeball manifestly in a preternatural condition. However, an opacity of the lens, and its capsule, even when the latter is completely adherent to the uvea, forms no prohibition to the formation of an artificial pupil, though it is a circumstance that has great weight in the selection of the method of operating.—(*Beer*, *B.* 2, *p.* 197.)

The following information, from the same source, is highly important to the practitioner: the morbid state of the iris, and other adjacent textures of the eyeball, prohibiting the operation, may be known by the annexed circumstances. Together with the smaller circle of the iris, the larger one is strikingly changed, in respect to its colour, its consistence, and its layers. Its radiated fibres are collected into dark blue, or blackish fasciculi, between which there is an appearance of empty interspaces, produced by the indentations of the iris, and actually semitransparent, in consequence of the tapetum of the uvea having always been in these cases more or less annihilated by the previous inflammation. Around the cornea, the sclerotica seems blueish, or rather of a smutty greyish blue colour; and sometimes certain points of this membrane are protuberant. The morbid states of the whole eyeball, which may complicate the atresia iridis, and render the operation not only useless, but hazardous to the preservation of the eye, are its dropsical enlargement, (see *Hydropthalmia*,) its atrophy; its preternatural firmness, from a general varicose affection of its blood vessels; and its morbid softness from a disorganization of the vitreous humour. (*Beer*, *Vol. cit. p.* 198.)

Before proceeding further into the subject, I think it will simplify it very much to state, that numerous as the plans are of making an artificial pupil, if we except the occasional practice of forming a kind of artificial prolapsus of the iris, in order to change the position or shape of the imperfectly closed pupil, they may all be classed into three principal methods. 1. The simple transverse, perpendicular, or otherwise directed incision in the iris, now termed *corotomia*, performed either through the sclerotica, or the cornea. 2. The excision of a piece of the iris, technically named *corectomia*. 3. The separation of a part of its circumference from the ciliary ligament, called in the language of oculists *corodialysis*, with which the last method, or the operation of *corectomia*, is combined in the plans suggested by Assalini and Reisinger. The excision of a portion of sclerotica, close to the cornea, with the view of forming an inlet for the rays of light to the retina, as proposed by Autenrieth, when the cornea is entirely opaque, may be considered a hopeless proceeding. With respect also to the three other methods, it is now well understood by all impartial surgeons, that the choice of them must depend upon the particular circumstances of the case, and that here it would be as absurd to think of employing in all instances only one plan, as to have the idea of extending the same principle to all the forms and varieties of cataract.

When the thing is possible, it is considered by Beer most advantageous to make the artificial pupil rather towards the inner canthus; though others express a preference to the centre of the iris. But, as he very truly remarks, since the new opening must be where the cornea is transparent, the operator is frequently obliged to form it either below, or towards the temple, or quite above; for there is often only just room enough left at one point for conducting the necessary manœuvres, with any degree of precision.

The following remarks by Mr. Guthrie I consider interesting: "an opening must be made in the iris of an extent equal, at least, to the natural size of the pupil when moderately dilated; for, if it be less, there will not be sufficient room for the rays of light to act with effect on the retina in a moderate light; and it must not be forgotten, that the artificial pupil never acquires the motions of dilatation and contraction, so eminently useful in the natural one. It should not, on the other hand, be too large, because it would prove detrimental to vision, by admitting too many rays of light to the retina. It should resemble the natural opening in form, as nearly as possible; for, there cannot be a doubt of the advantage derived in man from a circular pupil, where the axis of vision is directly forwards; and, although an artificial one is seldom made in a circular form, and in the centre of the iris, still that process will be the best, the result of which most nearly resembles the natural state.

"When an artificial pupil cannot be made in the centre of the iris, (from whatever cause) the other parts of it are eligible in the following order. 1. The inferior part of the iris inclining inwards. 2. The internal, a little below the transverse diameter of the eye. 3. The inferior and external: the upper part being the least eligible, from the eyelid covering that portion of the cornea in the natural state of the eye." (*Operative Surgery of the Eye*, *p.* 442.)

Mr. Guthrie agrees with Beer, that the place, in which the iris is to be perforated, generally depends more on the transparency of the cornea, than the choice of the operator. It is also remarked, that a small artificial pupil, at the lower part of the iris, is infinitely more valuable, than a large one at any other, which, in the natural state of the eye, is covered by the eyelid or much out of the axis of vision. If the state of the cornea will permit it, Mr. Guthrie says, a sound part of the iris should be selected. (*P.* 443.) He considers the external and internal margins of the iris, immediately on a line with the central transverse diameter, particularly unfavourable for the method in which the iris is separated from the ciliary ligament, because there the long ciliary arteries enter, and the attachment of the iris is firmer than at other points.

Cheselden first devised a section of the iris, for the purpose of forming an artificial pupil. He proposed the introduction of a couching needle, with a sharp edge only on one side, through the sclerotica, about half a line from the cornea, into the posterior chamber. After the iris had been perforated towards the external angle, and the point of the needle then pushed through the anterior chamber, as far as that side of the iris, which is nearest the nose, the edge was turned backward, and the instrument withdrawn, so as to make a transverse division of that membrane.

The account of the proposal given by Cheselden himself in the Philosophical Trans. for 1728 is very incomplete; and according to Mr. Guthrie, he did not actually perform the operation on the person, whose history he there relates, but only annexed to it an account of a particular operation which he considered worthy of record: a circumstance, which, from not being attended to, has been the source of considerable errors. (*Operative Surgery of the Eye*, *p.* 395.) Morand, when he was in London, saw Cheselden form an artificial pupil; but the process, as described by Morand, differs from the above, inasmuch as the needle passed as far across the posterior chamber as two thirds of the iris, when its edge was turned towards this membrane, which was thus cut, and as much of it divided, in withdrawing the instrument horizontally, as left an artificial pupil of an oblong form.

Janin performed Cheselden's method as described by Morand, on two subjects with the utmost care possible, but not the smallest benefit followed; for, after the subsidence of the symptoms, produced by the operation, the transverse section, made in the iris by the edge of the needle, reunited. (*Mém. sur l'Oeil.*) Mr. S. Sharp also saw a failure from the same cause. (*On Operations*, *chap.* 29.)

An accident occurred to Janin, in the act of extracting a cataract; viz. he included the iris together with the cornea, in Daviel's scissars, and cut it perpendicularly, and the division remained permanent. This led him to propose a perpendicular incision as the best expedient for making an artificial pupil. His plan consisted in opening the cornea, as is practised for the extraction of the cataract, and in dividing the iris perpendicularly with scissars, near that part of the pupil, which is next to the nose; for he affirms, that he has seen strabismus result from making the section towards the external side, on account of the too great divarication of the optical axes.

Although the practice of making an incision in the iris, or corotomia, is severely disapproved of by Beer, who states, that it admits of being practised only in very few cases, and is rendered quite unnecessary by what, he denominates, the two other better plans (*B.* 2. *P.* 199), it is still considered by some men of experience, as having recommendations, and they have therefore endeavoured to improve it. However, it will only be in my power to notice in this work a few of its modifications.

In 1812, Sir W. Adams recommended the revival of Cheselden's method of forming an artificial pupil, with the difference of using for the purpose a particular sort of knife. "With a cataract needle (says this oculist) I could not cut through the iris by a gentle force; and, if I ventured to apply a greater force, the iris separated from its attachment to the ciliary ligament, which rendered all further attempts to effect a central aperture useless. The same accident appears to have happened to Mr. Sharp in his trials of this operation. In the hopes of procuring an appropriate instrument, I twice went to London, at the interval of a few months; but, though I described to different instrument-makers the purposes for which it was intended, still I could only procure the needle, which cuts on one edge, and the spear-pointed knife, of different sizes, described by Cheselden. At length, it occurred to me that the curved edge of the common dissecting scalpel was well adapted to cut with facility. I therefore, when in London, a third time, got a small knife made, two thirds of an inch in length, and nearly a line in width, with a straight back, sharp point, and a curved edge, which cuts back towards the handle for about three lines." (*Adams's Pract. Obs. on Ectropium, &c. p.* 30.) According to this writer, *in all cases, where there is no crystalline lens, and the cornea is free from opacity, the division of the iris should be made in the centre*, and should extend across at least two-thirds of its transverse diameter. In a later work, however, this author states, that experience has convinced him, that so extensive a division of the iris is unnecessary for the prevention of the reunion of this membrane, and that a cut through one-third of its diameter, is sufficient. The eye being gently fixed, either with the finger of the assistant, who supports the upper eyelid, or with a concave sort of speculum, placed under the upper eyelid, the artificial pupil knife is to be introduced through the coats of the eye, about a line behind the iris, with its cutting edge turned backwards. The point is next to be brought forward through the iris, somewhat more than a line from its temporal ciliary attachment, and cautiously carried through the anterior chamber, until it has nearly reached the inner edge of that membrane, (or as is expressed in a later description,) "until it has traversed more than two thirds of the width of the iris," when it should be almost withdrawn out of the eye, gentle pressure being made with the curved part of the cutting edge of the instrument against the iris, in the line of its transverse diameter. If, in the first attempt, the iris should not be sufficiently cut, the point of the knife is to be again carried forward, and similarly withdrawn, until the incision is of a proper length. After the operation, the eye is to be covered with a plaster of simple ointment, and the patient put into bed, with his head raised. (*P.* 36, 37.) When the closure of the pupil is attended with a cataract, the primary steps of the operation are the same; but, Sir W. Adams takes care also to cut the cataract into pieces, some of which he brings forward into the anterior chamber, while others he leaves in the opening of the iris, where they at first serve as a plug, hindering union by the first intention, (*P.* 38.) and are afterwards absorbed. For an account of his particular methods for all the various complications of cases, the reader must consult his publications, where many successful examples of the operation are recorded.

That Cheselden's method ought not to be entirely rejected, there can now be no doubt. Like all other modes of forming an artificial pupil, it certainly does not merit exclusive preference. In addition to the testimony of Sir W. Adams, we have that of Mr. Ware, to prove, that Cheselden's operation frequently succeeds. When the pupil had become closed, after an unsuccessful extraction of the cataract, Mr. Ware in several instances made a new pupil, agreeably to Cheselden's mode, with the most perfect success. "The fibres of the iris retracted as soon as they were divided, and left the pupil very nearly of its natural size. Its shape was not quite round; but, the sight was immediately restored, and to so great a degree, as to enable the patient, by the help of suitable convex glasses, to see distinctly both near and distant objects, neither pain nor inflammation being consequent to the operation."

Where there is a prolapsus of the iris, through a breach of the cornea, involving more or less of the pupillary margin, Mr. Travers considers Cheselden's method the most applicable; "viz. the transverse division of the stretched fibres of the iris, and which, if the section be made in front of the membrane, i. e. from before backwards, admits of no improvement. The edges of the section instantly recede and form an excellent pupil." However, he afterwards adds, "that a partial adhesion of the pupillary margin may be combined with a healthy lens. In this case, the removal of the free border of the pupil, drawn by means of forceps, through an incision in the cornea, will be preferable, on account of preserving the transparency of the lens." (*Synopsis of the Diseases of the Eye, p.* 343.)

In a modern work, Professor Maunoir of Geneva, has published a very successful case, in which an artificial pupil was formed, and a caseous cataract extracted. "I operated (says he) on the right eye in the following manner. The patient being seated on a chair, and having the head inclined upon a cushion, I placed myself behind him, and with the fore-finger of the left hand, confining the upper eyelid, whilst an assistant depressed the lower, I made with the right hand a semicircular incision in the lower and external part of the cornea. This incision occupied a full third of the circumference of the membrane. On re-opening the eye, the iris was seen projecting a little from the wound in the cornea. I replaced it with the blunt point of my scissars. Introducing the two blades closed into the anterior chamber, and then opening them, I caused the pointed blade to penetrate the iris, leaving the blunt blade between that membrane and the cornea; then closing the scissars, a perpendicular incision of the iris resulted, describing a little more than half the chord of an arc of two-fifths of the circumference of the iris, traced on the side of the temple. The first incision not having occasioned the formation of a pupil of the necessary size, I introduced the scissars into the iris a second time a little obliquely; and immediately the pupil appeared of a satisfactory form and size, but exhibiting the crystalline entirely opaque. The second stroke of the scissars had divided the capsula: I therefore introduced a small curette, in order to endeavour to destroy what adhered of the crystalline to the shrunk and contracted circumference of the old pupil. This attempt did not succeed. Lastly, I effected the passage of a portion of the opaque lens, by means of a slight pressure with a large scoop, exercised on the lower part of the globe of the eye. The crystalline, which was of a cheesy consistence, came out with the greatest ease, and though it was not entirely removed, yet a sufficient quantity was discharged to leave the artificial pupil of a most perfect black. This new pupil was on the side of the temple; and at the exterior and lower part of the iris." (See *Med. Chir. Trans. Vol.* 7, *p.* 305, *et seq.*) In this communication are also two other cases, in which Maunoir operated, with success, though complicated with cataracts, and adhesions of the lens to the iris. In some remarks, annexed by Scarpa to the preceding account, the latter expresses his opinion, that it is not necessary to be scrupulous, whether the crystalline be partly, or entirely opaque, whenever the capsule is opaque, and adheres to the iris, behind the edge of the interior and inclosed pupil. "In this case only one remedy can be pointed out, namely, the removal of the opaque adherent capsule, and consequently of the crystalline, whether it be transparent, or opaque. In the second place, (says Scarpa) I think there is no reason to doubt, that, in similar cases, it is advisable to make an incision upon the iris, proportioned to the size of the body to be extracted, rather than to make it small, which obliges the operator to divide the crystalline and the capsule, with the intention of extracting a part, and of abandoning the rest to the powers of absorption. Thirdly: I would establish as a fundamental principle, in similar cases, that, after the complete extraction of the crystalline, with its opaque capsule, by means of the least possible introduction of the instruments, the artificial pupil ought not to be too near the incision in the cornea, and consequently not too near the cicatrix occasioned by it." (*P.* 317.) Scarpa then recommends a particular method of operating, in cases where there are cataracts: after having made, in the manner of Wenzel, a transverse incision in the iris, and in the cornea, he would introduce Maunoir's scissars, blunted at both points, into the anterior chamber of the aqueous humour, and make an incision in the iris, diverging from the cut made with the knife. The aperture thus made Scarpa thinks would be large enough for the easy passage of the opaque lens.

Amongst other late opinions, professed by Scarpa, we find the following: that no instrument is so proper as the scissars for making an incision in the iris; that, when the case is not complicated by cataract, a very small wound in the cornea is sufficient; that the formation of a triangular edge in the iris, by means of a double incision with the scissars, is the most easy and least painful of all the methods hitherto proposed for obtaining a *permanent* artificial pupil; and, lastly, that specks of the cornea present no obstacle, because the artificial pupil may be made opposite the transparent part of that membrane. (*Med. Chir. Trans. Vol.* 7, *p.* 320, 321.)

As I have already noticed, the contraction of the natural pupil is sometimes occasioned by the iris being stretched towards some point of the cornea, to which it is adherent. This state, as Scarpa observes, is most frequently accompanied with partial opacity of the cornea, around the adhesion, or prolapsus of the iris, as well as with opacity of the lens and its capsule. At other times, however, these internal parts preserve their natural transparency, notwithstanding the deviation of the natural pupil. In the latter case, the pupil, though removed from its situation, is not in reality obliterated, but merely very much contracted, and incapable of admitting the quantity of light necessary for vision, especially, if the opposite part of the cornea be slightly opaque. In such an example, Scarpa recommends making a small incision in the cornea at the most commodious part, when with Maunoir's scissars closed, and constructed with little buttons at the ends of both the blades, an endeavour is to be made to break the adhesion existing between the iris and the cornea. If this can be effected, the natural pupil generally recovers its former situation and size; but, if the adhesion be very firm, Scarpa introduces one of the blades within the contracted pupil, behind the posterior surface of the iris, until the other blade has reached the confines of the cornea with the sclerotica. The iris is then to be divided in the form of the letter V, without at all injuring the capsule, or lens, both of which are transparent. (*On Diseases of the Eyes*, *p.* 384, *Ed.* 2. *Transl. by Briggs.*) When, after extraction of the cataract, the pupil has been dragged down in this manner by adhesion to the lower third of the cornea, the upper two-thirds of which are transparent, Dr. Monteath, of Glasgow, has succeeded five times in forming an artificial pupil, and restoring vision by making a small opening in the upper and outer part of the edge of the cornea, capable of admitting Maunoir's eye-scissars, with which the overstretched fibres of the iris are to be cut across by one simple incision, three lines in length. The cut edges instantly recede, and leave an oval pupil of sufficient size. (See *Weller's Manual*, *Vol.* 2, *p.* 70.) In the cases, above specified by Scarpa, Sir Wm. Adams, instead of performing corotomia, endeavours to separate the iris from the cornea, and then to alter the position of the pupil by drawing it towards that part of the cornea, which has remained transparent. For this purpose, he punctures the cornea about one line in front of the iris, separates the adhesion, and then makes the disengaged portion of the iris protrude through the puncture, and leaves it there, even using the forceps, if necessary, for drawing it out as far as is deemed necessary for its being securely fixed. This method is disapproved of by Scarpa, because a second prolapsus of the iris in the same eye appears to him a very serious disease, and rather calculated to increase the opacity of the cornea, and augment the contraction of the pupil, than afford relief.

According to Beer, the excision of a portion of the iris, *corectomia* is particularly indicated in all cases, in which there is a sound transparent lens, as in many examples of synechia anterior, concealment of the natural pupil by a central opacity of the cornea, &c. Beer admits, however, as an exception, the instances, in which the transparent portion of the cornea is so small that no opening can be made in it with the knife, large enough to permit the iris to be taken hold of with a small hook, or forceps, and a piece of it cut out above the ciliary processes. (*B.* 2, *p.* 200.) The reason here given, does not appear to myself very strong, because it may be asked, why not acquire more room by cutting a portion of the opaque part of the cornea? Weller assigns a better reason against corectomia, viz. when he refers to the risk of a sufficient piece of the cornea not being left transparent, opposite the new pupil, after the cicatrization of that membrane. (*Vol.* 2, *p.* 65.) Beer further states, that corectomia may be performed, in cases of atresia iridis consequent to the operation of extracting the cataract, when the surgeon is certain, that no coagulating lymph, effused during the previous inflammation, in the posterior chamber, reaches above the lesser circle of the uvea, or is conjoined with opacity of the remaining capsule of the lens. The first state may be learned from the singular colour and form of the greater ring of the iris; the second, from the very indistinct manner, in which the patient is sensible of the different degrees of light. (*Beer, B.* 2, *p.* 200.)

The excision of a piece of the iris, says Beer, requires the preliminary formation of a flap in the cornea, one line in length, with the cataract knife, and as close as possible to the sclerotica, so that no subsequent opaque cicatrix may interfere with the success of the operation. The second part of the business, viz. the excision of a piece of the iris, must be done in three ways, according to circumstances. 1st, The iris may not be any where adherent to the cornea, in which case, after an opening has been made in the latter membrane, the iris is propelled out between the edges of the wound by the aqueous humour, yet left in the posterior chamber, which opportunity the surgeon must immediately avail himself of for taking hold of the projecting piece of the iris with a very fine hook, and cutting it off with Daviel's scissars. The remainder of the iris is instantly retracted behind the cornea, and a well-formed pupil is immediately seen. 2. Only the part of the edge of the pupil may remain not adherent to and drawn towards the cornea, where it is intended to form the artificial pupil; a state, best ascertained by a lateral inspection of the eye. In this case, after opening the cornea, Beer says, the operator is directly to introduce a small hook between the iris and cornea, so as not to injure either of these parts with its point, and he is then, with the instrument directed obliquely, to get hold of the pupillary edge of the iris, and, while the iris is drawn out between the edges of the incision, the projecting piece is to be cut off with Daviel's scissars. Thus, the natural pupil is to be extended behind the transparent part of the cornea, towards the edge of this membrane. 3. The pupillary edge of the iris may be adherent to the cornea exactly in the situation, where the artificial pupil is to be formed: in this case, Beer directs the iris to be taken hold of at its greater circle with the hook, or, (if this should tear its way out) with a pair of fine-pointed forceps with teeth, drawn out between the edges of the wound, and the point of the cone, thus produced, cut off somewhat within the edges of the wound, as drawing the iris further out might tear it, and have a prejudicial effect. In all these cases, says Beer, the undiseased lens and its capsule will not be injured, if the patient keep tolerably steady, and the operator have already acquired dexterity in the extraction of the cataract. The operation being finished, the subsequent treatment is like that generally adopted after the extraction of the cataract. (See *Cataract.*) When corectomia is to be performed for a closure of the pupil, consequent to extraction of the cataract, Beer particularly recommends the forceps to be used, though he adds, that such operation is applicable only when the remaining capsule has not been spoiled by inflammation, and the quantity of lymph in the posterior chamber is not so great as to reach above the lesser circle of the uvea.

The only other species of corectomia, which I deem it necessary to notice, is what was proposed, in the year 1811, by the late Mr. Gibson of Manchester. It is described as follows: "The first step of the operation is to secure the eyelids, as in the operation for extracting a cataract. A puncture is then to be made in the cornea, with a broad cornea knife, within a line of the sclerotica, to the extent of about three lines. All pressure is now to be removed from the eyeball, and the cornea knife gently withdrawn. The consequence of this is, that a portion of the aqueous humour escapes, and the iris falls into contact with the opening in the cornea, and closes it, like a valve. A slight pressure must now be made upon the superior and nasal part of the eyeball, with the fore and middle finger of the left hand, till at length, by an occasional and gentle increase of the pressure, or by varying its direction, the iris gradually protrudes, so as to present a bag of the size of a large pin's head. This protruded portion must be cut off with a pair of fine curved scissars, and all pressure at the same time removed: the iris will then recede within the eye, and the portion, which has been removed, will leave an artificial pupil more or less circular." (*Gibson on Artificial Pupil, &c. Lond.* 1811.) Such was this surgeon's mode of operating, when the closure of the pupil was attended with central opacity of the cornea, uncombined with adhesions. The effect of a slight adhesion of the inner border of the iris to the cornea, will be to prevent the protrusion of the first of these membranes through the puncture in the cornea, which protrusion so much facilitates the operation. In this case, a portion, which does not adhere, must be drawn out with a small hook and then removed. Sometimes the adhesion may be separated at the time of making the puncture, and then the iris will protrude. When the whole, or greater part of the inner border of the iris, is involved in adhesions to the cornea, these must be separated with the cornea knife after making the puncture, and the iris may then either be drawn out with the hook, or a portion of it be removed by means of very minute scissars. In every case, however, the removal of a portion is essential to success.

When a cataract is known to exist, Mr. Gibson recommends it to be depressed, or broken to pieces with the needle, before making the artificial pupil; and, when the whole cornea is transparent, he directs a flap to be made in the centre of the iris with the cornea knife, and then cut off with the iris scissars. (*Gibson, Op. cit.*)

Coredialysis, or the mode of forming an artificial pupil by detaching a portion of the iris from the ciliary ligament, is said to have been devised by Ad. Schmidt and Scarpa about the same time, and has been variously modified by Reisinger, Langenbeck, Himly, Graefe, and others. (*Weller on Diseases of the Eye, Vol.* 2, *p.* 65.) According to Beer, this plan of operating is indicated, first only when the coagulating lymph, effused in the posterior chamber after the extraction of the cataract, or reclination, (see this *word,*) reaches from above the lesser circle of the uvea towards the ciliary processes; a circumstance, which may be known by the considerable change of colour in the greater circle of the iris, and by the indistinct manner in which the patient perceives the light. Secondly, when the uvea is everywhere adherent to a secondary capsular cataract, or capsulo-lenticular cataract, or the closure of the pupil has been occasioned by a purulent, or bloody cataract. Whenever the attempt is made in these last cases, however, the patient should be capable, as he sometimes is, of plainly discerning the light. Lastly, coredialysis is sanctioned by Beer, when the cornea is everywhere incurably opaque, excepting so small a part of it, that it could not well be opened for the excision of a portion of the iris. (*B.* 2, *p.* 203.)

When the closed pupil is the result of inflammation from an injury, the lens has been absorbed, and the anterior capsule, or both the anterior and posterior, are thickened and firmly attached to the iris, with only an indistinct perception of light, and a discolouration of the lesser circle of the iris, indicating a deposition of lymph behind it, Mr. Guthrie sets down coredialysis as the proper operation; "for, the formation of a triangular opening by the scissars, would not be easily accomplished to a sufficient extent; and the simple division of the central part of the iris would, in general, be ineffectual, in consequence of the thickened capsule preventing the necessary retraction of the fibres of the iris." (*Operative Surgery of the Eye*, *p.* 466.)

The feeble union of the iris with the ciliary ligament, and, consequently, the greater facility of detaching its edge from that ligament, with which it is connected, than of lacerating its body, induced Scarpa to try a new method of forming an artificial pupil, when the natural one had become too much contracted, or quite obliterated, after the extraction, or depression of the cataract. His method of operating, consists in detaching, by means of a couching needle, a certain extent of the circumference of the iris from the ciliary ligament, without dividing the cornea. The attempt met with success.

The patient being seated, and supported, as if he were about to have the operation for the cataract performed, a straight slender couching needle is to be introduced through the sclerotica, at the external angle of the eye, about two lines from the union of this membrane with the cornea; and its point is to be pushed as far as the upper and inner edge of the iris; in other words, as far as that side of the iris which is nearest the nose. The needle advances nearly to the ciliary ligament, and the surgeon perforates the internal edge of the iris, at its upper part, so that the point of the instrument scarcely appears in the anterior chamber, because, that part of it being very narrow, the point of the instrument, however little it advance beyond the iris, would enter the substance of the cornea. The moment the needle appears in the anterior chamber, the instrument must be pressed on the iris from above downward, and from the internal towards the external angle, so as to bring it in a parallel line to the anterior surface of the iris, for the purpose of detaching a portion of the edge of this membrane from the ciliary ligament. This separation being effected, the operator must depress the point of the needle, in order to apply it to the inferior angle of the slit, that he has begun to make. Then the aperture may be enlarged at pleasure, by pushing the iris towards the temple, and withdrawing the needle from before backward, parallel to the anterior surface of the iris, and the greatest axis of the eye. If, when this detachment has been accomplished, no opaque body appear at the bottom of the eye, the needle is to be withdrawn altogether. If any portion of opaque capsule left behind after the depression, or extraction of the cataract, should afterwards advance, and present itself in the vicinity of the new pupil, the little opaque membrane must be reduced to fragments, and pushed through the artificial opening into the anterior chamber, where, Scarpa says, they will in time be dissolved and absorbed.

This separation of the iris from the ciliary ligament, invariably occasions an extravasation of blood, which always renders the aqueous humour more or less turbid; but the turbidness is afterwards absorbed, and the eye recovers its original transparency.

The patient, says Scarpa, complains, during the operation, of a vast deal more suffering, than at the time when he undergoes the extraction, or depression of a cataract. It cannot be otherwise; for, in detaching a part of the edge of the iris from the ciliary ligament, some filaments of the ciliary nerves, which proceed to be distributed to the iris, must at least be dragged, or lacerated. However, on the whole, the symptoms consequent to this operation, were neither obstinate nor fatal in the two cases which Scarpa has seen. From some experiments made on the dead subject, Scarpa thinks the curved needle, which he uses for the depression of the cataract, would also be better, than the straight one, for making an artificial pupil. (*Scarpa sulle Malattie degli Occhi, Capo* 16.)

The celebrated Ad. Schmidt performed coredialysis with a lancet-pointed curved needle, which was introduced, through the sclerotica, into the posterior chamber, with its concavity towards the uvea. Its point is to pass as far as the portion of the ciliary ligament, where it is designed to make the artificial pupil. The iris is then to be pierced from behind forwards, about the fourth part of a line from the ciliary ligament, from which it is to be separated, the surgeon taking care at the moment to catch well hold of the iris with the point of the instrument, which is then to be withdrawn a little from the eye. If the new pupil should not be now large enough, the iris is to be again hooked with the needle, near the ciliary ligament, and the opening enlarged at its upper or lower angle, as may appear most advantageous. This plan is said to be advisable, when the whole cornea is opaque excepting a small spot.

When, however, the diseased state of the cornea does not forbid it, Beer and Schmidt very properly recommend the needle to be introduced into the anterior chamber, and the iris thus separated from the ciliary ligament; a plan, which, as Weller observes, has proved more successful than the preceding method. In both modes, the lens will be pushed away from the new pupil by the movement of the needle, so that whether it be opaque already, or become so afterwards, vision will not be obstructed by it. (See *Beer's Lehre, &c. B.* 2, *p.* 204—206, *and Weller's Manual Transl. by Dr. Monteath, Vol.* 2, *p.* 66, *&c*)

With the view of removing all risk of the new opening becoming closed again, Reisinger forms an artificial pupil, by making a small incision in the cornea, and introducing a minute double hook, which opens and shuts like a pair of forceps. After passing the hook closed into the anterior chamber. as far as the greater circle of the iris, he turns the points of both the small hooks towards this membrane, then opens the instrument a little, and hooks hold of the iris, which is to be separated from the ciliary ligament, when the instrument is to be shut again, and the part of the iris, taken hold of, drawn a little through the opening of the cornea, where it adheres, and cannot recede again towards the ciliary ligament. (See *Darstellung eines neuen Verfahrens die Mastdarmfistel zu unterbinden, und einer leichten und sichern methode künstliche Pupillen zu bilden.* 12*mo. Augsburg*, 1816.) Under certain circumstances, however, as there may be difficulty in drawing the iris through the cornea, or apprehensions may be entertained of the opacity of the cornea being increased by the protrusion and adhesion of the iris (the great consideration unquestionably against this method), Reisinger approves of obviating the chance of the new opening being closed again, by removing a part of the iris, after its detachment from the ciliary ligament; a combination of *coredialysis with corectomia.* Were I a patient, and coredialysis were deemed most applicable to the circumstances of my case, I should dispense with any excision of the iris, preferring the chance of the new opening being permanent, to the dangers of too complicated and protracted an operation.

Langenbeck is the inventor of an instrument for the formation of an artificial pupil: it is a silver tube, to one end of which is attached a very small gold one, containing a minute hook, capable of being moved backwards, or forwards, to the extent of only two lines, by means of a spring in the silver tube. The following is the account of Langenbeck's method, as extracted by Mr. Guthrie from his writings. "A very small opening is to be made in the cornea, in order that the iris, when brought out, may not recede. The hook, inclosed in the golden tube, (to prevent its bending from its tenuity) is to be directed to the spot, where the iris is to be laid hold of. The hook is then to be pushed out by the spring to the extent of one line, which will be sufficient to enable it to penetrate the iris. As soon as the hook is affixed, it is to be allowed to recede to its usual place in the golden tube, drawing with it the iris, which will be caught between it and the end of the tube, something in the manner of a pair of forceps. As soon as the hook begins to recede, a small black spot will be seen at the edge of the iris from its incipient separation, and care should be taken to insert the hook at, or even under the edge of the sclerotica, and as near as possible to the ciliary processes. The hook must recede gradually, the finger being kept steadily on, and moved slowly with the knob, regulating the spring in the silver tube. As the chance of tearing off a part of the iris is proportionate to the distance it has to be drawn out, the opening is to be made, as near as possible, to the spot, where the separation is to be effected, taking care that the pupil shall be large enough, so that the prolapsed iris, and subsequent opacity of the cornea, cannot obstruct the entrance of the rays of light. The great advantage of this instrument, in Langenbeck's opinion, is, that the separation is effected, by means of the spring, more gently and gradually, than by the finger alone, so that if a commencement of the separation be effected, the completion of it is certain, without any risk of tearing the iris. As soon as the hook has receded to the golden tube, carrying with it the iris, the whole instrument is to be gently withdrawn, moving it slowly up and down, in order to loosen the upper and lower attachment of the iris; for, this membrane may be torn, if there has been much previous inflammation, or, if direct force be employed in withdrawing it. The instrument always keeps its hold, as firmly as the best forceps, and, with much more advantage, for it occupies less space, and enables the operator to make the incision in the cornea small, on which the correct strangulation of the iris depends. In all his operations, the capsule of the lens has never been injured by this instrument, which he considers another advantage, and, he conceives, that it may be used through the sclerotica, without rendering the lens opaque, as by the methods of Scarpa and Schmidt." (The latter author, however, as I have explained in this article, did not operate through the sclerotica, when the lens was transparent.) When the cornea is transparent only at its outer edge, Langenbeck sometimes performs excision; but, when this membrane is opaque opposite the natural pupil, he opens the cornea, near the edge of the sclerotica, and, if the iris will not protrude, he takes hold of its pupillary edge with the hook, and draws it between the lips of the wound, where he leaves it strangulated. (See *G. F. Guthrie on Artificial Pupil, p.* 63, *&c. 8vo. Lond.* 1819; *also Langenbeck's Neue Bibl.* 1 *B. p.* 1, 454, *and* 676, *8vo. Hanover*, 1817—19, *and* 2 *B. p.* 13 *and* 106, *where he answers some objections made to his instrument by Schlagintweit.*) Doubtless, one cause of the failure of many operations for artificial pupil is one, to which Mr. Guthrie has adverted, viz. the omission to keep down the subsequent inflammation of the iris and adjacent textures by the timely employment of the lancet, and other antiphlogistic measures. On this subject, however, I need not here dwell, as the proper treatment is already described in that part of the article *Ophthalmy*, which refers to iritis. Consult *Cheselden in Phil. Trans. for* 1735, *p.* 451, *&c. Sharp's Operations, Chap.* 29. *Janin Mém. sur l'Oeil. Richter von der Verschlossenen Pupille in Anfangsgr. der Wundarzn. B.* 3, *Gött.* 1795. *Scarpa sulle Malattie degli Occhi, cap.* 16; *or the English Transl. by Mr. Briggs. Gibson's Pract. Obs. on the Formation of an Artificial Pupil, &c. 8vo. Lond.* 1811; *a work of considerable merit. Wenzel on the Cataract. Sir W. Adams, Pract. Obs. on Ectropium, and on the modes of forming an Artificial Pupil, &c. 8vo. Lond.* 1812; *also, on Artificial Pupil, 8vo. Lond.* 1819. *Roux, Parallèle de la Chirurgie Angloise, &c. p.* 283, *&c. 8vo. Paris*, 1815. *Maunoir and Scarpa* *in Med. Chir. Trans. Vol. 7, p.* 301, *&c. G. J. Beer Ansicht der Staphylomatosen Metamorphosen des Auges, und der kunstlichen Pupillenbildung, Wien,* 1815; *and Lehre von den Augenkr. B.* 2, *Wien,* 1817. *P. Assalini, Ricerche sulle Pupille Artificiali; in Milano,* 1811. *This author practises the detachment of the iris from the ciliary ligament with a particular kind of forceps. He must have an early claim to the invention, as he began the method in* 1786. *Jules Cloquet, Mém. sur la Membrane Pupillaire. Paris,* 1818. *Maunoir sur l'Organization de l'Iris,* 8*vo. Paris,* 1812. *Benedict, De Pupillæ Artificialis Conformatione. Lips.* 1810. *R. Muter, Pract. Obs. on Various Novel Modes of Operating on Cataract, and of forming an Artificial Pupil,* 8*vo. Wisbeach,* 1811. *G. F. D. Evans, Pract. Obs. on Cataract and Closed Pupil, &c.* 8*vo. Lond.* 1815. *Ch. Jüngken, Das Corconcion, ein Beitrag zur Künstlichen Pupillenbildung.* 12*mo. Berlin,* 1817. *G. Wagner, Commentatio de Coromorphosi, sistens brevem. method. ad Pupillæ artific. conformationem, novique ad Tridodialysin instrumenti descriptionem, cum tab. æn.* 8*vo. Brunswig.* 1818. *Schmidt and Himly Ophthal. Bibl. B.* 2 *and* 3. *Flajani, Collezione di Osservazioni, T.* 4. 8*vo. Roma,* 1801. *Ryan, in Dublin Hospital Reports,* 1818. *Quadri Annotazioni Pratiche sulle Malattie degli Occhi,* 4*to. In Neapoli,* 1818. *Langenbeck, Neue Bibl. für die Chir. B.* 1 *et* 2, 12*mo. Gött.* 1817—1819. *Reisinger, Darstellung, &c. einer leichten, &c. Methode Kunstliche, Pupillen zu bilden,* 12*mo. Augsb.* 1816. *Schlagintweit, Ueber den gegenwärtigen Zustand der Kunstlichen, pupillenbildung in Deutschland,* 8*vo. Munich,* 1818. *Donegana, Ragionamento sulla Pupille Artificiali; Milano,* 1809: *this work suggests the method of opening the sclerotica, under certain circumstances, for the purpose of dividing the iris from behind forwards. G. F. Guthrie on the Operations for the Formation of an Artificial Pupil,* 8*vo. Lond.* 1819; *or Operative Surgery of the Eye;* 8*vo. Lond.* 1823; *works, containing a very ample account of the subject, and many judicious observations. B. Travers, Synopsis of the Diseases of the Eye, p.* 334, *&c.* 8*vo. Lond.* 1820. *C. H. Weller, A Manual of the Diseases of the Human Eye; transl. by Dr. Monteath, Vol.* 2, *p.* 55, *&c.* 8*vo. Glasgow,* 1821.

PUS. (from ϖυον, matter.) The fluid, formed by the process of suppuration. See *Suppuration.*

Q.

QUININE, SULPHATE OF. This valuable preparation of bark, which is now beginning to be prescribed, in a large number of surgical cases, where loss of appetite and great debility are present, may be exhibited in doses of from one to five grains, three or four times a day, according to circumstances. As its solubility in water is increased by an excess of acid, four or five drops of sulphuric acid are frequently added to every two ounces of the water, with which it is mixed. When, however, the circumstances of the case render it advisable to dispense with the acid, the sulphate of quinine may be prescribed without it in any aromatic water, like the aqua carui. It may also be given to children mixed with syrup. Other preparations are the wine and tincture.

R.

RACHITIS. (from ραχις, the spine of the back, because the disease was once supposed to depend on disease of the spinal marrow.) The rickets. See *this word.*

RANULA. (dim. of *rana*, a frog.) A tumor under the tongue, arising from an accumulation of saliva and mucus, in the ducts of the sublingual gland. The term has been derived, either from an imaginary resemblance of the swelling to a frog, or from the disease making the patient, as it were, croak when he attempts to articulate. Such writers, as have treated of this disease, before it was known, that the parts, affected by it, were destined for the secretion of the saliva, could have no accurate notions of its true nature. Celsus is supposed to have alluded to the ranula, in the fifth section of his seventh book, where, after treating of the diseases of the tongue, he continues with the following passage: *sub linguâ quoque interdum aliquid abcedit, quod fere consistit in tunicâ, doloresque magnos movet.* The latter circumstance, however, renders it probable, that some other affection was signified, as a ranula is rather attended with a sense of restraint, than of pain. Fabricius ab Aquapendente and Dionis considered ranula as an encysted tumor of the meliceris kind. Munick, better acquainted with the modern discoveries of anatomy, does not mistake the nature of the present disease; and he expressly says, that the affection originates from a thick saliva, which, not being able to pass out of the salivary ducts, accumulates under the tongue, so as to cause a swelling in that situation. Far from adopting the opinion of Munick, Heister fell back to that of Fabricius, and borrows every thing from this author.—Lastly, De La Faye, in his notes on Dionis, adopted Munick's sentiments; he says, "there are two sorts of ranulæ; some, which are round, and situated beneath the tongue, seem only to be produced by a dilatation of the excretory duct of the sublingual gland; the others are longer than they are round; are situated at the side of the tongue, and are formed by a dilatation of the excretory duct of the inferior maxillary gland. The fluid, which fills such tumors, is the saliva, which gradually accumulates in them, in consequence of its viscidity and the atony of the duct."

Persons who move their tongues a great deal, and those who sing, have been set down as very liable to the present complaint; but, this opinion, I believe, rests on no good foundation. The fluid in the tumor is precisely like white-of-egg; but, it is thicker, after having remained a long while in the swelling; and it is occasionally of a calcareous, and even stony nature. Ranula does not proceed from an inspissation of the saliva, as De la Faye supposed, but from an obstruction of the duct, or orifices of this tube. The collection often produces a tumor of very large size; but, the swelling generally bursts when it has attained the dimensions of a walnut, and then leaves an ulcer, which cannot be healed while the real cause of the disorder remains unknown.

Mr. B. Bell saw an ulcer of this kind, which was treated with the utmost care for several months; various detergent and corrosive applications were employed; and even a mercurial course; but, all in vain. At length, the true cause of the disease having been ascertained, a cure was accomplished in a few days, by removing a piece of calcareous matter, which, by obstructing the ducts, had first caused the swelling, and then ulceration.

The opening, when made with a lancet, and not of sufficient size, frequently closes up again. In this case, the swelling re-appears some time afterwards. The ancients made the same remark; and hence, Paré preferred the actual cautery to the lancet. Dionis had also seen ranulæ recur, after they had been simply opened with a lancet, and he recommends, for the prevention of this inconvenience, the application of a mixture of honey of roses and sulphuric acid to the inside of the cyst, so as to destroy it. As Louis remarks, all authors seem to regret that the situation of the tumor should prevent the sac from being totally dissected out. The success which Fabricius ab Aquapendente experienced, when he merely opened the tumor its whole length, did not free him from this prejudice; and Heister says, he should prefer extirpation, if the nature of the adjacent parts, liable to be wounded, were not a formidable objection. But if this pretended cyst, this pouch, is nothing else than the gland itself, or its duct, dilated by the retention of the saliva, it should not be irritated. Whenever a sufficient opening is made, no relapse takes place. Munick particularly advises such an incision, and Rossius mentions the smallness of the opening, among the defects in the treatment, and its being a cause of the disease returning. However, he also recommends destroying the sac; but specifies, for the purpose, only astringent drying applications, which act in a less powerful manner.

In a ranula of moderate size, there is nothing like a cyst absolutely requiring extirpation. It is generally enough to lay the cavity open, and cut off the edges of the incision, when they will not otherwise unite. M. Louis always observed that the radical cure depended on a fistulous aperture, through which the saliva continued to flow; and that, when this opening was situated behind the lower incisor teeth, a very annoying ejection of the saliva took place, in certain motions of the tongue. The cure cannot be complete, unless this inconvenience be obviated. For this purpose, such an opening for the saliva must be made, as will not close.

A ranula, when of long standing, is sometimes so large as absolutely to hinder a person from articulating. Le Clerc has recorded a case, in which the root of the swelling extended under the tongue; the tumor filled the whole mouth; the prominence which it formed outwardly was as large as a duck's egg; and the disease, in its progress, had made the teeth of both jaws project outward. At some parts of its surface, a fluctuation was perceptible; other places were exceedingly hard. The patient, who could scarcely breathe, demanded assistance; and a puncture was made in the softest part of the outside of the swelling. A thick yellowish fluid issued out of the ranula. The opening was enlarged with a knife, and about a pint of gritty inodorous matter was extracted. There was no hemorrhage from the cut; and no sooner had the contents of the swelling been let out, than the patient began to articulate, which he had not been able to do for a long while. The sides of the tumor being so prodigiously distended, Le Clerc thought proper to destroy the inside of the cavity with a tent, dipped in a mercurial solution. The cure was completed in a month, and the tongue gradually regained its original size, a part of which it had lost.

But, as M. Louis observes, fortunate as the termination of this case was, it must not be indiscriminately set down, that destroying the cyst, or even opening the tumor, is always requisite. A more simple method will sometimes succeed. In a particular case, which this gentleman has related, a sinuosity, which divided the swelling into a right and left portion, made him suspect that it consisted of two sacs, in contact with each other. On each side, in front, and in the same line, there was a point, which was the orifice of the salivary duct, somewhat dilated, and blocked up with a viscid matter. Having very easily passed a small probe into the orifices, a matter, similar to white of egg, made its escape. A small leaden probe was passed into each opening, and, two days afterwards, the sacs were emptied again, and two pieces of lead, somewhat larger, introduced. The patient was advised to take out the pieces of lead every morning, empty the swelling, and then replace them. In a fortnight the openings, having been kept continually dilated, had no tendency to close; the saliva did not accumulate, and the ranulæ never appeared again.

In certain cases, the above means are quite inadequate, and the tumor must be totally extirpated. Boinet related, to the French Academy, a case, in which the swelling not only filled the whole mouth, but one half of the tumor projected out, and a cure could only be accomplished in the latter manner. The two upper incisor teeth, on the left side, were lodged in a depression observable there; and the canine tooth, of the same side, forced outward by the mass of the disease, had pierced the lip near its commissure. A fluid, resembling mucus, flowed from a narrow aperture at the lower part of the swelling. The tongue could not be seen, so much was it pushed backward, and, for some time, the patient had only subsisted on liquid food, which he was first obliged to convey to the back of the throat with some mechanical contrivance. The four incisor teeth, two canine, and first grinders of the lower aw, had been pushed out of their sockets, by the pressure of the swelling. The patient's aspect was alarming, and he was threatened with suffocation. Extirpation was deemed necessary, and t was performed with all due caution. The large cavity, thus occasioned, was filled with lint. The lower jaw being diseased, Boinet scraped some of ts surface off, and covered the places with lint, either dry, or dipped in spirit of wine. Some exfoliations followed, and the fungous granulations which grew were repressed with proper applications. In three months, the parts were healed in so regular a manner, that the motion of the tongue was not in the least obstructed, and no change continued, except the alteration of the voice, occasioned by the loss of teeth. (See *Encyclopédie Méthodique, Art. Grenouillette. Mém. de l'Acad. de Chirurgie, T.* 3. *Sabatier, Médecine Opératoire, T.* 2, *p.* 19, *&c. Edit.* 2. *Callisen, Systema Chirurgiæ Hodiernæ, Vol.* 2, p. 108, *&c. Hafniæ*, 1800. *Lassus, Pathologie Chir. T.* 1, *p.* 402, *&c.* 8*vo. Paris*, 1809. *Richter, Anfangsgr. der Wundarzn. B.* 4, *Kap.* 1, *Göttingen*, 1800. *J. J. Stahl, et J. F. E. de Schoenerben de Ranulâ, sub linguâ, speciali cum casu, Erford*, 1734.)

RECLINATION. A term much employed abroad, to denote the operation of turning a caaract, so as to change the position of its anterior and posterior surfaces. (See *Cataract.*)

RECTUM. Many cases, in which this bowel is more or less concerned, are treated of elsewhere in this Dictionary, and therefore it will only be necessary for me here to refer to them, and then notice some diseases of the part, which are not considered in other articles. For an account of piles, hemorrhoidal excrescence, and other tumors of the rectum, see *Hemorrhoids;* and for that of prolapsus ani, fistula in ano, and mperforate anus, see *Anus.* Under the head of *Alvine Concretions*, I have noticed the dangerous obstruction of this bowel by masses of indurated matter. In the article *Lithotomy*, the mode of cutting through the rectum into the bladder, for the purpose of extracting a calculus rom the latter organ, is explained; and, if the eader refer to *Bladder*, he will there find a decription of the method of tapping it from the ectum.

Scirrhus, or *stricture of the rectum*, someimes called the *scirrho-contracted rectum*, and ometimes *cancer*, especially when the case is inveterate, and in a state of ulceration, is a disase which has received much elucidation from the writings of Desault, Sir Everard Home, Dr. Sherwin, Mr. White, and Mr. Copeland. In the various descriptions given of the complaint by hese, and other writers, one great point of diference is remarkable, viz. that some of them represent the case as always of an incurable nature, while others consider it as admitting of relief, at east when it has not made considerable progress, nd the parts are free from ulceration. "Many trictures of the rectum (as a judicious writer has emarked) are in their nature quite harmless, injurious only inasmuch as they present a mechanial obstruction, or disorder the functions of the limentary canal, and fatal only from neglect. In many cases, also, there is great thickening and induration, without the least tendency to cancer; at least, the latter disease has not supervened, even after an interval of many years." (*On Hemorrhoids, Strictures, &c. of the Rectum, p.* 120.) According to Desault, scirrhus of the rectum is not uncommon at an advanced period of life, and the disease is said to afflict women more frequently than men, as from a table kept at the Hotel Dieu, it appeared that ten cases out of eleven occurred in females; a proportion far exceeding what has been noticed in this country. Indeed, Mr. Calvert, speaking of strictures of the rectum generally, sets down their greater frequency in one sex, than the other, as doubtful, and scarcely worthy of notice. (*P.* 122.) If it were not for the fact, that Desault sometimes effected a cure of the disease in its early stage, I should venture to conclude, that his observations apply entirely to the true scirrhus, or cancer of the rectum, which I believe rarely, or never, occurs in young patients, but, as Desault states, is not very unfrequent in elderly persons. My friend, Mr. Copeland, in his practical remarks, does not confine himself to really scirrhous and cancerous affections, but comprehends strictures of the rectum from a variety of causes; and this accounts for his statement, that the disease "*attacks people of almost all ages;* but is most common about the middle age." However, he agrees with Desault, that women are more frequently affected than men. He admits, that it is sometimes cancerous, though not so often as is generally imagined, the mere induration not being an unequivocal proof of it. When the disease is really cancer, it is usually attended with more severe pain, darting through the pelvis to the bladder and the groin. The countenance is of a sallow leaden cast. (*On the principal Diseases of the Rectum and Anus, p.* 15—17.)

Sometimes the disease extends over a considerable length of the gut, but is generally more circumscribed. The coats of the bowel become much thicker and harder, than natural. The muscular is subdivided by membranous septa, and the internal coat is sometimes formed into hard, irregular folds. The surface of the inner membrane is occasionally ulcerated, so as to form a cancerous disease. Every vestige of the natural structure is sometimes lost, and the gut is changed into a gristly substance. The cavity of the bowel is always rendered narrow at the scirrhous part, and is, sometimes, almost obliterated. When the passage through the gut is very much obstructed, the bowel is always a good deal enlarged just above the stoppage, or stricture, from the accumulation of the feces there. As the disease advances, adhesions form between the rectum and adjacent parts, and ulcerations produce communications between them.

Besides a spasmodic form of stricture of the rectum, a case, the real existence of which is perhaps questionable, Mr. Calvert notices the examples attended with change of structure. In some cases, he says, the contraction is chiefly owing to a thickened and indurated state of the mucous membrane, arising from inflammation, or some chronic alteration of texture; but, that when the disease has existed a considerable time, the mucous, cellular, and muscular coats become more or less affected; so that on dissection, it is often impossible to determine, in which the disease originally commenced. He describes other cases, in which the cavity of the rectum is nearly obliterated by the presence of hard, painful tubercles. "This disease (he observes) bears some resemblance to the first stage of malignant stricture, at least as it appears in some cases; but, it is evidently quite of a different nature, as it is easily cured by compression." (*P.* 129.) Lastly, he adverts to carcinomatous strictures of the rectum which are deemed incurable. The disease is described by him as generally commencing at one side of the gut, just above the upper part of the internal sphincter, where a smooth, but hard and knotty projection may be felt. By degrees, the disease, which was probably confined at first to the glandular structure of the internal membrane, extends around the gut, changing the structure of the adjacent parts. (*P.* 131.) However, he says, carcinomatous stricture is not confined to the lower part of the rectum, but is often met with higher up, and especially in the sigmoid flexure of the colon. He remarks, that a considerable obliteration of the cavity of the rectum may proceed from an inflammation, or ulceration, and subsequent adhesion of hemorrhoidal tumors, resembling, when the swellings are not of long standing, that form of stricture which arises from an infiltration of coagulable lymph in the relaxed folds of the mucous membrane of the bowel; but, in other instances, where such tumors are of older date and more solid, resembling the tubercular form of stricture. (*P.* 138.)

As the disease, at first, is not very painful, it is usually not much noticed till somewhat advanced. There is perhaps no disease, as Mr. Calvert has noticed, in which the symptoms, arising from derangement of other parts, are so predominant over the local; and "there can be no doubt, that in many cases of iliac passion, and obstinate constipation, arising from this source, death takes place without the slightest suspicion of the cause. In other cases, especially when the disease is of a malignant nature, it is not unfrequently confounded with scirrhus of the uterus." (*P.* 123.) He also adverts to a case, in which a stricture of the rectum was lately mistaken for an intus-susception, by some practitioners "at the pinnacle of professional eminence." Mr. C. Bell, in one case where he attempted to puncture the bladder, and, in another where he was about to divide a fistula in ano, felt his finger stopped by strictures of the rectum, of which the patients had no suspicion. The patient is at first habitually costive, or affected with what is called a torpid state of the bowels, and usually voids his stools with a little difficulty. In time, a good deal of pain is felt in the part affected, especially at stool, after which some relief is experienced. "As the gut continues to decrease in diameter (says Mr. Copeland), the efforts to expel the feces become more violent, and the consequent progress of the disease more rapid. The stools, which have been long evacuated with difficulty, become contracted in size, appearing like earthworms in their form, or small pellets;" and, if the finger be introduced into the rectum, "the gut will be found either obstructed with small tubercles, or intersected with membranous filaments; or else the introduction of the finger will be opposed by a hard ring of a cartilaginous feel, composed of the diseased inner membrane o the intestines." These states, as Mr. Copeland observes, are very different from the regula tumor, on the anterior part of the rectum, occasioned by an enlargement of the prostate gland a case apt to be suspected. "As the disease advances (says the same author), the feces become more fluid, and there is a thin sanious discharge from the anus, accompanied with tenesmus." Mr. Calvert notices as the most characteristic symptoms, an unusual distention o the colon; the extension of pain, felt abou the upper part of the sacrum, down to the feet in the course of the large nervous trunks; the decrease of the tenesmus after a sufficient evacuation; and the scanty motions of irregular or figured appearances. The latter effect, however, he says, is not always present throughout the disease, for, if the contraction be at the upper part of the rectum, the motion may be of the usual size and appearance. (*P.* 147.) According to Desault, pus and blood may sometimes be noticed with the excrement, particularly when the disease has advanced to the ulcerated state. The carcinomatous stricture is said to be always attended with more or less of a burning sensation, or acute shooting pains at the seat of the disease, except at its very beginning. Sometimes, when a great part of the stricture has been destroyed by ulceration, the motions are voided without much effort, but not without intense suffering. (*Calvert, p.* 148—150.) The patient at length becomes sallow, frequent eructations of air from the bowels torment the patient, and render his life miserable; the constitution suffers, and dissolution follows. Severe tenesmus attends the whole course of the disease. (*Œuvres Chir. par Bichat, T.* 2.)

Sometimes a small fistulous orifice at the verge of the anus communicates with the inferior portion of the diseased part. Such a fistula, in a case recorded by Sir Everard Home, was half an inch in length. (*Obs. on Cancer, p.* 133.)

Desault often saw the disease form a communication between the rectum and vagina, and the feces passed through the latter part. In the latter stage of the affliction, the rectum, bladder, vagina, uterus, and adjacent parts, are all involved in one common ulceration. And, according to Mr. Calvert, the surface of the os sacrum, or even that of the lumbar vertebræ, may become involved in the extent of the disease, the rectum being sometimes so firmly connected with the former bone as to be very difficultly separable from it even with a knife. (*P.* 137.)

When the disease has attained the ulcerated state, it is probably always incurable. Palliatives can only now be resorted to, such as anodyne and emollient glysters, the warm-bath, &c. with the exhibition of medicines like opium, cicuta, uva ursi, &c. Claudinus applied his remedies to the inside of the bowel, by means of tents, and did not employ the latter as a mode of curing the disease when less advanced. Valsalva introduced a cannula, pierced with numerous holes, and then made his patient get into a bath, so as to let the fluid enter the intestine. Numerous practitioners, among whom is Morgagni, made mercurials the base of their treatment, from a supposition that the complaint was of venereal origin. I believe the latter opinion is, at present, entirely abandoned by all the most judicious surgeons in England, and this, whether mercury ever prove useful or not.

When the disease is not attended with ulceration, the contraction and thickening of the gut may be diminished by introducing bougies, keeping them for a certain time, every day, so introduced, and increasing their size gradually. The pressure of these instruments seems to lessen the disease, and stop its progress; a proof that its nature differs from that of a common malignant scirrhus. Desault used to employ long tents, made of lint, smeared with cerate, and passed into the bowel by means of a probe, with a forked end. Their size was gradually increased, so as to keep up the compression, to which, it was conceived, all the good was owing. Their length was also augmented, by degrees. At first, fresh ones were introduced twice a day. When any hardnesses were situated on the outside of the anus, Desault cured them on the same principle, viz. by making pressure on them with compresses and a bandage. In this manner he effected the cure of a scirrho-contracted rectum. The patient was taught to pass occasionally the tents, without assistance, in order to prevent a relapse.

Instead of tents, modern surgeons employ bougies for the dilatation of strictures in the rectum. When from habitual costiveness, the altered figure of the stools, and other circumstances, there is reason to suspect organic obstruction to the passage of the feces, and this suspicion is confirmed by an examination of the rectum with the finger, "the first object of the surgeon (says Mr. Copeland) should be an enlargement of the obstructed part, by the introduction of a bougie. This should be of such a size, as to pass when well lubricated with oil, without much difficulty or pain. Sometimes, when the disease has been of long continuance, it will be necessary to begin even with a large sized urethra bougie, or one of the same size as those which are made for a stricture of the œsophagus, and of a length that is likely to pass beyond the end of the stricture, that is, about six, or seven, or eight inches. But, I think it of consequence to use a bougie at first, which is rather too small than too large." (*P.* 29.) When it has remained for half an hour, or more, it is to be removed, and passed again the next day, the same sized bougie being continued for several days. In the introduction of the bougie, Mr. Copeland cautions the practitioner not to mistake the projection of the sacrum for a stricture of the gut; a mistake which, he says, has often been made, and, as I believe, too often wilfully, and from motives of imposition. Pressure on the rectum by the retroverted uterus, (*C. Bell,*) an enlarged ovarium, or other tumor, may also lead an inattentive surgeon to mistake the case for a stricture. Mr. Calvert has seen the bougie employed a long while in one example, where the real disorder arose from a biliary concretion imbedded in the parietes of the rectum. (*On Hemorrhoids, and other Diseases of the Rectum, p.* 167.) This gentleman conceives that an ivory ball, affixed to the end of a silver wire, is a good instrument for ascertaining the exact situation and extent of strictures of the rectum. (*P.* 169.) When the stricture is just above the sphincter, some information of the state of the parts, he says, may be gained by employing the speculum ani, but, he adds, that whenever there is organic stricture near the anus, this instrument should be used with caution, as any sudden distention of the parts is always very injurious. (*P.* 170.) Mr. Copeland advises the bowels to be kept constantly lax, by the use of castor oil, or electuary of senna, during the whole of the treatment. (*P.* 30.) Whatever be the nature of the stricture, whether it be that kind in which the rectum is obstructed by tubercles, by membranous filaments intersecting its canal (which two species Mr. Copeland says are the most easily relieved), or whether it be the indurated stricture, from a thickening of the coats of the intestine, this local treatment is equally necessary.—The plan is to be persisted in until a full-sized bougie will readily pass, and even after all symptoms have disappeared, it is recommended to introduce the bougie, and withdraw it again, once every two or three days, for some time, in order to prevent a relapse. The indurated, annular stricture, which long resists the bougie, Mr. Copeland sometimes divides with a probe-pointed curved bistoury on the side which is contiguous to the os sacrum; and he has frequently seen the late Mr. Ford perform the same operation. (*P.* 34.) This practice, which originated with Wiseman, has also been practised by others with success. (See *Dr. Jameson's Case, in American Recorder, April,* 1822.) When the disease is either combined with venereal symptoms, or there is any reason for suspecting it to be itself "the solitary symptom" of lues, Mr. Copeland joins Desault in recommending a trial of the effect of mercury, in conjunction with bougies. (*P.* 44.) The formation of abscesses, he remarks, is very frequent in the advanced stages of the disease, and he has often seen the common operation for fistula done under such circumstances without success. (*P.* 35.)

Besides tents and bougies, which latter Mr. Calvert thinks may be sometimes usefully made the vehicle of local applications, or be what is called medicated, this gentleman enumerates amongst the plans of dilating the stricture a prepared gut, introduced beyond the stricture, and then distended with water, in other words, Mr. Arnot's dilator. This method, he says, may be adopted where the bougie causes great irritation. (*P.* 173.)

When a stoppage of urine occurs in the advanced stage of the disease, Mr. Copeland advises surgeons not to use the catheter hastily. (*P.* 39.) And, in the event of great pain and irritation in the rectum, he has seen the greatest benefit derived from the local application of opium, either in a glyster, or by the introduction of one or two grains of the medicine within the anus. He also speaks favourably of the effects of the warm bath, and fomentations, in giving temporary relief; and he has also exhibited in these cases the pil. extracti conii cum hydrarg. submur. with considerable advantage.

When stricture of the rectum is of a cancerous nature, Mr. Calvert sets down every known remedy as inadequate to arrest its progress. A mitigation of sufferings is all that can be aimed at. "Diluent injections, combined with opium, conium, or similar remedies, may afford a temporary relief in the ulcerative stage;" but, says this writer, "the greatest advantage is derived from carefully introducing a hollow tube of elastic gum, through which the feces are drawn off by injecting tepid water." Dilating the passage, with any other view than that of maintaining an outlet for the feces, he considers quite useless. "A soft tent, composed of lint, smeared with some mild fresh ointment, will in general answer this purpose. If there be much pain and inflammation, fomentations may be used; and leeches applied in the vicinity of the anus, or over the sacrum. The bowels should be kept moderately open with castor oil, or some other mild laxative, which, if it is thought necessary, may be combined with the extract of hyoscyamus, cicuta, or opium; but the latter is in general less admissible, because it is more liable to counteract the effect of the laxative, and produce a torpid state of the bowels." (*P.* 187.)

A fatal case of mortification of the rectum is detailed by Larrey. *Parisian Chirurgical Journal, Vol.* 2, *p.* 398, *&c.* See *J. L. Petit, Œuvres Posthum. T.* 2. *Dr. Sherwin on the scirrho-contracted rectum, in Mem. of the London Medical Society, Vol.* 2. *Sir Everard Home, Obs. on Cancer, p.* 129, *&c. 8vo. Lond.* 1805. *L. F. J. Duchadoz, De Proctostenia, seu de Morbosis Intestini Recti Angustiis, Monsp.* 1771. *C. G. Siebold, de Morbis Intestini Recti. Baillie's Morbid Anatomy, p.* 116. *Œuvres Chir. de Desault, par Bichat, T.* 2, *p.* 422. *Obs. on the principal Diseases of the Rectum, &c. by T. Copeland,* 1814. *W. White, Obs. on the Contracted Intestinum Rectum, 8vo. Bath,* 1812. *Also his further Obs. on the same subject. Bath,* 1822. *Monro's Morbid Anat. of the Gullet, &c. p.* 347. *G. Calvert on Hemorrhoids, Strictures, and other Diseases of the Rectum, 8vo. Lond.* 1824. *W. Gibson, Institutes, &c. of Surgery, Vol.* 1, *p.* 292. *Philadelphia,* 1824

RESOLUTION. The subsidence of inflammation without abscess, ulceration, mortification, &c. Also the dispersion of swellings, indurations, &c.

RETENTION OF URINE. See *Urine, Retention of.*

RETROVERSIO UTERI. A turning backward of the womb. See *Uterus, Retroversion of.*

RICKETS. (*Rachitis.*) Is mostly met with in young children; seldom in adults. Morand, however, (*Acad. des Sciences,* 1753.) mentions an instance, in which an adult became affected. The disease, it is said, may even take place in the fœtus in utero; but the most common period of its commencement is in children, between the ages of seven or eight months, and two years. Hence, as Mr. Wilson observes, its origin has frequently been imputed to the effects of dentition. He adds, that he has often known it make its appearance after this time, and that it not unfrequently attacks the spine a little while before puberty, and may do so even later. (*On the Structure and Physiology of the Skeleton, &c. p.* 162.) Pinel has given a description of the skeleton of a rickety fœtus. (*Fourcroy's Journal.*) The disease seems to consist of a want of due firmness in the bones, in consequence of a deficiency in the phosphate of lime in their structure. The causes of the affection are involved in great obscurity. Authors have referred them to scrophula, scurvy, lues venerea, difficult dentition, &c.; and Richerand still firmly believes, that rachitis is only one of the effects of scrophula in its worst forms. (*Nosographie Chir. T.* 3, *p.* 148, *Edit.* 4.) But these are merely conjectures, which will not bear a rigorous investigation. Boyer, in particular, has well exposed their invalidity. (*Traité des Mal. Chir. T.* 3, *p.* 611.)

Rickety subjects are often at the same time scrophulous; and this is, probably, the only reason for scrophula being accounted a cause of the other affection. The particular appearances of rickety children we need not detail, as every one is familiarly acquainted with them: such children are usually of a bad, weak constitution, and their limbs and bones become bent in directions determined by the action of the muscles, and the weight and pressure which they have to sustain. When the affection is very general, the spine becomes shorter, and is curved in various directions; the breast becomes deformed, not only in consequence of the curvature of the spine, but by the depression of the ribs, and projection of the sternum. The bones of the pelvis fall inwards, and the os pubis generally approaches the sacrum. The latter circumstance is one of the causes of difficult parturition. The clavicles become more bent and prominent forward; the os humeri is distorted outward; the lower ends of the radius and ulna are twisted in the same direction; the thighs are curved forwards or outwards; the knees fall inwards; the spine and front surface of the tibia become convex; and the feet are thrown outwards.

According to Mr. Stanley, when the tibia and fibula become curved, they sometimes "acquire increased breadth in the direction of the curve, losing a proportionate degree of thickness in the opposite direction. Hence the bones become, as it were, newly modelled, passing from the cylindrical into the flattened form. This would seem to be designed for the purpose of enabling them to support more efficiently the weight of the body, since by this alteration they acquire increased breadth and power of resistance in that direction, where the greatest strength is required. I have never noticed (says Mr. Stanley) any expansion in the articular ends of rickety bones, as is mentioned by some authors. I should therefore feel inclined to believe, that there has existed only the appearance of such a phenomenon, the ends of the bones having appeared swollen, in consequence of the emaciation of the surrounding soft parts. (See *Med. Chir. Trans. Vol.* 7, *p.* 402—405.)

When the thoracic viscera are considerably oppressed by the alteration in the figure of the chest, produced by rickets, the disease may bring on fatal consequences.

Boyer has thus described the appearances of rickety bones: They are lighter than natural, and of a red, or brown colour. They are penetrated by many enlarged blood-vessels, being porous, and as it were spongy, soft, and compressible. They are moistened by a kind of sanies, which may be pressed out of their texture, s out of a sponge, or rather a macerated hide fter it has been tanned. The walls of the medullary cylinder of the great bones of the extrenities are very thin, while the bones of the skull ire considerably increased in thickness, and beome spongy, and reticular. All the affected ones, especially the long ones, acquire a remarkble suppleness; but if they are bent beyond a ertain point they break, &c. Instead of being illed with medulla, the medullary cavity of the ong bones contains only a reddish serum, toally devoid of the fat, oily nature of the other ecretion in the natural state. (See *Boyer, Traité des Maladies Chir. T.* 3, *p.* 619.) The onsistence of several rickety bones, examined y Mr. Stanley, was nearly that of common carilage. They presented throughout an areolated exture, and the cells were in some parts large, nd contained a brownish gelatinous substance. This gentleman did not find the periosteum hickened, as Bichat has described it. (*Anatomie Generale, T.* 3.) The investigations of Mr. Stanley have also discovered, that, in the proess by which rickety bones acquire strength nd solidity, there is always an undeviating reguarity in the situation, extent, and direction of he deposited earthy matter. "Thus it is obvious (says this gentleman) that, in the curved one, the part where there is the greatest need f strength, to prevent its further yielding, is in he middle of its concavity, or in other words in he line of its interior curve; and it is just in this ituation, that strength and compactness will be irst imparted to the bone by the deposition of hosphate of lime. It will be further found, that he greatest resistance being wanted at this part, he walls are accordingly rendered thicker here, han elsewhere, and the degree, to which this xcess in thickness is carried, bears an exact atio to the degree of curvature, which the bone as undergone."

Mr. Stanley's observations also prove, that the ony fibres are arranged obliquely across the xis of the bone, in a direction calculated to ugment its strength. Lastly, we learn from he same authority, that if a long bone, like the ibia, be very much bent, while it has to support a great supercincumbent weight, the deposiion of the bony matter may not be confined to he thickening of the walls of the concave side, ut may extend across the medullary cavity, endering the bone here perfectly solid, and thereby greatly strengthened. (See *Obs. on the Condition of the Bones in Rickets, &c. by E. Stanley, in Medico-Chir. Trans. Vol.* 7, *p.* 404, *et seq.*)

We learn from the late Mr. Wilson, that, for nany years, he also exhibited in his lectures reparations, illustrating the fact of the abundant leposition of osseous matter, "when the bones egin to recover from the disease, at the part where it is most wanted, viz. on the inner part of he concave surface of their curve." (*On the Skeleton, &c. p.* 167.)

Many very rickety and deformed infants improve as they grow up, and acquire strength. The deformity of their limbs spontaneously diminishes, and the bones gain a proper degree of irmness, a due quantity of the phosphate of lime eing deposited in their texture.

It is a question, whether the restoration of the proper figure of the bones can be promoted by the constant pressure of bandages, and mechanical contrivances, sold in the shops. Some authors contend, that in very young children machines are useless, as the confinement and inactivity of the muscles, necessarily occasioned by such contrivances, must increase the general debility, and consequently the disease.

Notwithstanding the praises which have been bestowed on those mechanical means by their inventors, and even by respectable authors, says Boyer, they are not now used by any enlightened judicious practitioners, it being generally agreed, that it is best to leave to nature alone, aided by good medical treatment, the duty of rectifying bones deformed by the rickets. (*Traité des Mal. Chir. T.* 3, *p.* 627.) Delpech expresses himself still more strongly against the employment of machinery. (See *Précis Elémentaire des Maladies Chir. T.* 3, *p.* 740, *&c.*) However, these opinions, against mechanical contrivances for the improvement of rickety bones, are not meant to apply to machines for rectifying distortions of the foot. In such cases, the malformation does not depend on constitutional causes, and mechanical means will do whatever is possible.

No medicine is known, that possesses any direct efficacy in rickets.—Tonics are indicated, and should be employed. Bark, especially the sulphate of quinine, may be tried, as well as steel medicines: to iron filings, a great deal of efficacy has been ascribed. (See *Med. Comment. Vol.* 2, *p.* 48.) In particular, the functions of the bowels should be duly regulated by medicine. The disease appearing to consist in a deficiency of lime in the bones, proposals have been made to exhibit internally the phosphate of lime; but this chemical project has had no success. (See *Bonhomme's Memoir on Rachitis, in Duncan's Annals for* 1797.)

Several circumstances, considered by Mr. Wilson, tend to prove, that this scheme could present no chance of benefit, because there is no proof of a deficiency of lime in the system, though the arteries of the bones do not deposit it in the natural degree. (See *Wilson on the Skeleton, &c. p.* 163, *&c.*)

More good is generally effected by keeping children in healthy situations, and in a salubrious air, than by any medicines whatever. Light, wholesome, nutritious, easily digestible food; cold bathing; good nursing; regular gentle exercise; or airings in a carriage; the use of the flesh-brush, &c. are also highly serviceable. The constitutional treatment of rickets belongs more properly to the physician than the surgeon; and it is not necessary to introduce more of the subject into a Dictionary expressly allotted to surgery. (See *Mollities Ossium.*) Consult *Buchner de Rachitide. Argent.* 1754. *Glisson, de Rachitide, sive, morbo puerili. Ludg. Batav.* 1671. *Bonhomme's Mem. on Rachitis, in Duncan's Medical Annals for* 1797. *Richerand, Nosographie Chir. T.* 3, *p.* 142, *&c. Edit.* 4. *Levéillé, in Mém. de Physiologie et de Chirurgie, par Scarpa, &c. Boyer, Traité des Maladies Chir. T.* 3, *p.* 607, *&c. Stanley's Obs. in Med. Chir. Trans. Vol.* 7, *p.* 404. *Delpech, Précis Elémentaire des Maladies Chir. T.* 3, *p.* 739, *&c. Trnka de Krzowitz, Historia*

Rachitidis, 8vo. *Vindob.* 1787. *R. Hamilton, on Scrophulous Affections, &c.* 8vo. *Lond.* 1791. *A. Portal, Obs. sur la Nature et sur le Traitement du Rachitisme ou des Courbures de la colonne Vertébrale et de celles des Extremités*, 8vo. *Paris*, 1797. *J. Wilson on the Structure and Physiology of the Skeleton, Diseases of Bones, &c. p.* 159, *&c.* 8vo. *Lond.* 1820.

RINGWORM. See *Herpes.*

RUPTURE. A protrusion of the abdominal viscera. See *Hernia.*

S.

SABINA. Savine. The use of the leaves of this plant, in forming the active ingredient in the ointment commonly preferred for keeping open blisters, has been explained in the article *Blisters.* The other chief surgical use of savine, is as a stimulating application for destroying warts, and other excrescences. For the latter purpose, it is generally powdered, and mixed with an equal proportion of subacetate of copper. The same powder is also sometimes employed by surgeons for maintaining the hollows in which peas are inserted in issues. The best plan is, first to wet the peas, then roll them in the powder, and put them, in this state, on the issue. But, when the whole surface of the issue has risen high above the level of the skin, the powder must be sprinkled all over the sore, so as to produce an absorption of the high granulations.—Indeed, even in this manner, a good cavity often cannot be obtained; and it becomes necessary to destroy the surface of the issue, by rubbing it with caustic potassa, or potassa cum calce.

SAL-AMMONIAC. *Ammonia Muriata. Muriate of Ammonia.* Employed a good deal by surgeons, as an ingredient in discutient lotions. See *Lotio Ammon. Mur.*

SALIVARY FISTULÆ. See *Parotid Duct.*

SANIES. (*Latin.*) A thin, serous, fetid matter, discharged from fistulæ, unhealthy sores, &c. It is sometimes tinged with blood.

SAPO TEREBINTHINÆ. (*Starkey's Soap.*) ℞. Potassæ Subcarbonatis calidi, ℥j. Olei Terebinth. ℥iij.—The turpentine is gradually blended with the hot subcarbonate of potassa in a heated mortar. Indolent swellings were formerly rubbed with this application, and, perhaps, some chronic affections of the joints might still be benefited by it.

SARCOCE'LE. (from σαρξ, flesh; and κηλη, a tumor.) A fleshy enlargement of the testicle. (See *Testicle, Diseases of.*)

SARCO'MA, or *Sarcòsis.* (from σαρξ, flesh.) A fleshy tumor. (See *Tumors, Sarcomatous.*)

SARSAPARILLA. The root of sarsaparilla was brought into Europe about 1530. It was at first reputed to possess singular efficacy in venereal cases; but afterwards lost all its fame. It was again brought into notice by Dr. W. Hunter, who advised Dr. Chapman to make trial of it in a bad case of phagedenic bubo; and the benefit, obtained in this instance, led Dr. Hunter to extend the recommendation of the medicine. Sir W. Fordyce stated that sarsaparilla would quickly relieve venereal head-achs, and nocturnal pains, and if persisted in, cure them; that in emaciated, or consumptive habits, from venereal cause, it was the greatest restorer of appetite, flesh, colour, and strength, which he knew of; that when mercurial frictions had been previously employed, it would generally complete the cure of the disease of the throat, nose, palate, or spongy bones; and that it would promote the cure of blotches and ulcers, and sometimes accomplish it, *even without mercury;* though, in this circumstance, there was danger of a relapse. Sir W. Fordyce pronounced sarsaparilla to be of little use in chancres; but that when these, or buboes, could not be healed by mercury, it would often cure, and always do good. He allows, however, that, in all venereal cases, *sarsaparilla is not to be trusted, unless preceded by, or combined with, the use of mercury*; and he thought sarsaparilla would, probably, always cure what resisted mercury. (*Medical Obs. and Inq. Vol.* 1.)

Cullen considered sarsaparilla as possessing no virtues of any kind; for, says he, " tried in every shape, I have never found it an effectual medicine in syphilis, or any other disease." (*Mat. Med. Vol.* 2.)

Mr. Bromfield declares, that he never saw a single instance in which sarsaparilla cured the venereal disease without the aid of mercury, either given before, or in conjunction with it. (*Pract. Obs. on the Use of Corrosive Sublimate, &c. p.* 78.) Mr. Pearson also contends, that sarsaparilla *has not the power of curing any one form of the lues venerea;* but he allows, that it may suspend, for a time, the ravages of that contagion, the disease returning, if no mercury should have been used. This gentleman admits, also, that sarsaparilla will alleviate symptoms derived from the venereal virus. He maintains, that the exhibition of sarsaparilla does not diminish the necessity for giving less mercury. Nocturnal pains in the limbs, painful enlargements of the elbow and knee, membranous nodes, cutaneous ulcerations, and certain other symptoms, resembling venereal ones, are often experienced after a full course of mercury. Such complaints, Mr. Pearson allows, are greatly benefited by sarsaparilla, and exasperated by mercury; and, he observes, that it is from these complaints having been mistaken for venereal ones, that the idea has arisen, that sarsaparilla has cured syphilis, when mercury had failed. Mercury, and the venereal poison, may jointly produce, in certain constitutions, symptoms which are not strictly venereal, and are sometimes more dreadful, than the simple effects of syphilis. Some of the worst of these appearances are capable of being cured by sarsaparilla, while the venereal virus still remains in the system. When this latter disease has been eradicated by mercury, sarsaparilla will also cure the sequelæ of a course of the other medicine. (*Pearson on the Effects of various Articles in the Cure of Lues Venerea*, 1807.)

The value of many of the foregoing opinions is much affected by the results of modern inquiries into the nature of the venereal disease, the possibility of generally curing which, without the aid of mercury, seems well established, though the expediency of the method is another question.

SCA'LPEL. (from *scalpo*, to scrape.) Originally a raspatory, or instrument for scraping diseased bones, &c. The term now generally signifies a common, straight, surgical knife.

SCA'RIFICATION. (from *scarifico*, to scarify.) The operation of making little cuts, or punctures, in a part, for the purpose of taking away blood, letting out fluid in anasarcous cases, or the air of emphysema.

SCIRRHUS; SCIRRHOMA; SCIRRHOSIS. (from σκιρροω, to harden.) The etymological import of these terms seems merely to be any induration. The first is now generally restricted to the induration, which precedes cancer in the ulcerated state.

SCLERIASIS; SCLEROSIS. (from σκληροω, to harden.) A hard tumor, or induration.

SCRO'PHULA, or SCROFULA. (from *scrofa*, a sow.) So named as is commonly supposed, because swine are said to be subject to it, though the correctness of this etymology is rendered very questionable by the remarks of Dr. Henning, and the statement, that pigs are really liable to scrophula, would appear to be erroneous. (See *Critical Inquiry into the Pathology of Scrophula*, *&c.* *p.* 1, 9.) Called also, *struma*, and the *King's evil*, from the custom of submitting patients formerly to the supposed beneficial effects of the royal touch. A disease, one of the chief, or most palpable symptoms of which is a chronic swelling of the absorbent glands, in various parts of the body, which glands generally tend very slowly to imperfect suppuration. Our notions of scrophula, however, would be very imperfect, were we to define the disorder to be a morbid state of the lymphatic glandular system. The first appearances, indeed, frequently consist of spots on different parts of the body, and of eruptions and ulcerations behind the ears. As a judicious author remarks, the system of absorbent glands, it is true, seldom or never fails to become affected in the progress of the disease; but, there is reason to believe, that scrophula frequently appears, for the first time, in parts, which are not of a glandular nature. There are, perhaps, but few, if any, of the textures of the human body, or of the organs, which these textures form, that are not liable to attacks of scrophula, and to scrophula as an original idiopathic affection. (*Thomson on Inflammation*, *p.* 134.) These sentiments are entirely at variance with those of Alibert, and many other moderns, who describe the disease as having its commencement in the conglobate glands, especially those of the neck, (*Nosol. Naturelle*, *T.* 1, *p.* 441, 4*to.* *Paris*, 1817;) and they are equally opposite to the doctrine of Dr. Henning, who argues, that the superficial absorbent glands alone are susceptible of the original action of the cause of this disease, and that if other parts become affected by it, such affection is consequential. (*On the Pathology of Scrophula*, *Chap.* 6.)

Scrophula generally shews itself during infancy, between the age of three and seven; sometimes rather sooner; but, frequently, as late as puberty, and, in some instances, though a very few, not till a much more advanced period of life. In the latter cases, the disease is said to be rarely so complete, or well marked, as it is in young subjects. Sir A. Cooper mentions the period of growth generally, as the time of life for scrophula; and its commencement, afterwards, he agrees with most writers in pronouncing very uncommon. "Cette maladie (says Alibert) est communément le partage de la première enfance. Il est rare qu'elle se développe chez les adultes. Je l'ai pourtant observée chez des septuagénaires; mais presque toujours ce sont les effècts de la dentition, qui la font éclore, et ceux de la puberté, qui la font evanouir."—(*Nosol. Naturelle*, *p.* 448.)

By some authors, it is stated, that the disease seldom attacks the glands in children under two years of age. Dr. Thomson, however, has seen the glands affected before this period, and Dr. Cullen used to mention a case, in which the disease broke out in an infant only three months old; which is uncommon. But, though glandular scrophula occurs most frequently in children, it is by no means confined to that period of life. Dr. Thomson has even found the lacteal glands affected with scrophulous inflammation in persons of very advanced age. (*Lectures on Inflammation*, *p.* 136.) Probably, however, such patients had laboured under scrophulous complaints in their earlier days; and it merits notice, that some authors, like Dr. Henning, (*P.* 110) do not regard enlargements of the mesenteric glands as an unequivocal specimen of scrophula. It is observed by Mr. Lloyd, that the susceptibility of different parts to the disease "is altered by age: thus, in children, the upper lip, eyes, glands of the neck, and those of the mesentery, are generally the parts first affected; the lungs, bones, and other parts, being subsequently attacked. It happens sometimes too in children, that small lumps form under the skin in various parts of the body, which suppurate, ulcerate, and pursue the same course with scrophulous abscesses in general." (*On Scrophula*, *p.* 5.) A species of warts, he says, also often forms about the face and neck of children of a scrophulous habit, but seldom in adults. "In more advanced age, the eyes, upper lip, and lymphatic glands are comparatively seldom affected; while the lungs, the other viscera, and the spongy parts of the bones are frequently attacked."

Scrophula is also as hereditary as any disease can be; that is to say, it is so as far as any particular kind of temperament, or constitution, can descend, more or less completely, from parents to children. Mr. White, Dr. Henning, and others have strongly censured calling the disease hereditary; but their observations only lead to these conclusions, that children, born of scrophulous parents, are not invariably affected with scrophulous diseases; and that sometimes, one child has some strumous affection, while the parents, and all the rest of the family, have no appearance of scrophulous habits. However, I still conceive that neither Mr. White, nor any other writer will maintain the opinion, that scrophula does not much more frequently afflict the children of scrophulous parents, than the offspring of persons, who have always been perfectly free from every tendency to any form of this affliction. Too numerous are the facts which occur to my own mind, to allow me to entertain the smallest doubt, that scrophula prevails in certain families. In this sense, I think the term *hereditary* perfectly accurate and allowable. But, at the same time, I beg the reader to understand, that I have no intention of questioning what seem to be irrefragable truths, viz. that the children of scrophulous parents often continue, as long as they live, entirely free from the disease; and that one child is sometimes afflicted, while its father, mother, brothers, sisters, and all the rest of its relations, have never had any tendency to strumous disorders. It should also be recollected, that the doctrine of a congenital tendency to the disease in particular families is one which interferes with some theories, which have been offered about the predisposing cause of the disease, as for instance with that of Dr. Henning, who declares that such cause is foreign to the body, and depends upon peculiarities of climate; (*On the Pathology of Scrophula, p.* 69, *&c.*) an opinion, which is incorrect only in respect to its exclusion of the influence of other circumstances. Two curious specimens of tuberculated lungs in the fœtus are preserved in Mr. Langstaff's museum, and have been adduced by Mr. Lloyd, as positive proofs of scrophula being hereditary: (*On Scrophula, p.* 23) however, I am not certain, that they will be admitted as such by all parties, as tubercles of the lungs are not constantly regarded as a scrophulous disease.

When scrophula does not actually take place at a very early period of life, it is generally stated by writers, that the particular constitutions, in which there is a disposition to the disease, are, in a certain degree, distinguishable. In the individuals, possessing the disposition in question, a peculiar softness and flaccidity of fibre are remarkable; their hair is more frequently light coloured than dark; and their eyes are said to be more often of a blue, than any other colour. The eyelashes are frequently long, and the pupils large. Their skin is generally very fine, and even handsome, both in regard to its outward texture and complexion. When pinched, it feels (as Sir A. Cooper observes) thinner than that of a healthy child, and the vessels may often be seen meandering under it. Subjects with scrophulous constitutions frequently have a thickening of the upper lip; this swelling is sometimes very considerable, and occasionally extends as far as within the nostrils. The extremities of the fingers are broad and flat, or *clubbed*, as the phrase is, just like what is seen in phthisical persons. Scrophula is also very often complicated with rachitis, or follows the latter affection; but there is as little reason for supposing rickets to arise from scrophula, as this latter from rickets. In some instances, however, the complexion is dark, and the skin coarse; but, in these subjects, at least when young, the face is generally tumid, and the look unhealthy. (*Burns on Inflammation, Vol.* 2, *p.* 232.)

In many instances, the last joints of the fingers have been observed to be enlarged, and the belly is generally larger than usual. (*Thomson, p.* 134.)

Mr. White denies that grey, or blue eyes, light hair, and a fair complexion, ought to be considered as marks of a scrophulous disposition; for the majority of children in this country have light hair and eyes while young, which become darker as they advance in life. Now, as the majority of scrophulous patients are children, and young subjects, and as most children in this country have naturally the kind of hair and eyes above described, Mr. White considers it inaccurate to lay any stress on persons affected with struma or predisposed to this disease, having such appearances. (*On the Struma or Scrofula, p.* 38, *Ed.* 3.) However, it is to be recollected, that the greater frequency of scrophula in fair people is noticed in France, where the eyes are mostly dark. Thus, Alibert, in his description of a patient disposed to the disease, takes notice of his swelled nostrils and upper lip; his florid complexion; his fair, delicate, and glossy skin; his cheeks of a lively red colour; circumscribed, however, by a pallid bloatedness of the rest of the face. His blue eyes; dilated pupils; light hair; short neck; large head and lower jaw; flabby flesh; large, protuberant belly; strong intellectual powers, &c. (*Nosol. Naturelle, p.* 442; also *Dict. des Sciences Méd. T.* 50, *p.* 281.)

Dr. Thomson expressly declares, that some of the worst cases of scrophula, which he has seen, occurred in persons, whose complexion and hair were of a very dark colour. (*Lectures, p.* 134.) And every man of experience must be aware of one remarkable fact, namely, that many negroes are afflicted in this country with scrophula in its worst forms. Does not this fact indicate, at the same time, that it is climate, which is most powerfully concerned in the production of the disease? since the African black, in his own country, is nearly exempt from scrophula. After all, however, as the disease is undoubtedly very frequent in persons of fair skin, light eyes, &c. the term *alike*, at least in the sense of *equally*, may not be altogether correct in the following inference, viz. "that persons of every variety of complexion are *alike* subject to this disease, and that it is only necessary to place them in circumstances, favourable to its development, to have it fully formed." (*Lloyd on Scrophula, p.* 7.) The truth, I believe, is, that though children of dark hair and complexion are often attacked by scrophula, those of light hair and fair complexion are still more frequently afflicted, and this even in France, where the fact cannot possibly be referred to the number of fair children exceeding that of such as naturally have dark hair and complexion.

I believe the fact is now almost generally admitted, that females are rather more subject, than males, to scrophulous disease. (See *Alibert Nosol. Naturelle, p.* 449.)

According to Mr. White, struma prevails more extensively in temperate latitudes, than in very hot or very cold climates. It is also more frequent in some parts of Europe than others; and in this country, it has been found to be most general in the counties of Suffolk and Lancashire. At all periods, it seems to have been a very common complaint in this island. From history, we learn, that it was denominated the king's evil in the time of Edward the Confessor, who is supposed to have been the first that attempted to cure it by the royal touch. From a register kept in the royal chapel, we find that Charles the Second touched 92,107 persons, in a certain number of years; and this equally bigoted and useless practice was not discontinued till a recent period, when kings were found to be, as well as their poorest subjects, totally destitute of all supernatural power.

Scrophula is not communicable from one person to another; neither can it be conveyed into the system by inoculation. The opinion also, that scrophulous nurses may infect children, seems quite destitute of foundation. (See *White*, *p*. 26, 57.)

Pinel and Alibert have purposely kept scrophulous and healthy children together in the same ward, without any of the latter receiving the complaint. Hébréard could not communicate the disease to dogs by inoculation. And G. T. Kortum, whose valuable work contains every thing known about scrophula at the period when it was written, tried in vain to impart the distemper to a child, by rubbing its neck every day with the pus discharged from scrophulous ulcers. Lepelletier, desirous of ascertaining the correctness of such experiments, has of late repeated them: he has made guinea pigs swallow scrophulous matter; and he has injected it into the veins, and applied it to wounds; but, in no instance, was there even a temporary appearance of the disease being communicated. The same author also mixed scrophulous with vaccine matter, and inoculated with it; yet, he never found the vaccine vesicle, thus produced, deviate in the least from its regular course. Lastly, Lepelletier inoculated himself with pus, discharged from scrophulous sores, as well as with the serum, collected under the cuticle of a strumous patient after the application of a blister; but he has remained free from every scrophulous ailment. (See *Dict. des Sciences Med. T.* 50, *p*. 294.) Our countryman, Mr. Goodlad, inoculated himself several times with the discharge from scrophulous sores and abscesses, and the result was, that the disease could not be thus transmitted. (*On the Diseases of the Vessels and Glands of the Absorbent System*, *p*. 113.)

The parts, which are most frequently affected by scrophula, next to the lymphatic glands, and perhaps the skin, are the spongy heads of the bones, and the joints. The form, which the disease assumes in the latter parts, is particularly described in the article *Joints*. The disorder of the spine, attended with a paralytic affection of the lower extremities, is, no doubt, very frequently of scrophulous origin. (See *Vertebræ*.) Spina bifida is a congenital disease, most frequently seen in children, whose parents are scrophulous. (*Thomson's Lectures*, *p*. 133.) The abscess, which forms in the cellular substance, between the peritoneum and psoas muscle, is often regarded as a strumous disease; and when the contents of the abscess are found to contain flakes of a curd-like matter, somewhat resembling white-of-egg, a substance peculiar to scrophulous abscesses, no one can doubt, that the complaint is connected with this constitutional affection. (See *Lumbar Abscess.*) The chronic enlargement of the thyroid gland is sometimes considered as scrophulous; but, though patients, with this affliction, very often have, at the same time, other complaints, which are unequivocally strumous, though the enlargement of the thyroid gland most frequently commences at an early period of life, like scrophulous diseases, and, though, like them it is sometimes benefited by the carbonate of soda, burnt sponge, and iodine, the opinion, I think, is rather on the decline. (See *Bronchocele*.) Scrophula also frequently makes its appearance in the form of imperfect suppurations, in various parts of the body; the contents of such abscesses being a curd-like matter, and the skin covering them, having an unhealthy red appearance, and a thickened doughy feel. The mesenteric glands are often found universally diseased, and enlarged in scrophulous subjects; and, as all nutriment has to pass through these parts, before it can arrive in the circulation, we cannot be surprised at the many ill effects which must be produced on the system, when such glands are thus diseased. However, as I have already hinted, doubts are entertained by Dr. Henning, whether enlarged mesenteric glands are decidedly scrophulous; but, if his sentiment be incorrect, I fear, he has been led to adopt it by his particular theory, which limits the origin of scrophula to the superficial absorbent glands. Scrophula frequently makes its attack on the testicle. (See *Testicle, Diseases of*.) The female breast is also subject to scrophulous tumors, and abscesses.

According to Sir A. Cooper, scrophulous persons frequently have follicles on different parts of the body, incrusted with inspissated matter. He agrees with most other writers in considering the absorbent glands and joints as the parts most frequently attacked, especially the glands of the neck and mesentery. Various other parts of the body he enumerates as liable to it, the lungs, the brain, the eyes; but, the heart, he believes, is never affected. The secreting glands, he also says, are rarely the seat of scrophula, at least, the liver and kidneys; for the breast and testicle are exceptions.

Dr. Thomson believes, that more or less local inflammation occurs in every form and stage of scrophulous diseases. He observes, that the swellings are very often from the first attended with a sensible increase of heat and redness, and that the pain, though seldom acute, is always present in a greater or less degree. Pressure on scrophulous swellings never fails to create pain; and the temperature of the skin covering them, is usually two or three degrees higher, than that of the contiguous parts. (*Lectures*, *&c. p*. 131.)

Scrophulous inflammation (as Mr. John Burns observes) is marked by a soft swelling of the affected part, which very frequently is one of the lymphatic glands. The covering, or coat of the gland, becomes slightly thickened, and its substance more porous and doughy. The swelling increases, and the doughy feel changes by degrees into that of elasticity, or fluctuation, and a firm, circumscribed, hardened margin, can be felt round the base of the tumor. The skin is slightly red. If, at this time, an incision, or puncture, be made, either no matter, or very little, is evacuated; the lips of the wound inflame and open, displaying a sloughy-looking substance within; and, betwixt this and the skin, a probe can often be introduced for some way all round. If, however, the disease should have advanced further, then there is very little elasticity in the tumor; it is quite soft, rather flaccid, and fluctuates freely; the skin becomes of a light purple colour, and small veins may be seen ramifying on its surface. Some time after these appearances, the skin becomes thinner at one particular part, and here it is also generally rendered of a darker colour. It afterwards bursts, and discharges a thin fluid, like whey, mixed with a curdy mattter, or thick white flocculi. The redness of the skin still continues; but the aperture enlarges as the tumor subsides, and thus a scrophulous ulcer is produced. The margins of this kind of sore are generally smooth, obtuse, and overlap the ulcer; they are of a purple colour, and rather hard and tumid. The surface of the sore is of a light red colour; the granulations are flabby and indistinct, and the aspect is of a peculiar kind, which, says Mr. Burns, cannot be described. The discharge is thin, slightly ropy, and copious, with curdy flakes. The pain is inconsiderable. When this ulcer has continued for some time, it either begins slowly to cicatrize, or as more frequently happens, the discharge diminishes and becomes thicker. An elevated scab is next formed, of a dirty white, or yellowish colour. This continues on the part a good while; and when it falls off, leaves the place covered with a smooth purple cicatrix. Mr. Burns adds, that the preceding description corresponds to the mild scrophula, or the *struma mansueta*, of the old writers. Sometimes, especially if a bone be diseased below the ulcer, the sore has a more fiery appearance, the surface is dark-coloured, the margins soft, elevated, and inflamed, and sometimes retorted. The discharge is watery, the pain very considerable, and the surrounding skin inflamed. This has been called the *struma maligna*. Such overacting scrophulous sores are most frequently met with over the smaller joints, particularly those of the toes. Sometimes a scrophulous abscess, after it has burst, forms a sinus; the mouth of which ulcerates, and assumes the specific scrophulous appearance, while the track of the sinus still continues to emit a discharge. Scrophulous swellings are often disposed to subside in winter, and recur on the approach of summer; but, this is not an invariable law. Glandular enlargements are very apt to become smaller, in a short time, in one place, while other glandular swellings originate with equal suddenness, somewhere in the vicinity of the former ones. Ulcers, also, very often heal, upon the appearance of the disease in other parts. (*Burn's Dissertations on Inflammation, Vol. 2*, 1800.)

The glandular swellings, which occur in syphilis, says Dr. Thomson, are of a more acute character, than those which proceed from scrophula. They arise from the absorption of a specific poison; and they do not, like those of scrophula, admit of a spontaneous cure; a belief, however, now known not to be exactly correct. (See *Venereal Disease.*) Chronic swellings of the lymphatic absorbent glands occur also in carcinoma; but these manifest little, or no disposition to suppuration; they succeed most frequently to carcinomatous indurations, or ulcers existing in the neighbourhood of the glands affected; and they are accompanied in their progress and growth by a peculiar lancinating pain. (*On Inflammation, p.* 135.)

With regard to the proximate cause of scrophula, medical men may be said to remain, even at the present day, in entire ignorance of it. After the ridiculous theory, referring scrophula to certain humours in the constitution, or chemical changes in the blood, had been exploded, the opinion gradually arose, that it was a disease of the lymphatic system; and indeed, that the absorbent glands are often visibly the seat of its attack, when no changes are distinguishable in other textures, is a fact, that admits of no dispute. I believe, at the same time, that whoever supposes scrophula to be exclusively confined to the lymphatic system, must have a very imperfect conception of what is really the case. On the contrary, I fully participate in the sentiments of Professor Thomson, already adduced upon this point, and in the belief of another modern writer, that strumous complaints " are not to be considered as dependent on disease of any particular system, as the lymphatic." (*Lloyd, p.* 10.) Such writers as have fixed upon the absorbent vessels, as the particular seat of scrophula, can throw no useful light upon its origin, by following up the theory, whether they imagine the cause to be obstruction of the vessels and glands; or take up the wild speculation of Cabani, that in scrophula, the mouths of the lymphatics are in a state of increased activity, while the vessels themselves are in a state of atony; or the doctrine of Soemmerring, that scrophula depends upon a passive relaxation and dilatation of the absorbents; or the hypothesis of Girtanner, that these vessels are in a state of increased irritability. The idea of obstruction being the cause, has of late years been much on the decline; and that the convolutions of lymphatic vessels, forming the glands, are quite pervious, and may readily be injected, even when diseased, is a fact, first demonstrated by Soemmerring, which must weigh heavily against this opinion. Sir A. Cooper describes the disease as proceeding from congenital debility, which attends its whole course, and imparts to it a peculiar character, rendering the various processes of inflammation in it slow and imperfect. (*Lancet, Vol.* 4, *p.* 65.) Of the exciting causes, very little is also known. Mr. John Hunter remarks, that " in this country, the tendency to scrophula arises from the climate, which is in many a predisposing cause, and only requires some derangement to become an immediate cause, and produce the whole disease." (*On the Venereal Disease, p.* 26.) The disease is remarked to be most common in females; in cold, damp, marshy countries, and in all places, near high mountains, where the temperature is subject to great vicissitude. " Nous voyons presque toujours, (says Alibert) que les tumeurs et les ulcères se rouvrent au printemps pour se fermer ensuite vers la canicule." (*Nosol. Naturelle, p.* 449.)

In the work quoted the last but one, Mr. Hunter takes notice of slight fevers, colds, smallpox, and measles, exciting scrophulous diseases. He observes, that in particular countries, and in young people, there will sometimes be a predisposition to scrophula; and that, in such subjects, buboes will more readily become scrophulous. (*P.* 37.) In short, it was one of Mr. Hunter's opinions, that the venereal disease is capable of calling into action such susceptibilities as are remarkably strong, and peculiar to certain constitutions and countries; and that, as scrophula is predominant in this country, some effects of other diseases may partake of a scrophulous nature. (*P.* 96.) Mr. Hunter, speaking of venereal buboes, mentions his having long suspected a mixed case, and adds, "I am now certain that such exists. I have seen cases where the venereal matter, like a cold, or fever, has only irritated the glands to disease, producing in them scrophula, to which they were predisposed. In such cases, the swellings commonly arise slowly, give but little pain, and seem to be rather hastened in their progress, if mercury is given to destroy the venereal disposition. Some come to suppuration while under this resolving course; and others, which probably had a venereal taint at first, become so indolent that mercury has no effect upon them; and, in the end, they get well of themselves, or by other means." (*P.* 269.) For such buboes, Mr. Hunter used to recommend sea-bathing; and, in case of suppuration, poultices made of sea-water.

Sir A. Cooper observes, that the predisposing cause of scrophula is congenital, or original fault of constitution. The exciting causes, he says, are whatever tends to produce or increase debility, such as fever from diseases of a specific kind, like measles, scarlet-fever, and small-pox. He notices the greater frequency on this account of scrophulous cases some years ago, when the advantages of vaccination were not known; and the importance of this practice to society, if it had no other recommendation. (See *Lancet, Vol.* 4, *p.* 70.)

In the words of a well-informed Professor, scrophula readily forms an alliance with almost every morbid affection, occurring either from external injury, or from internal disease: it modifies the appearance of other diseases, and seems to convert them gradually into its own nature. Indeed, there are few of the local inflammatory affections, which occur in this country, in which the symptoms and effects of these affections, and the operation of the food and remedies employed for their cure, are not more or less modified by the degree of scrophulous diathesis, which prevails in the constitution of those who are affected by them. The scrophulous diathesis, wherever it exists, usually gives more or less of a chronic character to local inflammatory affections. (*Thomson's Lectures, p.* 131.)

It has been the fashion of late years to ascribe the origin of a vast number of diseases to disorder of the digestive organs, little trouble being generally taken to consider, with any impartiality, whether the derangement of those organs may not be rather the common effect, than the common cause, of so many various diseases. Numerous circumstances tend to perpetuate the delusion, into which young practitioners are falling upon this topic. They see various diseases, attended with dyspepsia, flatulence, loss of appetite, costiveness, and a torpid state of the bowels; they observe that such diseases and the latter complaints of the alimentary canal, generally diminish together; that, when the functions of the stomach and bowels are deranged, any other diseases, which the patient may be labouring under, either grow worse, or are retarded in their amendment; and, lastly, the treatment, to which the theory leads, improves the health, by rectifying the state of the alimentary canal, and the sore, tumor, or other complaint, in the end, with the additional aid of time, nature, and other favourable circumstances, gets well. But, however simple, safe, and beneficial the practice may be, and plain as the facts are, which lead to it, there is no proof, that the other disease was truly a consequence of the disorder of the digestive organs. The latter symptom, I believe, is very frequently an effect mistaken for a cause, and perhaps, always so, in relation to scrophula. Besides, if it were to be assumed, (as indeed it actually is,) that, in scrophula "there *always* is more or less disorder of the digestive organs, and *primarily of no other important function*," I do not see that we advance one step nearer the truth; because, as the same cause is generally assigned, by gentlemen attached to this theory, for a vast number of other cases, we still remain in the dark, as to the circumstances, which make so many complaints of different kinds spring from one and the same cause. These circumstances, though buried in silence, are still the mystery—still the secret, which is desired; and, if it be answered, that the effect will only happen in particular constitutions, then we are brought back at once to the point, from which we first started, viz. that scrophula is a disease depending upon some unknown peculiarity of constitution, congenital or acquired, and capable of being excited into action by various causes, as climate, mode of living, &c. However, lest I may not have attached sufficient importance to the doctrine of gastric disorder being the cause of scrophula, I feel pleasure in referring for the arguments in its support, to the writings of Mr. Abernethy, Dr. Carmichael, and Mr. Lloyd, whose sentiments appear highly commendable, asfar as they tend to teach surgeons, rather to place confidence in means calculated to improve the health in general, as the most likely mode of benefiting scrophulous patients, than to encourage foolish dreams about new specifics for the distemper. Thus far, I can follow these gentlemen safely; but no farther, except as a sceptic. However, perhaps, none of the believers in the effect of disorder of the digestive organs mean to say, that such disorder is any thing more than one of the many exciting causes of scrophula; and with this qualification, their theory may, or may not be correct. It is the doctrine of Alibert, and indeed of nearly all writers: "ce sont les vices de la puissance digestive, qui preparent de loin les scrophules. Rien n'influe davantage sur leur développement que la mauvaise qualité des alimens, &c." (*Nosol. Naturelle, p.* 449.)—"Ajoutez a cet cause le sejour dans les habitations malsaines." But, every explanation, even of exciting causes, remains unsatisfactory, as long as we find children living in the same air, under the same roof, and feeding and sleeping together, and clothed also exactly alike, yet, only one or two of them become scrophulous, while all the rest continue perfectly free from the disease. Here, then, we are again compelled to return to predisposition, constitution, diathesis, and a congenital tendency to the complaint, as a solution of the difficulty. In short, then, respecting the etiology of scrophula, little is known, except that certain constitutions probably have a congenital disposition to the disease; that such disposition may be increased, or diminished, by the operation of climate, mode of life, age, &c.; and that irritations of a thousand kinds may excite the disease into action, when the system is predisposed to it, by inexplicable causes. That climate has great influence, cannot be doubted, when it is reflected, that the inhabitants of certain countries, in which the temperature is invariably warm, never suffer from scrophula. It is noticed by Sir A. Cooper, that the occurrence of scrophula is much promoted by climates, in which the change from cold to heat, and from heat to moisture, is particularly frequent, as is the case in this island. But though cold and moist climates have this effect, he remarks, that persons living in the extremes of heat, or cold, are not affected. The disease, he says, is even arrested by cold and heat, uncombined with a damp atmosphere. On the other hand, numerous children who come from the East or West Indies to this country, fall a prey to scrophula. He has also known some individuals from the South-Sea Islands die here of the same disease. (*Lancet*, *Vol.* 4, p. 67-68.) The fact of the great influence of climate on scrophula is equally proved by the effect of the weather and seasons, for, it is a common and a true remark, that in a mild dry atmosphere, and in summer-time, the health of scrophulous persons generally improves, and whatever local complaints they may have get better, while on the contrary their disorder in winter is more difficult of relief, and either continues stationary, or becomes worse again. Hence, as Sir A. Cooper has justly remarked, the exact value of any proposed remedy for scrophula cannot be estimated, without reference to the time of year when it is tried. (*Vol. cit. p.* 68.) There can also be no doubt that, with age, the disposition to scrophula diminishes; for, children, much afflicted while young, frequently get quite well when they approach the adult state; and, if a person remain perfectly free from every mark of a scrophulous constitution, till the age of twenty-five, he may be considered as nearly out of all danger of the disease.

TREATMENT OF SCROPHULA.

" For the cure of scrophula, (says Cullen,) we have not yet learned any practice that is certainly, or even generally successful. The remedy which seems to be the most successful, and which our practitioners especially trust to, or employ, is the use of mineral waters. But, he adds, in very many instances of the use of these waters, I have not been well satisfied, that they had shortened the duration of the disease more than had often happened when no such remedy had been employed. With regard to the choice of the mineral waters, most fit for the purpose, I cannot, with any confidence, give an opinion. Almost all kinds of mineral waters, whether chalybeate, sulphureous, or saline, have been employed for the cure of scrophula, and, seemingly, with equal success and reputation; a circumstance, which leads me to think, that, if they are ever successful, it is the elementary water that is the chief part of the remedy. Of late sea-water has been especially recommended, and employed; but, after numerous trials, I cannot yet discover its superior efficacy." (*First Lines of Physic*, *Vol.* 4.) On the subject of mineral waters, Dr. Thomson very properly remarks, that they are now usually employed as purgative and tonic remedies, and not as specifics. In employing them it is often difficult to distinguish between the effects, which they in reality produce, and those which are to be attributed to the slow operation of time, the season of the year, change of situation, alteration in the mode of life, or exercise in the open air. (*Lectures on Inflammation*, *&c. p.* 195.)

In scrophulous diseases, Dr. Fordyce had a high opinion of bark; and he endeavoured to prove, that, in cases of tumefied glands, attended with a feeble habit, and a weak circulation, it is a most efficacious medicine, and acts as a resolvent and discutient. He also brings forward a case, in support of bark being a means of cure for ophthalmia strumosa. (See *Med. Obs. and Imp. Vol.* 1, *p.* 184.) Dr. Fothergill, in the same work, p. 303, writes in favour of the good effects of bark in similar cases; small doses of calomel being sometimes given with it.

Dr. Cullen considered the efficacy of bark in scrophula very dubious and trivial. (*First Lines*, *&c. Vol.* 4.)

According to Mr. Burns, bark has been frequently found useful in the cure of scrophulous inflammation, but more often of ulceration, than tumefaction of the glands. But, says he, it does not appear to possess, by any means, that certain power of curing scrophulous affections, which is attributed to it by Dr. Fothergill and several other authors. He observes, that we are not to suppose it will infallibly cure scrophulous inflammation, or ulceration of parts, which, even when affected with simple inflammation, are very difficult of cure. If it be difficult to cure a simple inflammation, or ulceration, of a tendon, cartilage, or bone, we must not be disappointed if even a specific remedy for scrophula (were such ever discovered) should prove ineffectual in procuring a speedy restoration to health. Mr. Burns contends, that bark is often ineffectual, because improperly administered. Given in small quantities, once or twice a day, it may prove a stomachic, and increase, like other tonic bitters, the power of the stomach, or the functions dependent on it; but, in order to obtain the benefits of the specific action of bark, he maintains, that it should be given in large quantities, for several weeks, with a good diet, air, and proper exercise. (*On Inflammation*, *Vol.* 2, *p.* 371.) Dr. Thomson does not believe, that bark, or iron, has any specific virtue in curing scrophula; but, he admits, that either of these medicines may sometimes prove useful in amending the tone of the digestive organs, when given after, or occasionally along with, a course of purgative mineral waters. (*Lectures*, *p.* 197.) When bark is prescribed, the sulphate of quinine is one of the best formulæ, as least likely to disagree with the stomach.

As far as I can judge, Mr. White has with much reason recommended paying attention to such circumstances as may have effect in preventing the disease, viz. air, cleanliness, exercise, and diet. He mentions cold bathing among the preventives of struma, and speaks of sea-bathing as being the best. He advises attention also to be paid to the manner of clothing children, keeping them more covered in winter, than summer. He thought, a great deal of sleep prejudicial; but this seems only conjecture.

In noticing the treatment of the disease, Mr. White states, that "the general idea of the struma is, that it is a disease of debility; (a doctrine also inculcated by Sir A. Cooper) and therefore, the great object is, to invigorate the habit by every possible means; the chief of which are tonic medicines, and sea-bathing. Some are of opinion, that, in the case of young patients, this should be continued, during the summer months, every year, to the age of fourteen or sixteen. Many recommend it, not only in the summer, but throughout the year; whilst others are for administering alteratives, principally the alkaline salts, with or without antimonials, and the different tonics, during the winter; and the sea-water, and sea-bathing, or cold-bathing, during the summer, for a continuance of two or three years from the commencement of the disease; with this general observation, that they will outgrow the complaint." Mr. White mentions, as the chief external means, fomentations and poultices of sea-water. With respect to regimen, some recommend a milk and vegetable diet; others animal food and fermented liquors. Sir A. Cooper, in particular, who regards the disease as connected with congenital debility, strongly recommends a nutritious diet of animal food, in preference to one of vegetables. (*Lancet*, p. 71.)

Mr. White maintains, that the preceding plans of treatment are not, in general, efficacious, though, in some instances, they may prove useful. "In early affections of the lymphatic glands, (says this gentleman,) and from the want of a pure air, and proper exercise, where children are delicate and irritable, a change of situation to the sea-side, together with bathing, when they have acquired some strength, must be exceedingly proper; and, in gross plethoric subjects, who have diseased lymphatics, from improper feeding, and want of necessary exercise, a journey to the sea-coast may be very useful, particularly if the salt-water is drank often, and in a sufficient quantity to become purgative. This, with the novelty of their situation, which may naturally produce an increase of exercise, might answer every expectation; but, these are the kind of cases that, with a very little attention, are easily cured." (*White on the Struma, Edit.* 3, *p.* 104.)

The conclusion, to which Mr. White's remarks upon this part of the subject tend, is, that sea-bathing only deserves praise, as a preventive, and in the early stages of the disease. He particularly condemns cold-bathing, for poor, weakly, debilitated children, whose thin visages, enlarged bellies, and frequent tickling cough, sufficiently indicate diseased viscera; such do not recover their natural warmth, after cold-bathing, for hours, and their subsequent head-ache, livid lips, and pale countenance, are sufficient marks of its impropriety. (*P.* 107.)

Dr. Cullen entertained a very favourable opinion of cold-bathing, since he affirms, that he had seen scrophulous diseases more benefited by it, than any other remedy. (*First Lines of Physic*, *Vol.* 4.)

"Cold-bathing, especially cold sea-bathing, (says Mr. Russell) is a remedy universally employed in scrophula, and I believe with great advantage in many cases; for it not only appears to improve the patient's general health and strength, but likewise to promote the detumescence of enlarged glands, and the resolution of indolent swellings in the joints, even after they have attained a considerable size, and have existed for a great length of time. But, in order that cold-bathing may be practised with safety and advantage, the constitution must have vigour to sustain the shock of immersion without inconvenience. If the immersion be succeeded by a general glow over the surface of the body, and the patient feels cheerful, and has a keen appetite, we may conclude that the cold bath agrees with him; but if he shivers on coming out of the water, continues chill, and becomes drowsy, we may be assured that the practice of cold-bathing does no good, and had better be omitted.

"In estimating the comparative merit of cold-bathing and warm-bathing, in the cure of scrophulous complaints, my own experience, together with the result of different conversations on the subject with some of the most judicious practitioners of my acquaintance, would lead me to bestow much more commendation on the effects of warm-bathing. I should not even be inclined to circumscribe the practice to cases of emaciation and debility, since from observation, I am fully satisfied with regard to the beneficial effects of the warm-bath to patients of plethoric constitutions, who were much affected with swelled scrophulous glands. Several of those instances occurred in young women, about the prime of life, who were in all respects healthy and vigorous, abating the swellings of the glands, and those symptoms of distress which were connected with fulness of blood.

"The sensation of the warm-bath is exceedingly grateful to most patients, and the practice is universally safe. It may be employed at all seasons of the year, and in all weather, without danger or inconvenience; the risk of suffering from exposure to cold, immediately after immersion in the warm-bath, having been much magnified by prejudice. There is not even any good reason to believe in the existence of such a risk. The precautions, however, which are employed to avert it, are perfectly innocent; and provided they do not impose any unnecessary and incommoding restraints upon the practice, may be encouraged, so far as to relieve the patient's mind from uneasiness and groundless apprehensions.

"It requires many weeks, and sometimes several months, to ascertain the full effects of warm-bathing in relieving scrophulous complaints; but, as the practice is not attended with any inconvenience, nor followed by any bad consequence, there can be no reason to intermit the course, till the trial is completely satisfactory; and I am convinced, that the practice of warm-bathing, in cases of scrophula, will be more universally adopted, after the knowledge of its beneficial effects is more widely diffused." (See *Russell's Treatise on Scrophula.*)

Nothing can be more satisfactory (says Professor Thomson,) than the evidence, which is on record of the efficacy of the muriate of soda, as it exists in sea-water. In reading this, one only wonders how so efficacious a remedy should ever have fallen into neglect. (*P.* 196.) In a subsequent passage, however, the same gentleman evinces only a limited confidence in this means of relief. "Local sea-bathing, both cold and warm, has often appeared to be of use in procuring the resolution of scrophulous swellings. The temperature of the bath must always be varied according to circumstances, according to the season of the year, the strength and habits of the patient, and the particular effect which the bath seems to produce. It is at all times difficult to distinguish between the effects immediately arising from the application of salt water to the body, and those which arise from the increased warmth of temperature in the bathing seasons of the year; from the exercise, which patients going to sea-bathing generally take in the open air; from the change of situation and amusements; and, among the poorer classes, from the more nourishing diet and exemption from labour, in which they are usually permitted to indulge, during their residing at sea-bathing quarters. It is not improbable, that those living on the sea-coast, who become affected with scrophula, would, for similar reasons, derive equal benefit by going from the sea-coast to reside for a time in the interior of the country." (See *Thomson's Lectures, &c. p.* 203—204.) A still later writer declares his belief, that cold sea bathing has no *specific power* over the disease. (*Lloyd on Scrophula, p.* 43.) Yet the plain surgeon, in search of practical truths, will not care whether any plan has a *specific power* or not over a complaint, if that disorder is sometimes relieved by it. And, that this is the fact is admitted by Mr. Lloyd, when he says, "cold sea-bathing, however, is certainly useful when judiciously applied, &c. &c." (*P.* 44.)

With regard to electricity, Mr. White thinks it useful, when from length of time the enlarged glands have acquired a degree of hardness and insensibility.

Mr. White, after enjoining attention to air, exercise, and diet, as promotive of a recovery, as well as a preventive of the disease, proceeds to explain his own practice. The first external symptoms, such as swellings of the lips, side of the face, and of glands under the chin, and round the neck; also other symptoms, usually considered as strumous, viz. roughness of the skin, eruptions on the back of the hand, and different parts of the body, redness, and swelling of the eyelids, and eyes; are accompanied, according to Mr. White's conceptions, with an inflammatory diathesis, though seldom such as to require bleeding. Calomel is the medicine which this gentleman recommends for the removal of the foregoing complaints. It is not to be given in such quantities, as to render it a powerful evacuant, either by the intestines, or, any other way; but, in small doses, at bed-time. Thus, says Mr. White, "it remains longer in the intestinal canal, a greater quantity is taken into the habit, and the patient is less susceptible of cold, than when taken in the day-time. The first, and perhaps, the second dose may prove purgative, which is, in general, a salutary effect; but, afterwards, the same quantity will seldom do more, than is sufficient to keep the body open; and should it fail of answering that purpose, I have usually recommended some gentle purgative, every third or fourth morning, according to circumstances. If there should be a prevailing acidity, a few grains of the sal sodæ, magnesia, or some testaceous powder, may be added to the medicine. By this simple method (continues Mr. White) most of the symptoms before-mentioned will, in a short time, disappear; but if the tumors should continue hard, and retain their figure, without dividing into smaller ones, we may derive some benefit from external applications, particularly the steam of warm water. I have used a variety of medicinal herbs with success; but am inclined to believe, that the advantage was particularly derived from warm water, &c. At other times, I have stimulated the part affected with electricity, insulating the patient, and drawing sparks from the tumor, until a slight degree of inflammation was excited. After the application of the steam, or the use of the electrical machine, I have sometimes rubbed a little of the unguentum mercuriale into the tumor, and neighbouring parts, or applied the emplastrum saponaceum, or mercuriale cum ammoniaco, over the swelling, or a liniment with camphor, ol. olivarum, and sp. terebinth." Mr. White adds, that in such cases, if the tumors should suppurate, and burst, the parts will, in most instances, heal without much trouble. For eruptions on the head, he recommends applying the ung. saturn. album camphoratum, or the cerat. alb. cum hydrarg. præcip. alb. For the roughness of the skin, which is generally followed by eruptions, he also advises the liquor plumbi acetatis dilutus, aqua calcis, solutions of sal. tartar. or of the hydrarg. mur. as outward applications. "This last (says Mr. White) will seldom fail to check the progress of the complaint, and dry the sores; and in the quantity of ten or twelve grains to a quart of warm water, the use of it will not be productive of any pain. If the eruption should ulcerate, and require any unctuous application, to prevent the adhesion of the linen, the ointment before-mentioned may be applied; the best remedy will be warm-bathing, and when practicable, the sea-water claims a preference." (*P.* 114.) The author next mentions his having occasionally recommended the vinum antimoniale, tartarum emeticum, decoctum Lusitanicum, decoctum lignorum, or sarsaparillæ; and that he sometimes found advantage derived from artificial drains. We need not detail this gentleman's mode of treating affections of the eyelids, as notice is taken of scrophulous diseases of the eye and eyelids, in the articles *Ophthalmy* and *Psorophthalmy.*

For the cure of indurations in the breast, remaining after mammary abscesses, Mr. White speaks very highly of the effects of the steam of warm-water; and cautions us against indiscriminately employing calomel, which will often affect the mother little, but the child violently. Mr. White mentions his employing a small tin machine, large enough to hold a pint and a half, or two pints of boiling water. From the top proceeded a narrow tube, ten or twelve inches long, through which the steam passed. Near its end, which was moveable and curved, was a joint, for the greater convenience of directing the steam to the diseased parts. The water was easily kept boiling by means of a lamp under the machine. Mr. White says, that the steam should be employed twice, or thrice a day, and a piece of flannel, or skin, afterwards applied. The body should also be kept open. In obstinate, neglected cases, mercurial preparations, according to Mr. White, must likewise be given, and, if they affect the child much, suckling should be suspended. (*P.* 117, 118.) For chronic swellings of the breast, suspected to be scrophulous, I would here particularly recommend a trial of iodine, some surgeons of my acquaintance having found it in such cases a most efficacious medicine. (See *Iodine.*)

When the glands of the neck, or other parts of the body, tend to a state of suppuration, it is very slowly, the skin appearing uniformly thin, and of a deep red colour, and the tumor seeming flaccid. In such cases, Mr. White recommends the use of the lancet or caustic; for if no artificial opening is made, it will be a long time before the skin gives way; and, when it does, the aperture will not only be very small, but often unfavourable in its situation. Mr. White adds, that the contents will often be more like mucus, than pus, or like a mixture of both; and the discharge will continue for a great length of time, if no remedy is applied. He found a solution of gum myrrhæ in aqua calcis, used as a lotion, and the ceratum saponaceum, or some similar outward application, the best method of treating this symptom.

We need not describe Mr. White's practice in the treatment of scrophulous joints, as the subject is fully considered in the article *Joints.* It appears, however, that he confirms the efficacy of stimulating applications, and pressure with bandages, when the fingers and toes are affected with strumous disease. (*P.* 143.) What may be done in these cases by the external and internal use of iodine, remains to be proved by further experience; but, it is certainly a medicine, the power of which in scrophula merits the fullest investigation.

Whoever compares the practice of Mr. White in administering colomel, occasional purgatives, the decoctum Lusitanicum, sarsaparilla, &c. with the blue-pill, sarsaparilla, and laxative treatment of the present day, will perceive no very material difference between them, especially when the stress, which Mr. White laid upon attention to diet, clothing, &c. is taken into the account. Mr. Lloyd, who has detailed Mr. Abernethy's practice in scrophula, lays it down as an axiom, that "the disease is only to be cured by avoiding all sources of irritation, and restoring the natural and healthy functions of the digestive organs." (*P.* 48.) By sources of irritation, Mr. Lloyd means exciting causes; the advice is therefore excellent, as far as it can be followed, or such causes are decidedly known. The restoration of the functions of the digestive organs is also a thing worth aiming at, and the only difference in my views from those of Mr. Lloyd is, that, as I look upon the disorder of the digestive organs to be in general only a complication, or effect of the scrophulous disease, ulcer, abscess, diseased joint, &c. and not the exciting cause, the treatment, when beneficial, becoming so only on the principle of improving the general health, by the removal or diminution of one of the most hurtful consequences of the original disease. It is hardly necessary to inform the profession, that the treatment described by Mr. Lloyd, in addition to the usual advice about diet, clothing, the avoidance of damp and cold, and the utility of good air, exercise, &c. consists in giving the patient five grains of the pil. hydrarg. every night, and half a pint of decoct. sarsap c. twice a day. And, if at a certain hour of the day, there has been no motion, recourse is had to opening medicines. This plan is pursued, till the bowels become regular; and then, with a view of preventing a relapse of the bowels into their former state, Mr. Lloyd, continues the exhibition of alterative doses of mercury for an indefinite time, the preference being given to the compound calomel pill, in doses of five grains every night. In children, the practice is exactly like that of Mr. White, viz. small doses of colomel with purgatives. When acidity prevails in the stomach, small doses of soda are commended; and when the stomach is weak, with loss of appetite, cinchona, steel, and mineral acids. A full diet, with porter and wine, is disapproved of, and, as already stated, not much confidence is placed in sea-bathing. (*Lloyd on Scrophula, p.* 38.)

Crawford, Pinel, and others tried the muriated barytes in scrophulous cases. (*Med. Communications, Vol.* 2, *Nosogr. Philosophique, Vol.* 2, *p.* 238.) It has the recommendation of the celebrated Hufeland. Mr. Burns says, that the muriate of barytes has no effect on diseased glands; but, that it is occasionally serviceable in scrophulous ulceration, though, he adds, that it deserves little dependence. (*Dissert. on Inflam. Vol.* 2, *p.* 372.) This gentleman recommends the following formula: ℞. Terræ Ponder. Salit. Chryst. gr. x. Aq. Font. Aq. Cassiæ, utriusque, ℥iij. Syrup. Aurent. ℥ij. Half an ounce may be given at first, twice or three times a day, and gradually increased to such quantity, as the stomach can bear without sickness. At present, few practitioners have any faith in the antiscrophulous virtues of the muriate of barytes; and, as Dr. Thomson remarks, it has had a much shorter-lived reputation, than sea-water, or its successor the muriate of lime. (See *Lectures on Inflammation, p.* 196.)

Fourcroy proposed the muriate of lime; but, its efficacy is very doubtful, and inconsiderable. "Professor Thomson (says Mr. Russell) has favoured me with the following observations on the effects of muriate of lime. He employed muriate of lime in various cases of scrophula, without having derived benefit from it in a single instance. Some patients, indeed, he admits, got well, while under a course of muriate of lime; but then he had no reason to ascribe the cure to the effect of the medicine. In other cases, on the contrary, the muriate of lime produced severe sickness and oppression at the stomach, and the patients got daily worse, till the muriate of lime was intermitted, and other medicines employed. The relief, experienced from the intermission of the muriate of lime, left no doubt, with regard to the injurious effects which the use of it had produced; and from extensive experience and accurate observation on the subject, Professor Thomson is satisfied, that muriate of lime is attended with prejudicial effects in many cases of scrophula." (See *Russell's Treatise on Scrophula.*) Since the publication of the earlier editions of this Dictionary, I have seen the muriate of lime given in several cases of scrophula; but, without any beneficial effect on the disease. How long the muriate of lime will be permitted to enjoy its present fame, Dr. Thomson will not venture to say; but from what he has seen of its use, he imagines, its reputation will only last, till some other new remedy is proposed by those, who are still sanguine in their hopes of discovering a specific for scrophula. (*Lectures, &c. p.* 196.) Iron, given either alone, or joined with the fixed, or volatile alkali, also deserves very little confidence. Burnt sponge, millipedes, and sulphate of potassa, have all been extensively tried; the first of these is, in my opinion, sometimes useful in diminishing enlarged scrophulous glands; and that it has this effect on bronchoceles, is indisputable.

The Marischal de Rougeres employed a remedy, composed of iron filings, muriate of ammonia, subcarbonate of potassa, &c. (*Journ. de Med. tom.* 40, *p.* 219.)

Several narcotics have been tried, such as opium, hyoscyamus, the solanum dulcamara, &c.; but, though their virtues against scrophula have been sometimes cried up very highly, the moderns have lost all faith in them. The attention of the public to the effects of cicuta, in cases of cancer and scrophula, was first particularly excited by the accounts of its virtues published by Baron Stork.

Fothergill also praises cicuta, and, perhaps it is as good an internal medicine as can be tried; but, it is far from being generally efficacious. It is highly deserving of recommendation for irritable scrophulous ulcers. There is now not the least doubt, however, that the statements of Baron Stork were greatly exaggerated. He considered cicuta indicated, whenever obstructions and tumors existed; and, under this treatment, he says that he found the swellings melt away like ice. What is extraordinary, every sort of tumor yielded to cicuta. But, (as Dr. Thomson judiciously remarks) universal success is always one of the most suspicious circumstances which can be mentioned in the history of the effects produced by any new remedy. (*Lectures, &c. p.* 199.) Dr. Cullen frequently employed hemlock, and sometimes found it useful in discussing obstinate swellings; but, he says, it also frequently disappointed him, and he never saw it dispose scrophulous ulcers to heal.

With regard to mercury, we have already noticed, that calomel was much employed by Mr. White. Some have exhibited the sublimate, others the acetate of mercury. All these preparations have been at times conjoined with cicuta, antimony, &c. Calomel is, perhaps, the best mercurial preparation in scrophulous cases; but, mercury, given internally with any view of exciting a salivation, is justly deemed hurtful by all the best practitioners. As an alterative, and an occasional purgative, it is undoubtedly a good medicine for strumous patients. Mercury was much disapproved of by the celebrated Cullen, as a medicine for scrophula. As a distinguished Professor observes: "From the great apparent similarity of the symptoms, progress, and seats of scrophula, to those of syphilis, and from the well known effects of mercury in curing syphilis, it need not seem strange, that medical men should have been a little obstinate in their attempts to obtain benefit from the use of mercury in scrophula. These expectations are in general abandoned, and mercury is now given for the cure of scrophula as a purgative only. A long continued, or improperly administered course of this medicine, has often been known to aggravate all the symptoms of scrophula; and, in many instances, to excite these symptoms in persons, in whom they did not previously exist." (See *Thomson's Lectures on Inflammation, p.* 194, 195.)

Mr. Burns thinks the nitrous acid has some effect in promoting the suppuration of scrophulous glands, and tumors, and disposing ulcers to heal. He says, two or three drams may be given every day, for a fortnight; but, if in this time, it should do no good, its employment ought to be discontinued. The mineral acids, diluted with water, (says Professor Thomson,) are often used with views similar to those, which guide us in the employment of tonic remedies. Their medicinal powers appear to be nearly the same; but, the nitric acid has of late been preferred, particularly in the scrophulous affections, which are sometimes induced by the action of mercury. (*Lectures, &c. p.* 197.)

The pills containing carbonate of soda, (see *Pilulæ*) and the different soda waters, sold at the shops, have repute, for their good effects on scrophulous constitutions, and diseases. A spirituous infusion of gentian, into six ounces of which are put thirty-six grains of the carbonate of soda, or the same quantity of the carbonate of ammonia, is a medicine highly spoken of by Richerand for scrophulous cases. (*Nosogr. Chir. T.* 1, *p.* 184. *Ed.* 4.)

Potassa, in large doses, with mercurial frictions, is the practice lately extolled by Mr. Farr; but it appears to me, that mercury and potassa had been repeatedly tried, long before this author delivered his sentiments to the public; and that such practice cannot be justly called a method for the eradication of this disease. (See *Farr on Scrophula*, 8*vo. Lond.* 1820.)

According to Mr. Burns, eight or ten drops of hydrosulphuret of ammonia, given thrice a day, are useful, in irritable strumous ulcers. The breathing of oxygen gas has been proposed; but, of this plan I know nothing from experience, and as it now makes less noise in the world than formerly, I conclude that either its usefulness has been exaggerated, or the difficulty of the practice is too great to allow of its extensive adoption.

The sentiments of Dr. Cullen are decidedly against antimony. As a modern writer observes, no great dependence seems ever to have been placed in the use of diaphoretic medicines for the cure of scrophula. The different preparations of antimony, indeed, have been occasionally administered; but, chiefly in cutaneous affections, supposed to be of a scrophulous nature. Guaiacum, sarsaparilla, sassafras, and mezereon, singly, and in combination, have all been supposed to be useful in the cure of scrophula; but they are now seldom given with this view, except in cases of scrophula combined with syphilis, or excited by the too free and injudicious use of mercury. (*Thomson's Lectures, &c. p.* 199.)

With respect to Alibert's practice, amongst the vegetable bitters, he prefers the hop, burdock, gentian, and bark. He seems to have no confidence in specifics, like hemlock, belladonna, aconitum, &c. Neither does he express himself favourably of alkaline medicines, or the muriates of ammonia, and barytes. However, he praises the good effects of steel medicines on enlarged glands. He affirms, that he has seen most good derived from external means; aromatic fumigations in an apparatus prepared by the chemist Darcet. What he calls scrophulous eruptions, he covers with a strong solution of the nitrate of silver. Swelled glands he rubs with the antimonial ointment. He commends also change of air, and the avoidance of low damp places; and speaks favourably of sea-bathing, sea-voyages, sulphureous mineral waters, and particularly of the good effects derived from the solar warmth. (See *Nosol. Nat. p.* 449.)

Sir A. Cooper, in his account of the treatment of scrophula, dwells more upon the good effects of air, exercise, and nourishment, than upon the virtues of physic. He asserts, that there is no specific for the disease. Medicines, occasionally given for the improvement of the digestive organs, and regulation of the secretions, he admits, are useful; but attention to air, exercise, and diet, he considers far more important. Sometimes, he prescribes once a week, or every ten days, two grains of calomel, and eight of rhubarb, in order to restore the visceral secretions. A good tonic medicine, for a short time, he observes, is two grains of rhubarb and from three to five of the carbonate of iron. Another, he says, is two of rhubarb, six of dried subcarbonate of soda, and ten of columba, taken mixed with sugar. A few grains of hydrargyrus cum creta, taken in the infusion of camomile flowers at bed-time; or the oxymurias hydrargyri, in the proportion of a grain to two ounces of tincture of bark, of which a tea-spoonful may be taken twice a day in a glass of camomile infusion; or, when costiveness prevails, the tincture of rhubarb may be substituted for that of bark. The liquor potassæ is also enumerated. But the medicines he prefers, are steel, with rhubarb and calomel, or the sub-carbonate of soda, with rhubarb and columba. (*Lancet, Vol.* 4, *p.* 94.)

As tonics of the highest merit, the sulphate of quinine, and the preparations of iodine, should also be remembered.

The local treatment, preferred by Mr. White, has been already described. I have only a few words to add, concerning this part of the subject. Dr. Cullen states, that, in his practice, he had very little success in discussing incipient scrophulous tumors by topical applications; and that a solution of the saccharum saturni, though sometimes useful, more frequently failed. Dr. Cullen found the aqua ammoniæ acet. not more successful. "Fomentations of every kind (says he) have been frequently found to do harm; and poultices seem only to hurry on a suppuration. I am doubtful, if this last be ever practised with advantage; for scrophulous tumors sometimes spontaneously disappear, but never after any degree of inflammation has come upon them; and, therefore, poultices, which commonly induce inflammation, prevent that discussion of tumors, which might otherwise have happened." Even when scrophulous tumors have advanced towards suppuration, Dr. Cullen thought, that hastening the spontaneous opening, or making one with a lancet, was hurtful.

With respect to ulcers, Dr. Cullen remarks, that escharotic preparations, of either mercury, or copper, have been sometimes useful in bringing on a proper suppuration, and thereby disposing the ulcers to heal; but they have seldom succeeded, and more commonly, they have caused the ulcer to spread more. The escharotic, from which Cullen saw most benefit result, is burnt alum, mixed with some mild ointment. But this celebrated writer gives the preference to keeping the sores continually covered with linen wet with cold water in the day-time, and some ointment, or plaster at night. Cullen says, that he usually found sea-water too irritating, and no mineral water better than common water. (*First Lines of the Pract. of Physic, Vol.* 4.)

Formerly, the extirpation of scrophulous tumors was advised; but this method is now considered as being, for the most part, injudicious, and unnecessary, with the exception of diseased joints, and a few other parts, which frequently require being amputated, for the sake of saving the patient's life. Certainly, no particular danger (generally speaking) would attend cutting out scrophulous glands, and tumors; the objections to the plan are founded on the pain of the operation; on the number of such glands frequently diseased; on their often subsiding, either spontaneously, or by surgical treatment; on the operation doing no good to the general affection of the system, &c. When, however, a scrophulous testicle, breast, or joint, seriously impairs the health, and endangers life, the very existence of the patient demands the immediate removal of the diseased part. Wiseman relates, that he was in the habit of cutting out scrophulous glands, and tumors, with great success; but, for reasons already alleged, most of the moderns think such operations in general, at least unnecessary.

Caustics have been employed for the same purpose, instead of the knife; but as they effect the object in view less certainly, more painfully and tediously, and cause extensive ulcers, they are disused by all the best surgeons of the present day.

Some authors have advised making issues, and keeping them open, in order to prevent any ill effects from the healing of scrophulous ulcers. Issues are certainly quite unnecessary for any purpose of this kind; but they are eminently useful as a part of the local treatment of scrophulous joints and abscesses, as we have more particularly explained in the articles *Joints, Lumbar Abscess,* and *Vertebræ.*

Mr. Burns notices, that issues have hitherto been chiefly used in diseases of the bones and joints; but, he adds, that it is reasonable to suppose, that they ought likewise to be useful in the cure of enlargements of the glands, and other scrophulous tumors, if inserted in the immediate vicinity of the part. The only objection to their use, is the scar which they leave, and which, in certain situations, one would particularly wish to avoid. When the tumor is thickly covered with the integuments, the issue may be made directly over it, and kept open with the savine ointment. In other cases, a small pea issue, or seton, may be inserted by the side of the tumor. This method would be objectionable, for scrophulous glands in the neck, in consequence of the scar; but, it might be employed, when the mamma is diseased. (*Dissertations on Inflammation, Vol.* 2.) The late Mr. Crowther used to apply blisters to scrophulous swellings, and maintain a discharge from the part. And a more modern practice is that of producing irritation of the integuments, covering tumors and abscesses, by means of the tartar emetic ointment. (*Alibert Nosol. Naturelle, p.* 449; *Goodlad on Diseases of the Absorbents, p.* 162, *&c.*) The good effects of iodine upon scrophulous tumors, both as an internal medicine and local application, seem now to be exciting considerable attention. Certain indolent swellings of the testicle and breast, in particular, yield to this powerful medicine. (See *Iodine.*) The profession, however, are still in want of some candid and accurate reports upon the subject, which is at present obscured by the exaggerations always attending the first introduction of a medicine, supposed to have power over any disease that has been found so little under the control of physic as scrophula. I beg, at the same time, the attention of every surgeon to the strong recommendations with which iodine has been brought into notice, and to its great medicinal powers as already verified in bronchocele. (See *Bronchocele.*)

Preparations of lead; cloths dipped in cold water, sea-water, or weak vegetable acids; æther; sea-salt mixed with bile; the linimentum camphoræ; a mixture of æther and the linimentum opiatum; and hemlock poultices; form a long list of applications, which have been employed for scrophulous tumors.

According to Mr. Burns, moderate pressure, by means of adhesive plaster, conjoined with the application of cold water, is one of the best plans of treating mild scrophulous ulcers, when their situation admits of it. In other cases, he recommends applying a powder, five parts of which consist of cerussa acetata, and the sixth of burnt alum. A piece of dry lint is next to be applied, and a compress, with such a pressure as can be used. Benefit occasionally results from dipping the compress in cold water.

The ung. zinci is a good common dressing, when it is wished not to interfere much with the progress of the ulcer. The ung. hydrarg. nitrat. rub. and the ung. hydrarg. nitrat. are the best stimulating ointments. Poultices of bread and sea-water; solutions of alum, sulphate of copper, and the hydrarg. mur.; solutions of the nitrates of copper, bismuth, and silver; the recent leaves of the wood-sorrel bruised; lint dipped in lemon-juice, or vinegar and water; are among the applications to common scrophulous ulcers.

For irritable sores, diluted hydrosulphuret of ammonia; ointments containing opium; carrot and hemlock poultices; a solution of opium; and carbonic acid gas; are commonly recommended.

The following are Mr. Russell's sentiments respecting the treatment of scrophulous ulcers: "Scrophulous complaints in general do not agree well with stimulant applications. In the treatment of scrophulous ulcers, under the ordinary circumstances of complaint, the simplest and mildest dressings answer best. When the patients are using a course of sea-bathing, it is usual to wash the sores with sea-water, over and above the momentary application of the sea-water during the immersion of the whole body. Cold spring-water is likewise a favourite application with many practitioners; and, from much observation, it appears that the operation of cold is well suited to counteract the state of inflammation, which accompanies scrophulous sores. Preparations of lead are, upon the whole, very convenient and useful applications, provided the solutions be used in a state of sufficient dilution to prevent irritation. Liquid applications are applied by means of wet linen, which is renewed whenever it dries, so that the surface of the sore may be kept constantly moist, when under this course of management. Upon the same principle, simple ointment and Goulard's cerate, furnish the best dressing in ordinary cases.

"Scrophulous congestions, of a solid nature, in the more external parts of the body, are little adapted to the practice of local bleeding, unless they be attended with symptoms of inflammation; but as some degree of inflammation is, in general, present during the incipient stage, it may be prudent to employ local bleeding in moderation at the commencement of the attack, although there may be no indication to persist in the practice, after the complaint has advanced farther in its progress. If, however, these congestions are more of an indolent nature, unaccompanied with heat or pain, there is no benefit to be expected from the local detraction of blood; warm fomentations, together with the use of stimulants, and a repetition of blisters, are the most serviceable class of remedies: such cases, too, are the best adapted to the use of friction as a discutient. Friction, indeed, has long been employed for this purpose; but, of late years, it has been introduced to an extent, and with an effect, far beyond the experience of all former practice. As yet, it has been circumscribed to the practice of a very few individuals, with whom it is said to have performed very great cures; and if, upon the test of more extensive experience, it is found to answer its present high character, I shall consider the use of repeated frictions to be one of the most valuable improvements which have been introduced into practice in modern times. The safety and simplicity of the practice recommend it very strongly to favour, though I am afraid they are the very circumstances which retard its adoption by the public in general. I only regret that I do not feel myself entitled to give a decided opinion upon the subject from my own experience, though I have known some instances of successful cures; but the reports of success are so numerous and so well supported, that I am inclined to think very favourably of the practice.

"There is no substance interposed between the surface of the swelling and the hand of the person who administers the friction, excepting a little flour, to prevent the abrasion of the skin. The friction is applied regularly two or three hours every day, with great celerity, the hand being made to move to and fro one hundred and twenty times in a minute, and the course may require to be continued without interruption, for some months." (See *Russell on Scrophula.*) Here I would again recommend to the notice of surgeons, the external use of iodine, as perhaps possessing more efficacy than simple friction. (See *Iodine.*)

I shall not enlarge upon this endless subject, which still stands in need of elucidation, as much as any disease that can be instanced. The scrophulous affections of the joints are explained in *Joints. Bronchocele, Lumbar Abscess; Spina bifida;* and *Vertebræ*, are other articles, containing matter connected with the preceding observations.

The reader may consult *Wiseman's Chirurgical Treatises. J. Brown, Adenochoiradelogia, or an anatomick-chirurgical Treatise of Glandules and Strumals, or King's Evil Swellings. together with the Royal Gift of Healing, or Cure thereof by contact, or imposition of hands, &c. 8vo. Lond.* 1684. *Wm. Clowes, A right frutefull and approved Treatise, for the Artificial Cure of the Struma, or Evil, cured by Kings and Queens of England, 4to. Lond.* 1602. *Cullen's First Lines of the Practice of Physic, Vol.* 4. *Ferne on the King's Evil. Cheyne on the King's Evil. R. Russell, A Dissertation on the Use of Sea-Water in the Diseases of the Glands, &c.* 8vo. *Lond.* 1769. *B. Bell's Surgery, Vol. 5. B. Bell on Ulcers. Tumor Strumosus Colli post vomitorium imminutus.* 8vo. (*Weikard, Collect.* 88.) *Kirkland's Medical Surgery, Vol.* 2. *J. Morley, Essay on the Nature and cure of Scrophulous Disorders, &c. New. Ed.* 8vo. *Lond.* 1778. *White on the Struma, Edit.* 2. 1794. *P. Lalonette, Traité des Scrophules, &c. Paris*, 1780. *A. G. Kortum's Comment. de Vitio Scrophuloso, in 2 Vol. 4to. Lemgoviæ*, 1789. *R. Hamilton, Observations on Scrophulous Affection, &c.* 8vo. *Lond.* 1791. *Med. Obs. and Inq. Vol.* 1. *S. T. Soemmerring, de Morbis Vasorum Absorbentium Corporis Humani.* 8vo. *Traj.* 1795. *C. W. Hufeland, Ueber die Natur, &c. der Skrophelkrankeit. 8vo. Jena*, 1795. *Dissertations on Inflammation, by John Burns, Vol.* 2. *M. Underwood, Treatise upon Ulcers, &c. with Hints on a successful Method of treating some Scrofulous Tumors, &c.* 8vo. *Lond.* 1785. *Crowther's Obs. on the Disease of the Joints, commonly called White Swelling; with remarks on Caries, Necrosis, and Scrophulous Abscesses, &c. Edit.* 2, 1808. *A Treatise on Scrofula, by James Russell*, 8vo. *Edinburgh*, 1808. *Lectures on Inflammation, by J. Thomson, M. D. p.* 130, *et seq. p.* 155—191, *&c. Edinb.* 1813. *Wm. Goodlad, A Practical Essay on the Diseases of the Vessels and Glands of the Absorbent System*, 8vo. *Lond.* 1814. *G. Henning, A Critical Inquiry into the Pathology of Scrofula*, 8vo. *Lond.* 1815. *Richerand, Nosographie Chir. T.* 1, *p.* 165, *et seq. Edit.* 4. *Delpech. Précis Elémentaire des Maladies, Chir. T.* 3, *p.* 617, *&c. Paris*, 1816. *Lassus, Pathologie Chir. T.* 2, *p.* 383, *&c. Edit.* 1809. *Callisen, Systema Chirurgiæ Hodiernæ, Vol.* 2, *p.* 113, *Hafniæ*, 1800. *Boyer, Traité des Maladies Chir. T* 2, *p.* 414, *&c. Paris*, 1814. *Ch. Brown, Treatise on Scrophulous Diseases, showing the good Effects of factitious Airs*, 8vo. *Lond.* 1798. *J. Brandish, Obs. on the use of caustic alkali in Scrofula, and other chronic Diseases*, 8vo. *Lond.* 1811. *C. Armstrong, Essay on Scrophula, in which an account of the Effects of the Carbonas Ammoniæ is submitted to the Profession.* 8vo. *Lond.* 1812. *W. Lambe, Inquiry into the origin, &c. of constitutional Disorders, particularly Scrophula, Consumption, Cancer, &c.* 8vo. *Lond.* 1805. *Also Additional Reports on the Effects of a peculiar Regimen in cases of Cancer, Scrophula, &c.* 8vo. *Lond.* 1815. *R. Carmichael, Essay on the Nature and Cure of Scrophula, and a demonstration of its origin from Disorder of Digestive Organs.* 8vo. *Dubl.* 1810. *J. Rabben, De Præcipuis Causis Mali Scrofulosi ejusque Remediis efficacissimis commentatio*, 12mo. *Goth.* 1817. *Alibert, Nosologie Naturelle, p.* 448, *fol. Paris.* 1820. *Dict. des Sciences Med. T.* 50, *art. Scrofules*, 8vo. *Paris*, 1821. *E. A. Lloyd on the Nature and Treatment of Scrophula*, 8vo. *Lond.* 1821. *Dr. Coindet's letter on the Administration of Iodine in Scrophula, in Journ. of Science, &c. Vol.* 12, *Jan.* 1822. *Also his Obs. on the Remarkable Effects of Iodine in Bronchocele and Scrofula; trans. by J. R. Johnson, M. D. Lond.* 1821. *Brera, Suggio Clinico sull' Iodio &c.* 8vo. *Padua*, 1822. *W. Gibson, Institutes, &c. of Surgery, Vol.* 1, *p.* 249, *&c.* 8vo. *Philadelphia*, 1824. *W. P. Alison, in Edinb. Med. Chir. Trans.*

SCROTOCE'LE. (from *scrotum*, and κηλη, a tumor.) A rupture, or hernia in the scrotum.

SCROTUM, CANCER OF. (*Chimney-sweepers' Cancer. The soot-wart.*) This peculiar disorder, which commences as a wart-like excrescence, is described by Mr. Pott, as always making its first attack on, and its first appearance in, the inferior part of the scrotum; where it produces a superficial, painful, ragged, ill-looking sore, with hard and rising edges. He never saw it under the age of puberty. According to Mr. Earle's observations, it very rarely attacks persons under the age of thirty. Most of the cases, seen by him, were in individuals between the ages of thirty and forty. He has seen three instances in subjects between twenty and thirty; but only one at the age of puberty. A single case is mentioned by Sir J. Earle, which happened in a child under eight years of age. I have seen one case in a boy not more than sixteen. (*Med. Chir. Trans. Vol.* 12, *p.* 299.)

In no great length of time, it pervades the skin, and membranes of the scrotum, and seizes the testicle, which it enlarges, hardens, and renders truly and thoroughly distempered; from whence it makes its way up the spermatic process into the abdomen, most frequently indurating and spoiling the inguinal glands; when arrived within the abdomen, it affects some of the viscera, and then very soon becomes painfully destructive. (*Pott.*)

Not only is the discharge from the sore very fetid, but the perspiration from the whole body, has a very peculiar ammoniacal smell. (*Earle, in Med. Chir. Trans. Vol.* 12, *p.* 298.)

"Other people, besides chimney-sweepers, (says Pott,) have cancers of the same part; and so have others, besides lead-workers, the Poictou colic, and the consequent paralysis: but it is nevertheless a disease to which they are peculiarly liable; and so are chimney-sweepers to the cancer of the scrotum and testicles."

Workmen, exposed to the fumes of arsenic, are said to be liable to a cancerous disease of the scrotum, resembling that which infests chimney-sweepers. This is particularly the case with the smelters in Cornwall. (See *Paris's Pharmacologia, p.* 89. *Vol.* 2. *Ed.* 5.) If the two diseases are precisely similar, the fact is particularly interesting with regard to the cause of the complaint, which has been referred to the irritation of soot, and this alone, in a supposed particular state of constitution, not defined, nor indeed at all understood.

Mr. Pott, as we find, describes the disease as always beginning at the lower part of the scrotum: but there are exceptions. Sir James Earle has recorded an instance of its occurrence on the wrist of a gardener, who had been employed in distributing soot for the destruction of slugs; and some cases are said to have taken place on the face. (*H. Earle in Med. Chir. Trans. Vol.* 12, *p.* 297.) One circumstance is noticed by the latter writer, which if it prove generally correct, materially influences the prognosis and treatment: he says; "the inguinal glands are often enlarged, but they will generally subside on the removal of the diseased scrotum; clearly proving that the disease is not commonly communicated in the course of the absorbents." (*P.* 298.) He knows only one exception to this statement; a case, where a bubo formed, suppurated, and assumed the same characters, as the primary affection in the scrotum.

If there be any chance of putting a stop to, or preventing this mischief, says Mr. Pott, it must be by the immediate removal of the part affected; namely, that part of the scrotum where the sore is; for, if it be suffered to remain until the testicle is affected, it is generally too late even for castration. "I have many times made the experiment; but though the sores, after such operation, have, in some instances, healed kindly, and the patients have gone from the hospital seemingly well, yet, in the space of a few months, it has generally happened, that they have returned either with the same disease in the other testicle, or in the glands of the groin, or with such wan complexions, such pale leaden countenances, such a total loss of strength, and such frequent and acute internal pains, as have sufficiently proved a diseased state of some of the viscera, and which have soon been followed by a painful death." (*Pott.*)

Mr. Earle's experience has taught him, that no topical applications, nor internal medicines, have the slightest influence over the disease. The scalpel, he says, is the only resource, and it may be employed with confidence, provided the whole of the diseased mass can be removed. Even when the inguinal glands are enlarged, he inculcates the same practice. Also, when the testicle is affected, provided the spermatic cord is sound, he conceives, that it is right to give the patient the chance of recovering, and, notwithstanding the discouraging results of Mr. Pott's operations in this stage of the disease, he has known the attempt succeed in two cases, in which no relapse had happened several years afterwards. See *Pott's Works, Vol.* 3. *Ed. by Earle. Also W. Simmons's Obs. on Lithotomy, to which are added Obs. on Chimney-sweepers' Cancer. 8vo. Manchester,* 1808. *H. Earle on Chimney-sweepers' Cancer, in Med. Chir. Trans. Vol.* 12, *p.* 296, *&c.*

SCROTUM, *Sarcomatous Thickening and Enlargement of.* The investigations of Baron Larrey lead him to believe, that cases of enormous growth of the scrotum are endemial in warm countries, or, at least, that they are seldom observed in cold climates; since most of the examples, which have been seen in Europe, came from Asia and Africa. The scrotal tumor of Delacroix, formerly minister of external relations, says Larrey, is perhaps the only well authenticated instance of the origin of such a disease in our own climate; and it was also much smaller, than the instances related in the Ephemerides German. for the year 1692, in the surgical writings of Dionis, in the 9th vol. of the Bibliothéque de Médecine, and those which Larrey was surprised to meet with in Egypt. The smallest of these latter, after they had attained their full size, weighed more than 25 kilograms (between 60 and 70 pounds.)

Several cases of this curious disease are recorded by other writers, particularly by Dr. Cheston, Dr. Titley, and the celebrated Sandifort. I lately saw in Mr. Abernethy's museum, a considerable fleshy substance, which was a portion of diseased scrotum.

In the cases, which Larrey had an opportunity of seeing in Egypt, the fleshy mass, into which the scrotum was converted, was broad below, and suspended from the pubes by a sort of pedicle. "Externally (as Larrey observes,) the tumor presents rugosities of different sizes, separated by particular lines, or sinuses, to which the mucous cryptæ and roots of the hairs correspond. Upon a large portion of its surface, especially when the case is of long standing, yellowish scaly crusts are always seen, the detachment of which constantly leaves so many small herpetic ulcers, which emit an ichorous discharge. The tumor is indolent, and hard at some points, but softish at others. It may be handled, and pressed in different directions, without the least pain. The patient is only incommoded by its weight, and the impediment which it causes to his walking well. Hence, he is necessitated to employ a suspensory bandage. In consequence of the situation of the urethra, the urine dribbles over the swelling; but without causing any excoriation." In most of the cases, seen by Larrey, the spermatic chord and testicles were in the natural state, situated at the sides and at the root of the swelling. The spermatic vessels, however, are somewhat enlarged and elongated. All the patients were likewise more or less affected with elephantiasis.

Baron Larrey attempts to explain the causes of the complaint in Egypt, but, as I think, without any degree of success. As the affection is seldom seen in cold countries, climate has certainly a chief effect. Employments which keep persons a good deal in a sitting posture; the loose breeches worn by the Egyptians, and the consequently pendulous state of the scrotum; diseases of the humors, and particularly itchy pustules, on the part, an ordinary consequence of syphilis in that country; bad regimen; abuse of venery; and the immoderate use of the warm bath; are merely conjectures, which will not bear the test of reasoning.

The enormous magnitude, which this sort of disease may attain, is almost incredible. The case, recorded in the Ephemerides German. weighed about a hundred kilograms, or more than two hundred weight. Another, described by Larrey, was calculated to weigh about one hundred and twenty pounds, and this surgeon likewise saw in Egypt ten, or twelve more instances, nearly as large, and all of the same character.

A very curious example, in which a similar disease affected the labia pudendi in a surprising degree, is also detailed by Larrey. The woman was a native of Cairo.

In the early stage of the disorder, we may try preparations of antimony combined with sudorifics; drinks acidulated with sulphuric acid, lotions containing the same acid, or the oxymuriate of mercury, the oxyde of copper, or the muriate of ammonia. These means are to be assisted by a gradual, uniform compression of the whole tumor. In one case, incisions and the application of caustic, proved of no service, and Larrey very properly condemns such experiments.

When the disease resists every plan tried for its relief, and its increase renders the patient's life irksome and wretched, the extirpation of the tumor with a knife becomes proper. In this proceeding, the chief skill consists in doing no injury to the spermatic chords and testicles, which are generally perfectly sound. As the substance of the swelling is not furnished with large vessels, the hemorrhage need not be feared. Care must also be taken not to injure the corpora cavernosa penis, and the urethra. After the operation, the skin is to be brought over the exposed testicles, as much as possible, with adhesive plaster and a bandage.

M. Delonnes successfully removed the diseased mass in the celebrated case of the French minister Delacroix, and Larrey performed the same operation with success, when he was in Egypt. Dr. Titley, of the island of St. Christopher, also cut away such a tumor, which weighed seventy pounds, and the patient, who was a negro, and also affected with elephantiasis, speedily recovered. (See *Med. Chir. Trans. Vol.* 6, *p.* 73, *&c.*)

It is probable, that some of the cases, which occur in warm countries, are analogous to the elephantiasis; but I do not believe, that the scaly incrustations, which are represented by Larrey as occurring in the cases which he saw in Egypt, have been always noticed in the instances which have taken place in colder countries. Nor, indeed, did they take place in the instance recorded by Dr. Titley, the surface of the tumor having been quite smooth. (*Larrey, Mém. de Chir. Militaire, T.* 2, *p.* 110, *et seq. Richerand Nosographie Chir. T.* 4, *p.* 314, *&c. Edit.* 4. *Delonnes' Memoir. Dr. Cheston's Case, &c. Med. Chir. Trans. Vol.* 6.)

SEARCHING. The operation of introducing a metallic instrument, through the urethra into the bladder, for the purpose of ascertaining whether the patient has a stone or not. See *Sounding.*

SETON. A kind of issue, usually made by means of a flat needle, from half an inch to nearly an inch in breadth. The needle is commonly a little curved, but, if straight, it would be better calculated for the purpose. From the point, to its broadest part, it is double edged, and, behind, it has a transverse eye, through which a skein of thread, or silk, of exactly the same breadth as the needle, is placed.

A fold of skin is to be pinched up, at the part where the seton is designed to be made, and the needle is to be pushed through it, together with the skein of thread, which is first dipped in sweet oil. The instrument is not to be introduced too low into the base of the fold, nor too high, near its edge. In the first case, the muscles, and parts, which ought to be avoided, might be wounded; in the second, the interspace between the two wounds would be very narrow, and the seton soon make its way through it.

When no seton-needle is at hand, the fold of the skin may be punctured with a lancet, and the skein of thread introduced by means of an eye-probe. A seton may be applied almost to any part of the surface of the body, when circumstances require it; but, one of its openings should always be made lower than the other, that the matter may readily flow out. The skein of thread is to remain untouched, for a few days after the operation, until the suppuration loosens it. Afterwards the part of the thread, nearest the wound, is to be smeared with oil, white cerate or any digestive ointment, and drawn under the fleshy interspace between the two wounds, and what was there before is to be cut off. The seton is to be drawn in this manner once or twice a day, according as the quantity of matter may require. A new skein of silk, or thread, is to be attached to the preceding one, as often as necessary. Care is to be taken to keep the thread on the outside of the wound well covered, and free from the discharge, which would make it stiff and hard, and apt to occasion pain and bleeding on being drawn into the wound. If the discharge should be deficient in quantity, powdered cantharides may be mixed with the digestive ointment. A neater, and less troublesome kind of seton, is that in which a thin, smooth slip of elastic gum is employed, instead of silk. The elastic gum tape is generally about four inches long, and half an inch wide: the needle for conveying it through the integuments has no eye, but takes hold of it in the manner of a pair of forceps. This kind of seton has the recommendations of being less painful, than the common one, more cleanly, and does not require the repetition of the disagreeable operation of changing the silk. When it is wished to render it more irritating, the elastic gum slip may be drawn a little out of either opening, and smeared with savin ointment. I feel much obliged to Mr. M'Gregor, senior surgeon to the Lock hospital, for reminding me of this improvement, which is derived from the French.

SHINGLES. See *Herpes.*

SIGHT, DEFECTS OF. There are persons, who, from their infancy, are incapable of distinguishing one colour from another. A man, who was affected with this infirmity, could not distinguish green at all. Green and red appeared to him the same. Yellow and blue he could discern very well. With regard to dark-red and dark-blue, he frequently made mistakes. In other respects, his vision was sound and acute. The father of this patient was afflicted with the same infirmity. The mother and one sister were free from it. Another sister and two of her children had it. The patient himself had two children, who did not labour under the disorder. (See *Phil. Trans. Vol.* 68, *Part* 2.) Another subject, whose eyes were in other respects healthy, and whose eye-sight was sharp, could not distinguish a dark-green from a dark-red.

An interesting example of this curious imperfection of vision has lately been published by Dr. Nicholl, of Cowbridge. (See *Med. Chir. Trans. Vol.* 7, *p.* 477, *&c.*) The subject was a healthy boy, eleven years of age, whose eyes were grey, with a yellow tinge surrounding the pupil. He never called any colour green. Dark bottled green he called brown. He could distinguish light yellow; but darker yellows and light browns, he confounded with red. Dark brown he mistook for black. Pale green he called light red; common green he termed red. Light red and pink he called light blue. Red he called by its proper name. He could distinguish blue, both dark and light. On the mother's side, the boy had some relations, whose sight was similarly affected. An interesting chapter on what is termed *coloured vision*, may be read in a modern valuable work, to which I have great pleasure in referring. (See *Wardrop's Essays on the Morbid Anatomy of the Human Eye. Vol.* 2, *p.* 196, *8vo. Lond.* 1818.)

Sometimes, objects appear to the eye to be of a different colour from what they really are, not because there is any thing wrong in the eye itself, but in consequence of the unclear and coloured light by which the object is illuminated. Thus, for instance, a bad tallow candle, which emits a yellow flame, makes every thing appear yellow. When brandy is burning, all objects appear blue. In short, it is only by the light of the sun, that any object can be seen in its clear natural hue. In certain cases, the infirmity is owing to the transparent parts and humours of the eye, which do not happen to be of a proper colour. Thus, persons having the jaundice in a high degree, see all things yellow, because the transparent parts of the eye are of that colour. When, in consequence of external violence applied to the eye, blood is effused, and the aqueous humour rendered red by this fluid, all objects seem to the patient to be red; and, white, when the aqueous humour has been made of this colour by the couching of a milky cataract. Sometimes this defect in vision is ascribable to the duration of an impression. When one has surveyed a bright coloured object a long while, as for example a bright red or yellow wall, on which the sun shines, that colour will often remain a good while before the eyes, although one may not be looking any more at an object of this hue. There are some eyes, which seem much disposed to retain the impression of objects, which are not very bright coloured; but such a disposition always betrays great weakness and irritability of those organs. The most frequent cause of this defect in vision, is an irritation operating upon the optic nerves, so as to produce the irritability in them, which alone makes objects appear of one colour. The seat of such irritation, according to Richter, is also most commonly in the abdominal viscera, and the case demands evacuations, tonics, and anodyne medicines. But the disorder may also originate from other causes. The operation of bright-coloured or shining objects upon the eye, sometimes has, for a certain time afterwards, the effect of making objects of diverse colours appear to be moving before the eyes. In extreme terror, or fright, things may also seem to have a different colour from their real one. The same often happens in fevers attended with delirium. A sudden exposure of the head to cold, at a period, when it was perspiring much, in one instance, caused many coloured appearances before the eyes; but the disorder subsided in a couple of days. (*Richter, Anfangsgr. der Wundarzn. B.* 3, *p.* 523.)

Also a healthy eye sees a distant object with uncertainty, and error, in a room, or space, the extent, length, and breadth of which are unknown, when the size of the object itself is unascertained, and when there are few or no other objects intervening at a smaller distance between the eye and the thing looked at. The more numerous the objects are between the eye and the principal thing looked at, the more distant it is made to appear; the fewer they are, the nearer it seems to be. In a country covered with snow, and upon the sea, very distant objects appear to be close. The smaller an object is to the eye, in relation to its known magnitude, the further off it seems. The errors, which the eye makes, in regard to the distance of objects, also tend to deceive. But, there are certain cases, in which the eye is almost entirely incapable of judging of the distance of objects. The first is, when the object, of which we wish to ascertain the distance, is looked at with only one eye. Hence all one-eyed persons, and persons affected with strabismus, are unable to judge well of the real distance of objects. However they are only so for a certain time; and, by practice, they gradually acquire the faculty. Even when two eyes are employed, it requires some exercise, in order to enable them to judge of the right distance of objects. Persons, born blind, but who have their sight restored in both eyes by the operation for the cataract, are a long while incapable of judging of distances, and only obtain this power very gradually. Lastly, this infirmity is sometimes owing to an irritation affecting the optic nerves, whereby their sensibility is so altered, that distant objects make the impression upon them of near ones. In this circumstance, all objects appear to the patient closer than they really are. This is the only case, which admits of being treated as a disease. The irritation, producing the disorder, is mostly seated in the abdominal viscera, and requires evacuations and such medicines as invigorate the nerves. A suppression of the perspiration is alleged to be sometimes a cause. (*Richter, Anfangsgr. der Wundarzn. B.* 3, *p.* 525.)

A sound eye likewise does not always judge with accuracy and uniformity of the magnitude of objects. This may arise from three causes. In order to judge rightly of the size of any thing, its precise distance must be known; for, the more remote it is, the smaller will it seem to the eye. Hence, any conjecture, respecting the magnitude of an object, is constantly erroneous, unless the distance be ascertained. Size is invariably something relative. A single large object, surrounded by many small ones, always appears to be larger than it really is; et vice versâ. An object whose magnitude is known, seems smaller than it actually is, when one has been a little previously looking at another that is still larger. Lastly, the refraction of the rays of light in the eye, by which operation an object is made to appear large or small, is not always accomplished in the same degree, as the eye is not at all times equally full and distended with its humours. Hence, at one time, the same object will appear to the same eye, and at the same distance, larger; at another time, smaller. Sometimes, however, the eye judges so erroneously of the magnitude of objects, that there is reason for regarding the case as an infirmity, or disease. It is for the most part owing to a defective sensibility in the nerves, caused by some species of irritation acting upon the eye, and generally seated in the gastric organs. A man, to whom every thing seemed one half smaller and nearer, than it really was, was cured by means of an emetic, bark, an issue, and valerian. (*Leutin, obs. fascic.*)

Sometimes to the eye, under circumstances of disease, straight lines appear serpentine; perpendicular objects, sloping, things standing upright, to be inverted, &c. All these cases are set down by Richter as depending upon a wrong sensibility of the nerves, occasioned by the effect of some irritation. The irritation, he says, may be of many kinds; but experience proves, that it is mostly seated in the gastric organs. These defects of sight may generally be cured by first exhibiting emetics and purgatives, and afterwards having recourse to remedies for strengthening the nerves, bark, oleum animale, valerian, issues, &c. One mark of a very weak and irritable eye, is when objects, after being looked at a good while, and presenting a right appearance, begin to move, swim about, mix together, and, at length, become quite undistinguishable. This principally happens when the objects regarded are small and strongly illuminated. Here such remedies, both general, and topical, as have the effect of invigorating the nerves, are indicated. However, sometimes, the infirmity is partly owing to the operation of some species of irritation, which will require removal, ere the tonic medicines and applications can avail. Indeed, in particular cases, the dispersion of such irritation is alone sufficient to accomplish the cure.

Sometimes, all objects appear to the eye, as if they were in a more or less dense mist. This defect in vision is always owing either to some slight opacity of one of the humours of the eye, or to excessive debility of the optic nerves. (See *Richter*, *Anfangsgr. der Wundarzn. B.* 3, *p.* 521, *&c.*)

SINUS. A long, narrow, hollow track, leading from some abscess, diseased bone, &c.

SOUND. An instrument, which surgeons introduce through the urethra into the bladder, in order to discover, whether there is a stone in this viscus, or not. The sound is made of highly polished steel, that it may be well calculated for conveying to the surgeon's fingers the sensation of any thing, against which its end may strike. It is also generally rather less curved, than a catheter, so that its extremity may be more easily inclined to the lower part of the bladder, where the stone is most frequently situated.

SOUNDING. The operation of introducing the foregoing instrument.

Sounds are generally introduced much in the same way as catheters, either with the concavity towards the abdomen, or the convexity, in which last method, it is necessary, as soon as the beak of the sound has arrived in the perineum, to bring the handle of the instrument downward by a semicircular movement to the right, while the other end is kept as much fixed as possible. This is what the French term the coup, or tour de maître; a plan, that is often followed at the present day, though, except in very corpulent subjects, it has no particular recommendation.

When a patient is to be sounded, he is usually put in a posture very similar to that adopted in the lateral operation for the stone, with the exception that he is not bound in this position, as there is sometimes an advantage in making the patient stand up, in order that the stone may come into contact with the end of the sound. The instrument having been introduced, its extremity is to be turned, and moved in every direction, when, if there be a calculus, its presence will usually be indicated by the collision against the beak of the sound.

Stones have sometimes been found in the bladder after death, although they could never be discovered with a sound while the patient was alive, suffering all the symptoms of the complaint. The celebrated French surgeon La Peyronie was thus circumstanced: he was so fully convinced of there being a stone in his bladder, notwithstanding neither he, nor any of his friends could feel it with a sound, that, on his death-bed, he gave directions for ascertaining the fact. Hence, when the usual symptoms of a stone in the bladder continue, patients should be searched several times, before a positive opinion is delivered respecting the nature of the disease. When during the operation of sounding, all the urine has escaped from the bladder, the inner surface of this viscus comes into contact with the end of the sound, and such a sensation may be communicated to the surgeon's fingers as leads him to suspect that a fungus, or some other hardish extraneous substance, is contained in the bladder. In such cases, patients have actually been cut for the stone, when no foreign body whatever was present. (See *Sabatier*, *Médecine Opératoire*, *T.* 3, *p.* 127—128, *Edit.* 2. See *Lithotomy.*)

SPE'CULUM. An instrument intended for facilitating the examination of parts, and also the performance of operations on them: thus we have specula ani, oculi, auris, uteri, &c.

SPHA'CELUS. (from σφαζω, to destroy.) Surgeons imply, by this word, complete mortification, which is mostly preceded by a stage of the disorder, termed *gangrene.* See *Mortification.*

SPICA. (from σταχυς, an ear of corn.) A name, given to a kind of bandage, in consequence of its turns being thought to resemble the rows of an ear of corn.

In order to apply the spica bandage to the shoulder, the margins of the axillæ must first be protected from the effects of the pressure, by means of soft compresses, and the end of a common roller is then to be placed under the arm-pit, on the sound side. After conveying the bandage backward, obliquely over the scapulæ, the surgeon is to bring it forward over the injured shoulder. The roller is next to descend under the arm-pit, then be carried upward again, and made to cross on the deltoid muscle. It is now to be carried obliquely over the front of the chest, and under the opposite arm-pit, where the end of it is to be pinned, or stitched. The bandage is next to pass across the back, over the part of the roller previously applied in this situation, and is to be conveyed round the head of the os brachii, so as to form a turn, or *doloire*, with the first circle of the roller. Three or four *doloires*, or turns, each of which covers about one-third of the preceding one, are to be made, and then the upper part of the arm is to be once surrounded with a plain circle of the bandage. This last circular application leaves between it, and the cross previously made, a triangular, equilateral, space, technically named by writers *geranis.* The roller is now to be carried upward in a spiral manner; its head is to be brought to the opposite arm-pit, and the application of the whole concludes with a few turns round the body. The bandage is to be fastened with pins at the place where it commenced.

In applying the *spica inguinis*, the end of the roller is to be placed on the spine of the os ilium, of the affected side. The bandage is then to be carried obliquely over the groin, and under the perinæum. Then it is to pass over the back of the thigh, and next forward, so as to cross the part previously applied on the front of the groin. The application is continued by carrying the roller over the pubes, over the opposite os ilium, and next round the body above the buttocks. The bandage thus returns to the place, where it began. Its application is completed by making a few turns, like the preceding ones, and lastly, a few circles round the body.

SPINA BIFIDA. (i. e. the Cloven Spine.) *Hydro-Rachitis.* A disease attended with an incomplete state of some of the vertebræ, and a fluid swelling, which is most commonly situated over the lower lumbar vertebræ, sometimes over the dorsal and cervical ones, and in some instances, over the os sacrum. The same name has also been given to an analogous tumor, which sometimes occurs on children's heads, attended with an imperfect ossification of a part of the cranium. The malformation of the spine seems to consist in a deficiency of one or more of the spinous processes. Sometimes, indeed, these processes are wanting, the whole length of the vertebral column, as was seen in the case reported by Fieliz. (See *Richter's Chir. Bibl. B.* 9, *p.* 185.) Sometimes, the tumor is composed of two distinct cysts, as happened in the case recorded by Mr. Brewerton; (*Ed. Med. and Surg. Journ. Vol.* 17:) but this is uncommon.

The Arabians who first treated of this disease, erroneously imputed the deficiency of one, or more of the spinous processes to the tumor, while it is now well known, that the incomplete state of the affected vertebræ is a congenital malformation, and that the swelling is only an effect. In fact, the tumor generally becomes larger and larger, the longer it continues. The spina bifida may be regarded as an affliction only met with in children: few, very few, live to the adult age with this incurable affection. Warner, however, has related a case, in which the patient lived till he was twenty.—(*Cases in Surgery, p.* 134, *Edit.* 4.) I have also seen under the care of Mr. C. Hutchison, a young woman, 19 years of age, who had a spina bifida, which was of astonishing size, and situated at the lower part of the vertebral column. One curious circumstance in the case was, that the patient used to menstruate through a sore in the thigh. I conclude this is the same case as is described by Mr. Jukes; (see *Med. and Phys. Journ. for Feb.* 1822,) and who states the measurement of the swelling to have been 30 inches in its vertical line. The urine and feces used to pass involuntarily.

As I have remarked, the swelling is most frequently situated towards the lower part of the spinal canal, particularly at the place, where the lumbar vertebræ join the sacrum. The fluid, which it contains, resembles serum, being somewhat more liquid, than the white of egg, and, like the latter, frequently coagulable. It is in general limpid and colourless; but, occasionally, it is turbid, and tinged with blood. On pressing the tumor, a fluctuation is very perceptible, and a preternatural space may also be felt existing between some of the spinous processes. The fluid is contained in a kind of cyst which is composed of the continuation of the dura mater, investing the spinal canal, and is usually closely adherent to the integuments.

According to Morgagni, spina bifida is mostly attended with hydrocephalus, and the enlargement of the head has been known to undergo a considerable diminution, after the casual rupture of the tumor of the spine. *De Sed. et* (*Caus. Morb. epist.* 7. *art.* 9. *Ephem. Cur. Nat. Decad.* 3, *Art.* 1, *Decad.* 2, *Art.* 2.) The fluid, which was lodged in the lateral ventricles, and third ventricle, passed into the fourth, through the aquaductus Sylvii, ruptured the calamus scriptorius, and thus passed into the spinal canal.

Spinæ bifidæ usually occur on the lower part of the spine; but they occasionally take place on the cervical vertebræ, where the tumors have the same characteristic marks, as those near the sacrum. Many facts, recorded by Ruysch, in his Anatomical Observations, confirm the preceding account.

The present affliction is one of a most incurable nature; for, with the exception of one case mentioned by Morgagni, (*De Sed. et Caus. Morb. epist.* 12, *art.* 9,) a second, recorded by Keilmann, (*Prodrom. Act. Havn. p.* 136,) and two or three others more recently published by Sir Astley Cooper, there is not, I believe, in all the records of medicine, or surgery, any case, which either got well of itself, or was benefited by any mode of treatment. Opening the tumor, either with caustics, or cutting instruments, has generally only tended to hasten the fatal event of the disease. Death soon follows an operation of this kind, and sometimes instantly. Tulpius observes on this subject; *quam calamitatem si quidem reformides, chirurge, cave sis improvide aperias, quod tam facilè occidit hominem.* (*Observ. Med.*)

But, whether the tumor be opened, or not, still the disease is one of the most fatal, to which children are exposed. When afflicted with it, they very seldom live till three years of age; but, after lingering several months from their birth, suddenly die. It has been said, that children, with spina bifida, always have their legs in a paralytic state. However, this is not true; for the largest spina bifida I ever saw, was under my friend Mr. Maul, of Southampton, and was unattended with any weakness of the legs. Indeed, the child was, to all appearance, as stout, healthy, and full of play, as possible. The fatal event, however, took place after a time, as usual; and, if my memory does not fail me, Mr. Maul noticed, that a little before death, a remarkable subsidence of the swelling occurred, though it never burst externally. Still it is a fact, that many infants, with spina bifida, have paralytic legs, and can neither retain their feces, nor urine.

If we draw our inferences from the cases, and remarks offered by almost every writer on spina bifida, we must regard all attempts to cure the disorder, by making any kind of opening, as exceedingly perilous, if not positively fatal. It is to be observed, at the same time, that some practitioners have not altogether abandoned the idea of devising a mode of accomplishing a cure, at least in a few instances. Mr. B. Bell says, that if the tumor proceeded from disease of the spinal marrow, or its membranes, no means of cure will probably ever be discovered. But, if the deficiency in the spinous processes of the vertebræ, with which the disease is always accompanied, is not an effect of the complaint, as was commonly imagined, and if the collection of fluid takes place, from the want of resistance in the dura mater, in consequence of the imperfection of the bones, Mr. B. Bell questions, whether it would not be proper to tie the base of the tumor with a ligature, not merely with a view of removing the swelling, but in order to resist the propulsion of the cyst further outward. Mr. Bell acknowledges, that the event of this practice must be considered as very dubious; but, expresses his wish to devise any plan, that would afford even the least chance of success, in a case which must terminate in an unfavourable manner. Mr. Bell mentioned the design of putting the method to a trial, on the first opportunity, and after the detachment of the swelling on the outside of the ligature, he intended to keep a soft compress on the part with a proper bandage. I do not know whether this gentleman ever put the above scheme in practice; but suppose not. It is properly objected to by the author of the article *Spina Bifida* in the *Encyclopédie Méthodique, Part. Chir.* because the disease is often attended with other mischief of the spinal marrow and brain, and the base of the swelling is almost always too large to admit of being tied at all, or not without hazard of dangerous consequences.

Richter has proposed the trial of two caustic issues at a little distance from the swelling; but, I am not acquainted with any facts in favour of this practice.

Mr. Abernethy first suggested the trial of a gentle degree of pressure on the tumor from its commencement, with the view of producing absorption of the fluid, and preventing the distention of the unsupported dura mater. Were the fluid to continue to increase, notwithstanding such pressure, Mr. Abernethy thinks, that as death would be inevitable on the tumor bursting, it might be vindicable to let out the fluid, by means of a puncture, made with a finely-cutting instrument. The wound is to be immediately afterwards closed with sticking plaster, and, if possible, healed. Another accumulation is then to be prevented, if practicable, with bandages and topical applications. Mr. Abernethy actually made the experiment of a puncture in one hopeless instance, in which, indeed, the swelling had previously just begun to burst. The puncture was repeated, every fourth day, for six weeks, during which time the child's health continued unaffected. The wounds were regularly healed; but the plaster having been rubbed off one of the punctures, the part ulcerated, the opening could not be healed, the discharge, from having been of an aqueous quality, became purulent, and death ensued. This case was also unfavourable for the trial of the method, as the integuments covering the tumor were diseased, and had no disposition to contract.

The annexed case, published by Sir Astley Cooper, will serve to show the benefit, which may be derived from pressure.

" James Applebee, Baldwin-street, Old-street, was born on the 19th of May, 1807, and his mother, immediately after his birth, observed a round and transparent tumor on the loins, of the size of a large walnut. On the 22d of June, 1807, the child was brought to my house, and I found, that although it had spina bifida, the head was not unusually large; and the motions of its legs were perfect; and its stools and urine were discharged naturally. I applied a roller around the child's waist, so as to compress the tumor, being induced to do so from considering it as a species of hernia, and that the deficiency of the spine might be compensated for by external pressure. The pressure, made by the roller, had no unpleasant influence on its voluntary powers; its stools and urine continued to be properly discharged, but the mother thought, that the child was occasionally convulsed. At the end of a week, a piece of plaster of Paris, somewhat hollowed, and that hollow partly filled with a piece of loose lint, was placed upon the surface of the tumor; a strap of adhesive plaster was applied to prevent its changing its situation, and a roller was carried around the waist, to bind the plaster of Paris firmly upon the back, and to compress the tumor as much as the child could bear. This treatment was continued until the month of October, during which time, the tumor was examined about three times a week, and the mother reported, that the child was occasionally convulsed. When the child was five months old, a truss was applied, similar in form to that which I sometimes use for umbilical hernia in children, and this has been continued ever since. At the age of fifteen months it began to make use of its limbs; it could crawl along a passage and up two pair of stairs. At eighteen months, by some accident, the truss slipped from the tumor, which had become of the size of a small orange, and the mother observed, when it was reduced, that the child appeared in some degree dull; and this was always the case, if the truss was left off for a few minutes, and then re-applied. At fifteen months, he began to talk; and at two years of age, he could walk alone. He now goes to school, runs, jumps, and plays about, as other children. His powers of mind do not appear to differ from those of other children. His memory is retentive, and he learns with facility. He had the measles and small-pox in the first year, and the hooping-cough at three years. His head previously and subsequently to the bones closing, has preserved a due proportion to other parts of the body. The tumor is kept by the truss entirely within the channel of the spine: but when the truss is removed, it soon becomes of the size of half a small orange. It is therefore necessary, that the use of the truss should be continued. When the truss is removed, the finger can be readily pressed through the tumor into the channel of the spine." (*Med. Chir. Trans. Vol.* 2, *p.* 323, *&c.*)

The next case, also published by Sir Astley Cooper, will prove, that spina bifida may sometimes be treated on another plan, so as to accomplish a permanent cure.

"January 21st, 1809, Mrs. Little of No. 27, Limehouse Causeway brought to my house her son, aged ten weeks, who was the subject of spina bifida. The tumor was situated on the loins; it was soft, elastic, and transparent; and its size about as large as a billiard ball when cut in half; his legs were perfectly sensible, and his urine and feces were under the power of the will, &c. Having endeavoured to push the water, contained in the tumor, into the channel of the spine, and finding that if the whole was returned, the pressure would be too great upon the brain; I thought it a fair opportunity of trying what would be the effect of evacuating the swelling by means of a very fine pointed instrument, and by subsequent pressure to bring it into the state of the spina bifida in Applebee's child. I therefore immediately punctured the tumor with a needle, and drew off about two ounces of water. On the 25th January, finding the tumor as large as before it had been punctured, I opened it again, and in the same manner, and discharged about four ounces of fluid. The child cried when the fluid was evacuated, but not whilst it was passing off. On January 28th, the tumor was as large as at first; I opened it again, and discharged the fluid. A roller was applied over the tumor and around the abdomen. February 1st, it was again pricked, and two ounces of fluid discharged. On the 4th, three ounces of fluid were discharged. On the 9th, the same quantity of fluid was evacuated as on the 4th; but, instead of its being perfectly clear, as at first, it was now sanious, and it had been gradually becoming so in the three former operations. On the 13th, the same quantity of fluid was taken away; a flannel roller was applied over the tumor and around the abdomen; a piece of pasteboard was placed upon the flannel roller over the tumor, and another roller over the pasteboard to confine it. On the 17th, three ounces of fluid, of a more limpid kind, were discharged; the pasteboard was again applied. On the 27th, the surface of the tumor inflamed; the fluid, not more than half its former quantity, was mixed with coagulable lymph, and the child suffering considerable constitutional irritation, was ordered calomel and scammony, and the rollers were discontinued. On the 26th, the tumor was not more than a quarter of its former size; it felt solid; the integuments were thickened, and it had all the appearance of having undergone the adhesive inflammation. On the 28th it was still more reduced in size, and felt solid. March 8th, the swelling was very much lessened; the skin over it thickened and wrinkled; a roller was again had recourse to; a card was put over the tumor, and a second roller was applied. March 11th, the tumor was much reduced; the skin covering it was a little ulcerated. On the 15th, it was flat, but still a little ulcerated. On the 27th, the effused coagulable lymph was considerably reduced in quantity, and of a very firm consistence. On the 2d of May, nothing more than a loose pendulous bag of skin remained, and the child appearing to be perfectly well, the bandage was soon left off. On December the 18th, the child was attacked with the small-pox, and went well through the disease. The skin now hangs flaccid from the basis of the sacrum; its centre is drawn to the spine, to which it is united, and thus the appearance of a navel is produced in the tumor by retraction of the skin. The pricks of the needles are very obvious, forming slight indentations." (See *Med. Chir. Trans. Vol.* 2, *p.* 326—329.)

At the time when Sir A. Cooper transmitted this case to the Medical and Chirurgical Society, it had been under his observation two years and a half.

The first of the preceding observations exemplifies the palliative treatment, adopted by the latter gentleman, and consisting of the application of pressure in the manner of a truss for hernia; the second shows the radical mode of cure by puncturing the swelling from time to time with a needle, and exciting the adhesive inflammation, which, with the assistance of pressure, stops the disease altogether, that is to say, in such examples as admit of cure.

Children are sometimes born with tumors, analogous to spina bifida, but situated on the head. There is a deficiency of bone at some part of the skull, and through the opening a sac, composed of the dura mater, protrudes, covered only by the integuments. Mr. Earle lately met with such a swelling situated upon the occiput of a female infant. The plan of repeatedly making small punctures with a common needle, discharging the fluid, healing up the punctures and applying pressure, was tried, and followed up for some time without the occurrence of any unpleasant symptoms. Even punctures were sometimes made with an ordinary lancet; yet the child suffered no harm from the operation, and some hopes of a cure were indulged. At length, however, ulceration of the swelling took place, the child became indisposed, and rapidly sunk. (See *Med. Chir. Trans. Vol.* 7, *p.* 427.) Consult *Ruyschii Obs. Anat. Warner's Cases in Surgery. B. Bell's System of Surgery, Vol.* 5. *Acrel in Schwed. Abhandl.* x. *B. p.* 291, *&c. Murray, Opusc.* 2, *No.* 5, *et Med. Pract. Bibl.* 3, *p.* 612. *Portal, Cours d'Anat. Med. T.* 4, *p.* 66. *Lassus, Pathologie Chir. T.* 1, *p.* 260, *et seq. Edit.* 1809. *Abernethy's Surgical and Physiological Essays, Parts* 1 *and* 3. *T. V. Okes, An Account of Spina Bifida, with Remarks on the Method of Treatment, proposed by Mr. Abernethy, 8vo. Cambridge,* 1810. *Encyclopédie Méthodique, Part Chir. Art. Spina Bifida. Richter, Anfangsgr. der Wundarzn. B.* 5, *Kap. Sir A. Cooper, in Med. Chir. Trans. Vol.* 2, *p.* 322, *&c. H. Earle, in the same work, Vol.* 7, *p.* 427, *&c. Edinb. Med. and Surg. Journ. No.* 67.

SPINA VENTOSA. The Arabian writers first employed this term to express a disease, in which matter formed in the interior of a bone, and afterwards made its way outward beneath the skin. Until the matter had escaped from within the bone, these authors describe the pain as being incessant and intolerable; but that after the pus had made its way outward by fistulous openings, the pain underwent a considerable diminution. The matter sometimes insinuated itself, from the interior of the bone, into the cellular substance, so as to render it soft and flabby, though not always attended with any change of colour in the skin. The swelling had some of the appearance of emphysema. To express this state, the Arabians added the term *ventosa* to that of *spina*, which was employed, before their time, to express the nature of the pain attendant on the disease. (See an account of this subject in the *Encyclopédie Méthodique, Part. Chir. Art. Spina Ventosa.*)

The term *spina ventosa* has, since the time of the Arabian writers, been used by many to signify the disease named *white-swelling*, and the former might also mean by it a similar affection, though the contrary may be inferred from their account of the matter passing from the interior of the bone under the integuments, a thing which I believe never yet happened in any case of white-swelling. Another, and perhaps, a decisive argument, against the original signification of the word being the same as that of white-swelling, is, that it was not restricted to diseases of the joints and heads of the bones; but was also applied to abscesses, which commenced in the cavities of the middle portions of the long bones, where, I need hardly observe, white-swellings never make their attack.

For these reasons, many respectable authors have implied by the term *spina ventosa*, an abscess, in the interior of the bone. (See, on this subject, *Latta's System of Surgery, Vol.* 1, *p.* 165.) Cases of this latter kind, I know, are infinitely rare, compared with that common disorder, the white-swelling; and, I am also certain, from the descriptions given by some authors, that their cases of spina ventosa were in reality instances of necrosis. But, that abscesses do occur, and begin in the interior of the bones, more particularly of those of young persons, I have no doubt myself, both from two or three cases, which I remember having seen in St. Bartholomew's Hospital, and from some cases recorded by the most authentic writers. I cannot conceive, however, that suppuration can take place to any extent within a long bone, without being followed by necrosis.

Dr. Cumin, however, whose ingenious arrangement of diseases of bones has just made its appearance, saw a case in which, though matter had formed within one of the bones of a diseased finger, and it was in a state of decay, it was certainly not affected with necrosis; "for interstitial absorption seemed to be going on in it to the last, and no line of separation could be detected between the diseased parts, and the healthy articulating extremities." (See *Edinb. Med. and Surg. Journ. No.* 82.)

J. L. Petit relates, that a man, with a tumor on the middle of the tibia, who had been treated by him as a venereal patient, found, a fortnight afterwards, that the pains which had never ceased, now began to grow more violent. The patient was feverish, his legs became red, and even painful, externally. An incision was made in the situation of the tumor with a view of letting out the matter which was suspected to be the occasion of the bad symptoms, and to have insinuated itself under the periosteum. The incision was of no service, and, two days afterwards, the trepan was applied, by which means, a large quantity of matter was let out. The medullary part of the bone seemed quite annihilated, and the cavity almost empty. Petit made three other perforations with the trepan, and cut away the intervening pieces of bone. The actual cautery was also used several times to destroy the caries, and the patient at length got well. (*Traité des Maladies des Os, de J. L. Petit.*) If any one doubt, that abscesses ever form in the middle of the long bones, I must request him to consult Mr. Hey's *Practical Observations in Surgery, p.* 22, where he may peruse two very interesting cases illustrative of what Mr. Hey calls *Abscess in the Tibia with Caries.*

It must be confessed, however, that these were only cases of necrosis, for which affection the term caries is too often inaccurately used. Indeed, it would appear, from the observations of Dr. Macartney, that a very small suppuration in the medulla is accompanied with the beginning of those changes of the periosteum, which attend necrosis. (See *Necrosis, p.* 762.)

For an account of spina ventosa, in the sense of white-swelling, refer to *Joints. J. Pandolphinus, De Ventositatis Spinæ Sævissimo Morbo,* 12*mo. Norib.* 1674. *A. J. van der Meer, De Spina Ventosa, Duisb.* 1729. *F. L. Augustin, de Spina Ventosa Ossium, Icon.* 4, 4*to. Halæ,* 1797. *F. H. Schuchardt, Annotata quædam de Spina Ventosa, cum annexa singulari hujus morbi observatione,* 12*mo. Marburg.* 1817.

SPIRITUS AMMONIÆ COMPOSITUS. Besides the well known uses of this medicine internally exhibited, its vapours are an exceedingly proper application to the eye in some cases of chronic ophthalmy. Scarpa recommends a reremedy of a similar nature.

SPLINTS. Long thin pieces of wood, or tin, or strong pasteboard, employed for preventing the ends of broken bones from moving so as to interrupt the process by which fractures unite. These instruments are sometimes used in other cases, for the purpose of keeping limbs from moving, particularly in some kinds of dislocations, wounds, &c.

In simple fractures of the arm, forearm, or even of the thigh, or leg, in young infants, it matters not whether the splints be made of wood, pasteboard, or tin. In this country, surgeons usually keep sets of splints made expressly for the leg. These are of different sizes, excavated and shaped to the part, and furnished below with apertures for the projecting malleoli. When the limb is laid upon its outside, the foot is also usually supported and kept steady by the under splint extending some distance towards the toes. Very excellent splints for the legs of young children are made of strong pasteboard, accommodated in shape to the contour of the limb. Splints for the thigh, arm, and forearm, whether made of tin, or wood, should always be slightly concave on the side, which is to be applied to the broken limb. They should likewise be made as thin and light, as is consistent with the necessary degree of strength for preventing the broken bone from bending. The sets of splints, which are used for fractured legs and thighs in England, are frequently furnished with straps, which have a great many small perforations in them at stated distances, and can thus be easily fastened by means of little pegs for the purpose. Tapes are also sometimes employed; but they often get loose, and cannot be depended upon so well as leather straps. Pasteboard, as a material for splints, has one advantage, viz.; when wet, it becomes soft, and admits of being accurately applied to every point of the surface of the limb: consequently, as soon as it dries and recovers its firmness again, it retains the exact shape of the part, and makes everywhere equal pressure on it, without incommoding the patient. Pasteboard, however, is hardly strong and durable enough for many fractures; nor will it answer when there is a discharge, nor when the surgeon wishes to employ any fluid applications. But, it is generally allowed, that no substance is better calculated for supporting the fractured lower jaw; for, it is perfectly strong enough for this particular case, and if wet before being applied, it forms when dry a solid covering, most accurately corresponding to the shape of the jaw.

Whatever may be the substance, of which splints are made, they ought always to be at least as long as the fractured bone; and if the situation of the limb will allow, they ought, says Boyer, to extend its whole length. "For instance, (says he) for simple fractures of the thighs of very young children, the pasteboard splints, which I employ, reach from the upper part of the thigh, to the lower part of the leg. Generally speaking, the longer splints are, the better they fix the limb, and keep the fracture steady." (*Boyer, Traité des Mal. Chir. T.* 3, *p.* 50.)

The number of splints must depend upon their breadth, and the thickness of the limb. For the forearm, two are sufficient; for the upper arm and thigh four are often used; and for the leg two, and sometimes three.

In cases of fractured thighs, when the straight position is preferred, the external splint should extend from the crista of the ilium to some little distance beyond the sole of the foot; while the inner one should reach from the upper and internal part of the thigh also beyond the sole of the foot. With respect to the anterior splint it is indifferent, whether it only reaches from the groin to the knee, or as far as the lower part of the leg.

The lateral splints for a broken leg ought to be sufficiently long to embrace the knee and confine the motions of the foot and ankle. When the straight posture is adopted, a splint is frequently laid along the front of the leg, from the patella to the lower part of the tibia. None however can ever be required under the limb, as there the bedding itself more conveniently affords the necessary degree of support.

Of all the different pieces of the apparatus for the treatment of fractures, the splints are by far the most important and essential. Without them, indeed, it would be in vain to attempt to keep the extremities of the fracture from being displaced.

As splints are generally composed of hard materials, the bad effects of their pressure upon the skin must always be counteracted by placing a sufficient quantity of tow, wool, or other soft substance between them and the limb.

In order to understand, however, the principles, which should guide the surgeon in the choice and application of splints, many remarks, offered in the article *Fracture,* must be consulted.

SPONGIA PRÆPARATA. (*Prepared Sponge; Sponge-tent.*) Formed by dipping pieces of sponge in hot melted emplastrum ceræ compositum, and pressing them between two iron plates. As soon as cold, the substance thus formed, may be cut into pieces of any shape. It was formerly much used for dilating small openings, for which it was well adapted, as when the wax melted, the elasticity of the sponge made it expand and distend the opening. However, the best modern surgeons seldom employ it.

SPONGIA USTA. (*Burnt Sponge.*) This medicine, which the preparations of iodine are likely to supersede, was often given in the form of lozenges, in cases of bronchocele, in which particular instances much efficacy was imputed to allowing the lozenges to dissolve gradually under the tongue. Burnt sponge has also been exhibited in many scrophulous diseases, and in chronic enlargements of the prostate gland. The dose is from a scruple to a dram.

STAFF. An instrument of considerable importance in the operation of lithotomy, being in fact the director for the gorget, or knife. It is made of steel, and its handle is generally rough, in order that it may be more securely held. As it is intended to be introduced through the urethra, its shape ought to be principally determined by the natural course of that passage. The English generally employ a staff, the curvature of which forms the segment of a larger circle, than that described by the curvature of a staff used by the French practitioners. (See *Roux, Voyage fait à Londres en* 1814, *ou Parallèle* *de la Chirurgie Angloise, &c. p.* 319.) In other words, the French staff turns more upward than ours, as it approaches and enters the bladder. There may be some advantage in this construction, inasmuch, as it tends to make the gorget enter in the direction of the long axis of the bladder; yet, a great deal more seems to me to depend upon the position, in which the staff is held, than upon its shape. Lithotomists should always employ as large a staff as can be easily introduced, because the operation will thereby be facilitated. The groove, the most important part of the staff, is of course situated upon the convexity of the curved part of the instrument, or upon that portion, which, when introduced, lies in the membranous part of the urethra, prostate gland, and the bladder. It should always be made very broad and deep, as recommended by Langenbeck, and Mr. Martineau. (See *Lithotomy.*) The termination of the groove, at the end of the instrument, should be closed, so as to stop the further entrance of the gorget, and prevent the beak of the latter instrument from doing mischief. English surgeons have been justly censured by Desault and Sabatier, for neglecting this essential caution; for, certainly, the most fatal injury may be done by the gorget slipping beyond the end of the staff. (See *Lithotomy.*) For my own part, if I am more sure of any one thing in surgery, than another, it is this, that the beak of a gorget in the bladder ought never to pass out of, or beyond the groove of the staff.

STAPHYLOMA. (from σταφυλη, a grape, from its being thought to resemble a grape.) Is that disease of the eyeball, in which the cornea loses its natural transparency, rises above the level of the eye, and even projects beyond the eyelids, in the form of an elongated, whitish, or pearl-coloured tumor, which is sometimes smooth, sometimes uneven, and, according to Scarpa, attended with total loss of sight. However, staphyloma is either *partial*, or *total*, that is to say, it affects only a part, or the whole of the cornea; and, in the first case, if there be not too much additional injury of the eye, a degree of vision may yet be left, and even admit of further improvement. The circumstance of Scarpa's observations applying only to cases, in which the eyesight is already destroyed, accounts for some important differences between him and other writers, who, in the practice which they advise, refer to the *partial* staphyloma, and cases, in which the sight is not quite annihilated. Scarpa does not mention adhesion of the iris to the diseased cornea, as a part of the definition of staphyloma; a point in which he differs both from Richter and Beer. (*Lehre von den Augenkr. B.* 2, *p.* 69.) However, Scarpa may be correct; for though, as Mr. Wardrop remarks, "the internal surface of the cornea adheres to the iris in *almost* every case of staphyloma," (*Essays on the Morbid Anat. of the Eye, Vol.* 1, *p.* 101,) yet, as it does not invariably do so, the circumstance forms no essential part of the nature of the disease. In some instances, Mr. Wardrop has seen the opacity confined to one half of the cornea, generally the lower one. (*Vol. cit. p.* 100.)

Scarpa observes, that infants are often attacked by this disease soon after their birth, and mostly in consequence of purulent ophthalmy. It is also produced by the small-pox, yet never during its eruption; nor during the stage of suppuration; but, when the pustules dry, and even after the detachment of the variolous scabs.

In a great number of subjects, says Scarpa, when the staphyloma has attained a certain elevation above the cornea, it becomes stationary, or only increases in due proportion to the rest of the eye. In other instances, the small tumor of the cornea enlarges in all its dimensions, and in such a disproportion to the rest of the eye, that at length it protrudes considerably between the eyelids, to the great molestation and deformity of the patient.

This disease is justly considered as one of the most serious to which the eyeball is subject; for, to the total and irremediable loss of sight that it occasions, are added all the evils which necessarily result from the bulk and protuberance of the staphyloma. In such circumstances, the continual exposure of the eyeball to the contact of the air, and particles of matter suspended in it; the friction of the eyelashes; the incessant flux of tears down the subjacent cheek; render the eye painful and inflamed; the sound one is affected by sympathy, and the diseased one at length ulcerates, together with the lower eyelid and cheek, on which it presses.

According to Richter (*Obs. Chir. Fasc.* 2,) staphyloma is generally formed, without the swelling of the cornea being preceded by any of those morbific dispositions, which are usually considered capable of weakening the texture and elasticity of the cornea; which, in fact, acquires a much greater thickness, than what it has in its natural state, and, consequently, staphyloma, far from being concave within, is everywhere compact and solid; though it ought to be quite the contrary, if the tumor were occasioned, as Beer yet appears to believe, by an immoderate distention, operating on the cornea from within outward, with absorption of its natural texture.

Scarpa thinks, that Richter has generalized his doctrine too much, by not drawing any line of distinction between the staphyloma of recent occurrence in infants, and that of adult subjects, in whom the disease has acquired so large a volume, as to protrude considerably beyond the eyelids. He agrees with Richter, that the recent staphyloma in infants is quite compact and solid, on account of the augmented thickness of the cornea; but he is convinced by repeated observation, that, in this very same staphyloma, originally quite solid and compact, the cornea becomes thinner, or, at all events, is not thicker than natural, after the disease has existed a series of years in adult subjects, and in whom the swelling of the cornea has attained such a size as to protrude between the eyelids. The tumor, he observes, is not solid throughout, except in regard to its containing, in its amplified state, the iris, the crystalline, and very often, also, a portion of the vitreous humour.

The cornea of infants, in its natural state, is, at least, twice as thick and pulpy as that of adults, and, consequently, the anterior chamber of the aqueous humour, in the former, is comparatively so contracted, to what it is in the latter, that, in infants at the breast, the cornea may be considered as in contact with the iris.

To such qualities of the cornea, in children of tender years, and to the natural narrowness of the anterior chamber of the aqueous humour, Scarpa imputes the cause, why ophthalmies in infants so often produce opacity and thickening of this membrane. The cornea swells, becomes preternaturally thickened, and is very soon converted into a pointed, whitish, or pearl coloured tumor, without any cavity internally, and either in perfect contact with, or adherent to, the iris. In the course of years, however, Scarpa remarks, that this disease undergoes new modifications. For, as the whole eye enlarges with age, the iris, and crystalline, from causes not sufficiently understood, abandon their natural situation, and are propelled forward, nearer and nearer to the cornea, which they in time distend in all its dimensions, so as to make it project beyond the eyelids, at the same time rendering it thinner in a ratio to its bulk and magnitude. Scarpa has never met with a voluminous staphyloma, projecting beyond the eyelids in adult persons, which had not originally made its first appearance in infancy; and he has invariably found, that the thickness, and density of the cornea, both in the living, and dead bodies of those, who have been affected with this disease, were in an inverse ratio to the eye. In inveterate cases of staphyloma, forming a large protuberance beyond the eyelids, the iris may here and there be clearly discerned through the diseased cornea, and, if it be not equally manifest at all points of the tumor, it is because the conjunctiva externally spread over the cornea forms, in conjunction with its varicose vessels, on the surface of the tumor, a stratum of matter, not everywhere equally dense, and opaque. This dense stratum of the conjunctiva, spread over the cornea, easily causes deception in a staphyloma of considerable bulk. The more the tumor increases, the more the substance of the cornea seems to become dense and thickened; while, in reality, the contrary happens; for the augmentation in the density of the layer of the conjunctiva, covering the cornea, only partly supplies the diminution in the thickness of the latter membrane. In staphyloma, as Mr. Wardrop observes, " the pupil is hid according to the situation and degree of the opacity of the cornea; but, in most cases, it is altogether obliterated, and even in those, where a transparent portion of the cornea is opposite to it, the vision is much impaired; for, as *the eye has lost its form as an optical instrument, the change in its refractive power must render objects very indistinct.*" (*Morbid Anat. of the Eye*, *Vol.* 1, *p*. 101.)

The sclerotica is also subject to staphyloma, that is, to a partial distention, and prominence of its anterior hemisphere in the white of the eye. Scarpa never met with any tumor, or prominence on the front surface of the sclerotica, corresponding to the white of the eye; but in the dead subject he has met with two examples of staphyloma, in the posterior hemisphere of the sclerotica. According to Mr. Travers, in the spheroidal staphyloma of the cornea, the sclerotica sometimes yields so much as greatly to increase the deformity. " This happens in hydropic and other degenerations of the humours. It also frequently becomes extenuated, or bulged near its junction with the cornea in the amaurosis, which follows inflammation of the choroid. This protrusion, larger or smaller, is sometimes circumscribed, and, in other instances, diffused over a large portion of the ball. It is often seen encircling the cornea, and presenting a sacculated or pouched appearance. It has a bluish grey tint, &c." (*Synopsis of the Diseases of the Eye*, *p*. 130.)

When in the staphyloma of the cornea, this part is affected with irremediable opacity, Scarpa thinks, that if the disease be recent, and in a child, the only object must be to hinder the increase of the swelling of the cornea, the organization of which is already destroyed. The tumor must be levelled, and flattened as much as possible; and when the swelling of the cornea is inveterate, very large, and prominent beyond the eyelids, it is to be diminished by surgical means, so that it may return within the orbit, sufficiently to permit the deformity of the face to be amended by the application of an artificial eye.

In cases of recent staphyloma, Richter used to make at the bottom of the tumor of the cornea an artificial ulcer, by repeatedly applying the argentum nitratum, or the oxygenated muriate of antimony (butter of antimony), and to keep the little sore open by the continued use of the same caustic, with the view of effecting a diminution of the swelling of the cornea. In this way, he frequently succeeded in lessening staphyloma, and, in one particular case, he even restored the transparency of the cornea. *Ter repetitâ operatione, quarto scilicet, septimo et decimo die, ne vestigium quidem morbi die decimo-quarto superabat. Obs. Chir. Fasciculus* 2. In this plan, Mr. Guthrie conceives, that Richter evidently meant that the small ulcer, made with the caustic, should penetrate the cornea; and that from not comprehending this particular, Scarpa's trials of the method were unsuccessful. (*Operative Surgery of the Eye*, *p*. 175.) It appears, however, that Richter himself never intended, or attempted any thing more, than what Scarpa did afterwards; for, he expressly cautions the surgeon not to let the caustic penetrate through the cornea, this meaning, indeed, admits of no doubt: in his chapter on staphyloma, he refers for the description of the method to his observations on leucoma. (*Anfangsgr. &c. B.* 3, *p*. 138—139) where it is distinctly stated " *immer muss man wohl darauf merken dass das geschwür nich zu tief in die hornhaut eindringt, und dieselbe ganz und gar durchfrisst.*" Richter does not claim the proposal, as one originally made by himself, but mentions it as a suggestion made by Günz. (*Diss. de Staphylomate.*)

Though Scarpa frequently attempted to cure the recent staphyloma of infants, by the above method, he never met with such success, as could be at all compared with Richter's, either in restoring the transparency of the cornea, or accomplishing a diminution of the volume of the staphyloma. Having formed with the argentum nitratum a small ulcer, at the bottom of the cornea, and kept the sore open thirty days and more, he failed in obtaining any benefit, in respect to the diminution, much less the opacity of the cornea, in three infants, one a year and a half old, and the two others somewhat more than three, all which subjects had been recently attacked by staphyloma in one eye, in consequence of the small-pox. A violent chemosis, in a very short time, produced a staphyloma in the eye of a child five years old. Scarpa made an ulcer at the bottom of the cornea, into the unorganized, swollen substance of which he introduced, for a little depth, the flat part of a lancet. The sore was kept open for five weeks, with a solution of the argentum nitratum, and the staphyloma became somewhat flatter, so as to lose the acute prominence in its centre; but the cornea continued, as before, everywhere opaque. Though Scarpa employed the same method in two other subjects, of about the same age, and in the same circumstances; though he kept the ulcer open fifty days, he was never able to effect any depression or diminution of the staphyloma; and, consequently, the pointed, pearl-coloured projecting part of the tumor continued in the same state as it was before. The conical shape, which the cornea assumes in this disease, he observes, is a characteristic symptom by which a staphyloma may be distinguished from a leucoma, with total opacity of the cornea.

If, also, in the course of further trials, partial benefit be found to accrue from this plan, adopted not for the purpose of re-establishing the transparency of the cornea, but for that of merely checking, and diminishing the recent staphyloma in infants, still Scarpa is of opinion, that no one will be easily persuaded, that the same treatment can ever prove of the least service in diminishing the size of the large, inveterate, staphyloma in adults; in other words, of that which projects beyond the eyelids, and rests on the cheek. Under these circumstances, he believes, that there is no effectual means of restraining the progress of the complaint, and removing the deformity, but cutting away the staphyloma.

Mr. Guthrie considers Scarpa's application of Richter's method to young subjects, erroneous, because the thickness of the cornea in them prevents the caustic from quickly penetrating the anterior chamber, and considerable inflammation is brought on. (*Operative Surgery of the Eye*, *p.* 175.) It is to be recollected, however, that Scarpa, when he tried Richter's plan, never meant the caustic to penetrate the anterior chamber, but merely to form and keep up a sort of issue, the exact principle of treatment, which Richter himself intended.

Celsus describes two modes of cure; viz. that with a ligature, and the removal of a portion of the conical, most projecting part of the diseased cornea. (*Lib.* 9. *Cap.* 7.)

Though, says Scarpa, the first plan, or that of the ligature, is at present abandoned, the majority of surgeons still persevere in passing a needle and ligature through the lower part of the staphyloma, not for the purpose of tying or constricting the tumor, it is true, but of making a noose, in order to fix the eye conveniently, when the staphyloma is to be cut off in a circular manner. This use of a needle and ligature, which, I observe, is sanctioned by Mr. Travers, (*Synopsis, &c. p.* 285), is strongly disapproved of by Scarpa.

With regard to the second method of removing the staphyloma, or that of excision, Scarpa thinks that sufficient attention has not been paid to the directions of Celsus, that this operation should be done in the centre, or conical point of the tumor, and that as much of this part of the staphyloma ought to be cut away as will equal a lentil in size: *In summâ parte ejus ad lenticulæ magnitudinem exscindere.* Scarpa remarks, that the great importance of this precept can be duly appreciated only by those, who have often had occasion to compare the advantages of Celsus's doctrine, with the serious inconveniences which result from the practice of cutting away the staphyloma circularly at its base; and with the evils produced by a semicircular section, comprehending the sclerotica, in Woolhouse's manner, always followed by acute inflammation of the eyeball and eyelids, violent pains in the head, restlessness, spasms, copious, and sometimes gangrenous, suppurations of the eye and eyelids.

The patient being seated, Scarpa directs an assistant to support his head properly; then taking in his hand a knife, similar to what is used in the extraction of the cataract, he passes the instrument completely across the staphyloma, at the distance of one line and a half, or two lines, from the centre or apex of the tumor, from the external towards the internal angle of the eye, and, by passing the knife forward in the same direction, just as is done in the extraction of the cataract, he makes a semicircular incision downwards, in the most prominent part of the tumor. Having done this, he takes hold of the segment of the staphyloma with the forceps, and turning the edge of the knife upward, he completes the circular recision of the apex of the tumor, in such a way that the detached portion is one, two, three, or four lines in diameter, according to the size of the staphyloma. As a portion of the iris adhering to the cornea, from the very commencement of the disease, is commonly included in this section of the pointed part of the tumor, no sooner is the circular division of the apex of the staphyloma made, than the crystalline, or its nucleus, issues from the eye, followed by a portion of the vitreous humour. In consequence of this evacuation, the eyeball is often so diminished that it can be covered by the eyelids, to which Scarpa immediately applies a pledget of dry lint, supported by a retentive bandage.

When the eye and eyelids begin to be painful, inflame, and swell, as they generally do, on the fourth day, the eye is to be covered with a bread and milk poultice. When things proceed in a regular manner, the swelling of the eyelids subsides about the seventh, or ninth day, and purulent matter is seen on the poultice, blended with the vitreous humour. The matter afterwards becomes thick and whitish, the patient feels great relief, and the eyeball shrinks and sinks into the orbit.

At this period, on gently separating the eyelids, the conjunctiva is found swelled, and reddish, and the margin of the wound seems like a whitish circle. This is usually detached on the twelfth or fourteenth day after the operation, when the edge of the surface, from which the staphyloma was cut, becomes red, contracts, and daily diminishes, so that, at last, the wound is entirely closed. There only remains in the centre of the cornea, for a few days, a small fleshy prominence, resembling a little reddish papilla, which, after being touched a few times with the argentum nitratum, contracts, and heals.

So far, says Scarpa, are alarming symptoms from following this operation, that, in a great number of cases, the surgeon is even obliged, several days afterwards, to stimulate the eye on which it has been performed, in order to make it inflame, partly by leaving it a long while uncovered, and exposed to the air, partly by enlarging the circular recision, made in the centre of the staphyloma, of which another circular portion, half a line broad, is removed, in order to facilitate the more abundant discharge of the humours, and the ingress of air into the cavities of the eye, which are so backward to inflame. As soon as inflammation has invaded the interior of the eye, and suppuration has taken place, the rest of the cure regularly follows under the use of topical emollients, and is soon completed with all possible mildness.

It should be particularly recollected, that Scarpa means the foregoing practice, for inveterate cases of staphyloma, where the eyesight is totally lost, and the projection of the diseased cornea produces serious annoyance. Under other circumstances, the method can hardly be admissible. Amongst others, Dr. Vetch particularly objects to the removal of the apex of the tumor, as destructive of all chance of the recovery of a degree of vision; a consideration, however, which would not exist in the hopeless cases spoken of by Scarpa. Dr. Vetch also disapproves of letting out the aqueous humour in cases of staphyloma as an endless operation, from which no permanent effect takes place, the humour collecting again in a few hours; a sentiment which is likewise expressed by Mr. Travers. (See *Vetch on the Diseases of the Eye*, p. 63; *and B. Travers, Synopsis, &c. p.* 286.) For the purpose of accomplishing the gradual diminution of the tumor, and *bringing the eye into a state in which an artificial pupil may be made*, Dr. Vetch has employed caustic (the method commended both by Richter and Beer) and the introduction of a seton through the tumor. Beer confirms the statement of Scarpa, concerning the impossibility of restoring the transparency of any part of the cornea affected with staphyloma. For the relief of a partial staphyloma, he prefers the cautious application of the oxygenated muriate of antimony, by means of the point of a camel-hair brush, while the eyelids are held asunder. The diseased part of the cornea is to be smeared with it until a small white superficial slough is formed, when every particle of the caustic must be immediately washed out of the eye with another larger camel-hair brush, dipped in water, or milk. The application is not to be repeated, until the subsequent inflammation has quite subsided, and the slough been thrown off. Beer condemns all escharotic salves, because their action extends to parts, which should be left unirritated. (*Lehre von den Augenkr. B.* 2, *p.* 74.) Mr. Guthrie regards the treatment with caustic as only applicable to cases in adult subjects, where the diseased cornea is thin and the sclerotica nearly, or quite healthy. The knife, he says, is requisite in young, or old individuals, where the staphyloma is evidently thick and hard, and the front of the eye more or less varicose. (*Operative Surgery of the Eye*, *p.* 174.) In this last condition, indicated by the bluish, leaden appearance of the sclerotica, which seems to be penetrated, close to the cornea by many tortuous dark-red vessels, and accompanied in a more advanced stage by a bulging out of particular parts in the same situation, he says, "the anterior portion of the eye ought to be removed, and, with it, the vessels, which are in a varicose state." (*P.* 178.)

Wenzel, and numerous other writers, imply by Staphyloma, a protrusion of a piece of the iris, through a wound or ulcer of the eye. (See *Iris, Prolapsus of.*)

R. Fr. B. Hoelder, *De Staphylomate*, *Tubingæ*, 1748. *Scarpa sulle Mallattie degli Occhi, Ed.* 5. *G. J. Beer's Ansicht der Staphylomatosen Metamorphosen des Auges*, *&c. Wien.* 1805. *Nachtrag zur Ansicht*, *&c.* 1806; *and Lehre von den Augenkr. B.* 2, *p.* 69, *8vo. Wien.* 1817. *Richter*, *Anfangsgründe der Wundarzneykunst*, *B.* 3, *p.* 153, *&c. Gott.* 1795. *Sabatier*, *Médecine Operatoire*, *T.* 2, *p.* 191, *Ed.* 2, 1810. *James Wardrop*, *Essays on the Morbid Anatomy of the Human Eye*, *Vol.* 1, *p.* 99, *8vo. Edinb.* 1808. *B. Travers*, *Synopsis of the Diseases of the Eye*, *8vo. Lond.* 1820. *J. Vetch*, *A Practical Treatise on the Diseases of the Eye*, *8vo. Lond.* 1821. *G. J. Guthrie*, *Operative Surgery of the Eye*, *8vo. Lond.* 1823.

STEATOMA. (from στεαρ, fat.) A wen, or encysted tumor, containing fat. See *Tumors, Encysted.*

STELLA, or STELLATED BANDAGE. A bandage so named because it makes a cross, or star, on the back. It is a roller, applied in the manner of a figure 8, so as to keep back the shoulders. It is often employed in cases of fractures and dislocations of the clavicle.

STRAMONIUM. A series of interesting experiments were detailed in illustration of the properties of stramonium, in a Dissertation, which was read to the Medical Faculty of the University of Pennsylvania, on the 12th of May, 1797, by Dr. Samuel Cooper. The experiments, No. 15 and 16, merit particular notice in this Dictionary, as being, perhaps, the earliest discovery of the effect of the local application of powerful narcotics in dilating the pupil. A drop of an infusion of the powder of stramonium was let fall into the left eye. In half an hour the pupil began to enlarge, and attained its greatest dimensions about twelve hours after the experiment, at which time it was viewed in a considerable light, and seemed thrice as large as the other. It continued dilated two days. In a strong light, objects were seen more distinctly with the right eye; but, in a weak light, with the left. Some other gentlemen, however, on whom the experiment was tried, experienced no increased power of seeing in the dark. A drop of the expressed juice, dropped into the eye of a cat, soon converted the whole of the coloured part of the eye into pupil. (See *Caldwell's Medical Theses*, *p.* 173, *8vo. Philadelphia*, 1805.) Stramonium then resembles belladonna and hyosciamus in its action upon the iris. It has been exhibited internally, in epilepsy, tic douleureux, and severe chronic pains, and used in poultices for dispersing indurations of the breast, and in ointments for allaying the pain of piles. The doses should at first be only gr. ss. of the extract twice a day, but they may be gradually increased to five grains.

STRICTURE. (from *stringo*, to bind.) A contracted state of some tube, or duct in the body. (See *Urethra, Strictures of; Œsophagus, &c. Rectum, &c.*) Stricture also means, in cases of strangulated hernia, the narrowest part of the opening, or passage through which the bowels protrude. (See *Hernia.*)

STRUMA. (from *struo*, to heap up.) Scrofula, or Scrophula. The King's Evil. (See *Scrophula.*)

STYE. A little inflammatory tumor on the eyelid. (See *Hordeolum.*)

SULPHURIC ACID. The strong sulphuric acid is used as a means of extricating from the nitrate of potash, or muriate of soda, certain gases for the purpose of purifying the air of sick rooms, or infected places. A few practitioners have also sometimes employed it, blended with sixteen times its weight of lard, as a local application for the cure of scabies. One drachm of it, mixed with an ounce of lard, is sometimes rubbed upon diseased joints, and with considerable effect, when the right cases are selected. (See *Joints.*) As a caustic, this acid is not generally eligible, because it is difficult to limit its operation exactly to the parts which are intended to be destroyed. A few years ago, a proposal was made to apply it along the outside of the eyelid, in cases of trichiasis, so as to produce a slough, and subsequent ulcer, the cicatrization of which draws out the inverted tursus. Nay, it is alleged, that the application sometimes produces an instantaneous amendment of the position of the eyelid. I have seen one example, in which the experiment was tried; but, whether it was owing to the acid not having been sufficiently applied, or other causes, the method did not answer so well as the usual plan of removing a part of the integuments with a cutting instrument. Sulphuric acid has also been employed in the cure of ectropium. (See *this word.*)

Diluted sulphuric acid is frequently employed as an ingredient in gargles. It is also commonly exhibited with a view of checking passive hemorrhages, and profuse nocturnal sweats in hectic fever. The dose is from ten to thirty drops.

This acid, in the diluted form, has been tried in venereal cases. According to Mr. Pearson, when a bad state of health prohibits the introduction of mercury, the case has not yet put on an unequivocal appearance, or dyspeptic symptoms, attended with profuse perspirations, harass the patient, it is an useful remedy, capable of giving a temporary check to the progress of the disease. He says, that he has often seen it arrest the progress of venereal ulcers of the tonsils, and make venereal eruptions fade and nearly disappear; but that these beneficial effects were never permanent. At the same time, he acknowledges that the medicine will confer actual and durable benefit in ulcers of the penis, groin, and throat, sometimes remaining stationary after a mercurial course. He has likewise found this acid very efficient, when mercury acts too violently upon the mouth. (See *Pearson's Obs. on the Effects of various Articles in the Cure of Lues Venerea, p.* 189—191. *Ed.* 2.)

In cases of poison, by sulphuric acid, the most successful treatment consists in making the patient drink large quantities of water, in which calcined magnesia is suspended. Should this last medicine, however, not be at hand, soap, blended with water, is the best substitute. While these remedies are preparing, copious draughts of some mucilaginous beverage, milk, or even of common water, should be administered without delay; for the practitioner should ever be mindful, that so rapidly does sulphuric acid operate upon the texture of the parts with which it comes into contact, that all chance of saving the patient must depend upon the quickness with which the means to counteract the poison are applied. After the acid has been diluted and neutralized, local and general bleeding, emollient clysters, and mucilaginous drinks, constitute the best remedies. (*Orfila, Traité des Poisons, &c. Vol.* 1, *p.* 434, *Ed.* 2.)

SUPPRESSION OF URINE. See *Urine, Retention of.*

SUPPURATION. A process, by which a peculiar fluid, termed *pus*, is formed in the substance, or from the surface, of parts of the body. From observations in the article *inflammation*, it appears, that, when this last affection is above a certain pitch, it sometimes terminates in suppuration.

When purulent matter accumulates in the part affected, it is termed an *abscess*, which is distinguished into several kinds, *acute, chronic, venereal, scrophulous*, &c.

It is observed by Professor Thomson, that the texture, in which suppuration seems to be most readily produced, by a certain degree of inflammation, is mucous membrane, whether this lines excretory ducts, or canals, or covers the inner surfaces of the respiratory, or urinary organs. In a few hours, after an irritating cause has been applied to these surfaces, the physical and chemical qualities of the fluid, which they secrete in their natural state are changed. From being a tough viscid substance, not easily miscible with water, the mucus of the nose and bronchia becomes, during an attack of inflammation, very readily miscible with water, of a yellowish white colour, and fluid consistence. If, in this state, the secretion from these membranes be examined with the microscope, it will be found to contain small globules, similar to those which are seen in the blood; and these globules are found to increase in number in proportion to the degree and continuance of the inflammation. We have examples of the production of this pus, or, at least, of a puriform fluid, in the respiratory organs of persons affected with catarrh, and in the urinary organs of those who labour under gonorrhœa. In the progress of these diseases, we can generally trace the changes, which take place by slow, but sensible degrees, in the nature of the secretion, from mucus to pus, and from pus back again to the state of mucus. This puriform discharge from mucous membranes, in a state of inflammation, may be kept up for months without these membranes appearing to undergo any other morbid changes than a slight degree of redness and swelling. A loss of substance, or ulceration, is found not to happen oftener, than in one case, out of ten examples of suppuration from mucous membranes. (*On Inflammation, p.* 305, 306.)

The same well-informed writer afterwards proceeds to explain, that suppuration may be readily produced in the skin, or cutaneous texture, by whatever excites inflammation in that texture, and causes a separation of the cuticle. We have examples of this fact, in blisters from cantharides, and in vesications of the cuticle from superficial burns. If the cuticle, covering a recent blister, or burn, be removed, and the cutis exposed to the irritation of stimulating substances, pus will soon be discharged from the abraded surface. Suppuration can be kept up in cutaneous texture, for an indefinite length of time, as we see done every day in the management of perpetual blisters. Ulceration is seldom observed in these cases, and, consequently, in cutaneous texture, loss of substance is by no means necessary for the production of pus.

If the cutis be divided, as in a wound, or a portion of it removed, as in the extirpation of tumors, and either the air, or any other external body, be permitted to remain in contact with the divided surfaces, the process of suppuration is speedily induced in the cellular texture subjacent to the skin. After the hemorrhage, which takes place from the small vessels, has ceased, an oozing of a fluid, at first resembling serum, occurs, which is gradually changed into pus. But in this case, as Dr. Thomson has correctly observed, the surface of the wound is previously covered with a layer of coagulable lymph, which is penetrated with blood vessels, and gradually raised into the little red eminences, termed granulations.

Appearances similar, though slighter in degree, says Dr. Thomson, are observed in cutaneous suppuration, giving probability to the opinion of Sir E. Home, that in inflammation, a vascular surface is produced previously to the formation of pus in a cellular membrane, and perhaps also in cutaneous texture. Dr. Thomson is inclined to believe, however, that no new vascular surface is generated in the inflammation of mucous membrane. Thus, we see, that in the formation of pus in mucous membrane, cutaneous texture, and exposed cellular substance, no ulceration, no breach of substance occurs: but that, on the contrary, in two of these textures, the cutaneous and cellular, there is an addition made to the parts by the exudation of coagulable lymph, which becomes organized. (*Thomson, p.* 305—308.)

SYMPTOMS OF SUPPURATION.

When matter is fully formed in a tumor, there is a remission of all the symptoms. The throbbing pain, which was before frequent, now goes off, and the patient complains of a more dull, constant, heavy pain. A conical eminence, or *pointing*, as it is termed, takes place at some part of the tumor, generally near its middle. In this situation, a whitish, or yellowish appearance is generally observable, instead of a deep red, which was previously apparent, and a fluctuation of a fluid underneath may be discovered, on a careful examination with the fingers. Sometimes, indeed, when an abscess is thickly covered with muscles and other parts, the fluctuation cannot be easily distinguished, though, from other concurring circumstances, there can hardly be the least doubt of there being even a very considerable collection of matter. An œdematous swelling over the situation of deeply situated abscesses is a symptom, which often occurs, and is well worthy the attention of every practical surgeon.

The discovery of the existence of deep abscesses is a circumstance of the highest importance in practice, and one which greatly involves the practitioner's reputation. In no part of surgery, is experience, in former similar cases, of greater use to him, than in the present; and however simple it may appear, yet nothing, it is certain, more readily distinguishes a man of observation and extensive practice, than his being able easily to detect collections of deep-seated matter. On the contrary, nothing so materially injures the character and professional credit of a surgeon, as his having in such cases given an inaccurate or unjust prognosis; for, in disorders of this kind, the nature and event of the case are generally at last clearly demonstrated to all concerned.

Together with the several local symptoms of the presence of pus, already enumerated, may be mentioned the frequent shiverings to which patients are liable, especially on the first formation of acute abscesses. However, these rigors seldom occur so as to be distinctly observed, unless the collection of matter be considerable, or situated internally in some of the viscera.

"In the progress of the fever, accompanying acute inflammation, (says Professor Thomson) rigors, or cold shiverings not unfrequently take place, which recur at irregular intervals, and are in general followed by a hot fit, and slight increase of the febrile symptoms. These rigors, or cold shiverings, in general indicate, when they occur in the progress of inflammatory diseases, that pus either is formed, or is about to be so. In inflammation, succeeding to injuries of the head, these rigors are often the first constitutional symptoms which give alarm to the well-informed practitioner: for, they are generally, though not always, an indication, that inflammation has already made a dangerous, if not fatal progress. These rigors also accompany the formation of pus in the viscera contained within the cavities of the chest and belly, and are often the first symptoms, which inform the practitioner, that his endeavours to procure resolution have not been successful." (See *Thomson's Lectures on Inflammation, p.* 321.)

Rigors, as Mr. Hunter remarked, are more common at the commencement of spontaneous inflammations, than in inflammations from external injury. They seldom occur in the suppurations, which follow operations.

According to Sir A. Cooper, when matter is formed upon the natural surfaces of the body, which are connected with vital organs, much irritation and disturbance take place; but, when matter is produced upon the surface of a wound, in a part not important to life, or upon parts of little vital importance, then its formation is often unpreceded by irritative fever. (See *Lectures, &c. Vol.* 1, *p.* 113.)

The constitutional symptoms which attend the formation of pus in the progress of chronic suppurations, are generally comprehended under the name of hectic fever. (See *Fevers.*)

The pain, attending what Mr. Hunter termed *suppurative* inflammation, is increased at the time when the arteries are dilated, and this gives the sensation called throbbing, in which every one can count his own pulse, by merely paying attention to the inflamed part. Perhaps this last symptom is one of the best characteristics of this species of inflammation. When the inflammation is moving from the adhesive state to the suppurative, the pain is considerably increased; but, when suppuration has taken place, the pain in some degree subsides.

The redness that took place in the adhesive stage is now increased, and is of a pale scarlet colour. The part, which was firm, hard, and swelled, in the previous stage of the inflammation, now becomes still more swelled, in consequence of the greater dilatation of the vessels, and the greater quantity of coagulating lymph thrown out. (*Hunter.*)

THEORY OF SUPPURATION.

The dissolution of the living solids of an animal body into pus, and the power of this fluid to continue the dissolution, are opinions, which are no longer entertained by any well-informed surgeons of the present day; and the use of such phrases as "*pus corrodes,*" "*it is acrid,*" &c. expressions, which imply an erroneous way of thinking, is very properly almost entirely discontinued in the language of every sensible medical man. If these notions were true, no sore, which discharges matter, could be exempted from a continual dissolution. Such ideas probably arose from the circumstance of an abscess being a hollow cavity in the solids, and from the supposition, that the whole of the original substance of that cavity was now the matter, which was found in it. This was a very natural way of accounting for the formation of pus by one entirely ignorant of the moving juices, the powers of the arteries, and what takes place in an abscess after it is opened. The knowledge of these three subjects, abstracted from the knowledge of the abscess before its being opened, should have led surgeons to account for the formation of pus from the blood by the powers of the arteries alone. According to the above erroneous principle, abscesses would continue to increase after being opened, as fast as before. Upon the principle of the solids being dissolved into pus, was founded the practice of bringing all indurated parts to suppuration, if possible, and not making an early opening. This was done for the purpose of giving time for the solids to melt down into pus; but, it was apparently forgotten, that abscesses formed matter after they were opened, and, therefore, the parts stood the same chance of dissolution into pus as before. Blinded with the idea, that the solids entered into the composition of pus, the partisans of this doctrine could never see pus flowing from any internal canal, as from the urethra, in cases of gonorrhœa, without supposing the existence of an ulcer in the passage. Such sentiments might be forgiven, before it was known, that these surfaces could, and generally did, form pus, without a breach of the solids; but, the continuance of this way of thinking now is not mere ignorance, but stupidity. The formation of pints of matter in the cavities of the chest and abdomen, without any breach in the solids, could not have been overlooked by the most zealous advocates for the doctrine of dissolution.

The moderns have been still more ridiculous; for, knowing, that it was denied that the solids were ever dissolved into pus, and that there was not a single proof of it, they have been busy in producing what to them seemed a proof. They have been putting dead animal matter into abscesses, and, finding, that it was either wholly, or in part dissolved, they, therefore, attributed the loss to its being formed into pus. This, however, was putting living and dead animal matter upon the same footing, which is a contradiction in itself; for, if the result of this experiment were really what they supposed it to be, the idea of living parts being dissolved into pus must be abandoned, because living and dead animal matter can never be considered in the same light.

It might have been remarked, that even extraneous animal matter would lie in abscesses for a considerable time, without being dissolved; and, that in abscesses arising, either from violence, or from a species of erysipelatous inflammation, there were often sloughs of the cellular membrane, which sloughs would come away, like wet tow, and, therefore, were not dissolved into pus. (*Hunter.*)

It might also have been noticed, that in abscesses of tendinous parts, as about the ankle, a tendon often mortified, and sloughed away, and that the sores would not heal till such sloughs were detached; but though this separation was sometimes not completed, before the expiration of months, yet the sloughs at last were thrown off, and consequently could not be converted into pus. Pieces of dead bone often lie soaking in matter for many months, without being changed into pus; and although bones, so circumstanced, may lose a considerable deal of their substance, a loss which some might impute to the dissolution of the bone into pus, yet, that waste can be accounted for and proved on the principle of absorption. The loss is always upon that surface, upon which the continuity is broken off, and it is a part of the process by which exfoliation of a dead piece of bone is accomplished. The formation of pus has been attributed to a kind of fermentation, in which both the solids and fluids were concerned. This doctrine is easily refuted by stating what happens in internal canals, which naturally secrete mucus, but frequently form pus, without any loss of substance, or any previous fermenting process. Were we to suppose a fermentation of the solids and fluids the immediate cause of the production of pus, whence could the solids come, which enter into the composition of discharges from the urethra? for the whole penis could not afford matter enough to form the pus, which is discharged in a common gonorrhœa. How also could the fermentation of the solids ever cease? for, there is the same surface secreting its mucus, whenever the formation of pus is discontinued. It may be asked, likewise, by what power the first particle of pus in an abscess, or on a sore, is formed, before there is any particle existing, which is capable of dissolving the solids? An abscess may be stationary for months, and at last be absorbed; what becomes of the fermentation all the while the collection of matter continues stationary?

Extravasated blood has been supposed to be capable of being converted into pus. We find, however, that blood, when extravasated, either from violence, or a rupture of a vessel, as in aneurism, never of itself becomes pus; nor was pus ever formed in these cases, without being preceded by inflammation. Both the blood and matter are also found together in the same cavity, under such circumstances. If the blood had coagulated, which it seldom does in cases of violence, it would be found still coagulated; and if it had not coagulated, the pus would be bloody. *(Hunter.)*

The modern theory of suppuration is, that the matter is separated from the blood by the secreting power of the vessels of the inflamed part, which acquire a new mode of action.

That pus is formed in the vessels, from which it exudes, by an action of these vessels analagous to secretion, was, so far as I know (says Professor Thomson), first distinctly suggested by Dr. Simpson of St. Andrew's, in his "*Dissertationes de Re Medica*," published in the year 1722. An opinion, similar to that of Dr. Simpson's, suggested itself, about the year 1756, to De Haen, from the consideration of what takes place in some cases of phthisis pulmonalis. This author observes, that pus was often expectorated, for a great length of time, by patients affected with phthisis, in whom, after death, no mark of ulceration could be perceived, not even the place in which the pus had been formed. The hypothesis of pus being a secretion was afterwards more fully considered by Dr. Morgan of Philadelphia, in his inaugural thesis printed at Edinburgh in 1763, entitled "*Puopoioses, sive Tentamen Medicum de Puris Confectione.*" The belief, that pus is a secretion, or formed at least by an action of the vessels analagous to secretion, was adopted by Mr. Hunter. Indeed, the merit of the original suggestion of this hypothesis has been ascribed to him, though improperly. Bruggman, professor of botany at Leyden, has maintained the same doctrine in an excellent thesis "*De Puogenia,*" published in 1785; and it is that which is now very generally taught all over Europe. (See *Thomson's Lectures on Inflammation, p.* 316, 317.) With respect to suppuration from exposed surfaces, however, it is more proper to say, that the vessels secrete a fluid, which *becomes* pus; for, Sir Everard Home has proved, that this fluid has not the purulent appearance, when first secreted, but acquires it, while it remains on the inflamed surface, and does not acquire it the less readily, when removed from that surface in a colourless state provided its proper temperature be preserved, and it be kept exposed to the air, which promotes the change.

The opinion, that suppuration is a process, analagous to glandular secretion, was at first hastily rejected by many, who were swayed by the fact, that no pus is ever found blended with the blood in the circulating system. By this mode of reasoning, however, such thinkers must be led to deny the universally received and undoubted doctrine, that the bile is a secretion; and, yet, it is well known, that nothing like this fluid can be detected in an analysis of the blood, and, indeed, a very small quantity would be sufficient to tinge the whole mass of circulating blood with a yellow colour, the same as we see in cases of jaundice. No one would wish to defend the idea of there being either pus, or bile, actually in the circulation; but, only the matter, or modifications of the matter, which, by the combinations, or whatever changes, we may choose to term them, taking place in the secreting vessels, and by their operations are converted into one of the particular fluids in question.

Violence done to parts is one of the great causes of suppuration; but, simply, violence does not always occasion it. The violence must be followed by a prevention of a cure in a more simple way, viz. by a restoration of the structure, so as to carry on the animal functions of the part. The parts must be kept long enough in that state into which they were put by the violence. Or, what is somewhat similar to this, the violence must be attended with death in a part, as, in many bruises, all mortifications and all sloughs, in consequence of the application of caustic, which, when the dead parts separate, leave internal surfaces exposed. *(Hunter.)*

As every injury, or effect of outward violence, under the above circumstances, is more or less exposed to the surrounding air, the application of air to internal surfaces, has been assigned as a cause of suppuration; but, certainly, the air has not the least effect on parts, circumstanced as above, for a stimulus would arise from a wound, were it even contained in a vacuum. In circumscribed abscesses, the air cannot possibly get to the parts, so as to have any share in making them suppurate.

In cases of emphysema, when the air is diffused over the whole body, no suppuration is the consequence, unless an exposure, or imperfection of some internal surface should be made, for the purpose of allowing the air to escape. A stronger proof, that it is not the admission of air, which makes parts inflame, is, that the cells in the soft parts of birds, and many of the cells and canals of their bones, communicating with the lungs, and always containing air, never inflame; but if these cells are exposed in an unnatural way, then the stimulus of imperfection is given, these cavities then inflame, and their surfaces either form adhesions together, or produce pus. *(Hunter.)*

When the interior of an abscess is examined, the cavity, which contained the matter, is observed to be lined with a smooth, membranous-looking substance, which is of a whitish ash-colour, and has a strong resemblance to coagulating lymph. This membrane-like substance has been termed the *sac* or *cyst* of the abscess. This sac, or cyst, seems in general to adhere by a vascular union to the surrounding cellular membrane, which is itself likewise denser in texture, and more vascular, than in the natural state, *(Thomson's Lectures, p.* 310), its cells being closed by coagulating lymph, effused in consequence of that species of inflammation, which Mr. Hunter termed the adhesive. Thus by the formation of a cyst, and the effusion of coagulating lymph in the cellular substance around the abscess, the collection of matter is bounded, and cannot become diffused, as it otherwise would do, in the communicating cavities of the cellular membrane, like the water in œdema.

Something, like this diffusion of pus, seems to occur in erysipelas phlegmonoides. "But, in this case, (says Professor Thomson) the vitality of greater, or less portions of the cellular substance is destroyed, the deadened portions are converted into dirty, whitish, ash-coloured sloughs, and it becomes extremely difficult to say, whether any part of the pus contained in the deadened cellular membrane has been formed in the cells in which it is contained, or has been absorbed into these cells, after being separated from the parietes of the cavities containing the sloughs themselves." (*Lectures, &c. p.* 310.)

There can be no doubt, that, after an abscess has received a membranous lining, or cyst, the secretion of pus is continued from the surface of the latter part entirely, as well as whatever degree of absorption of the same fluid happens to be going on. In fact, the cysts must be both secreting and absorbing surfaces. The circumstances which leave no doubt of this point, are the frequent, sudden, or gradual removal of very large manifest collections of matter; the continual changes occurring in the quantity and consistence of the pus; and the speedy filling of the cavity with purulent matter again after the first contents of the abscess have been discharged.

Another thing, which is yet a subject of controversy, is, whether suppuration ever happens unpreceded by inflammation? Professor Thomson, of Edinburgh, believes, that the affirmative opinion on this point was first suggested by De Haen, of Vienna; but, he thinks, that much of the difference of sentiment in this matter has proceeded from the vague "notions entertained with regard to the symptoms, which necessarily characterize the state of inflammation, and also with regard to the properties, by which pus is to be distinguished from other animal fluids. Accordingly, in almost all the examples, which De Haen has adduced to prove the formation of pus, without the previous existence of inflammation, he has himself occasion to remark the exudation of coagulating lymph, and the existence of preternatural adhesions; phenomena, which we now know are produced by that state, which Mr. Hunter has denominated adhesive inflammation." But, De Haen uses the term inflammation to express that state, which we denominate ulceration, or ulcerative absorption; for, in speaking of the cases of suppuration, which he has adduced, he observes, that, "in many of them no previous loss, or consumption of substance could be perceived." An observation, similar to this, was made about the same time, or perhaps a little earlier, by Dr. W. Hunter, and an account given of it in the second vol. of the London Medical Observations and Inquiries.

"Mr. Hunter, though he endeavours to establish it as an invariable fact, that no suppuration takes place, which is not preceded by inflammation, is of opinion, that collections of what he terms extraneous matter, something like pus, may form in various parts of the body, without the previous existence of inflammation in the parts, in which it is formed; and accordingly you will find, at page 300 of his treatise on Inflammation, a chapter entitled, 'Of Collections of Matter without Inflammation.'"

Professor Thomson doubts, however, "whether these collections of matter, said to be formed without inflammation, would not have been more properly denominated scrophulous abscesses, or chronic suppurations. I am disposed to believe (says he), that, in whatever texture, or organ of the body, scrophula manifests itself, there inflammation will be found to exist. The phenomena, it is true, of inflammation, both local and constitutional, are modified by the existence of the scrophulous diathesis; but, they are, I believe, always present in such a degree as to justify us in giving to them the name of inflammation, and in classing most, if not all local scrophulous affections, among inflammatory diseases. When the indolent swellings, of which Mr. Hunter speaks, occur near to the surface of the body, that part feels warmer than usual, as may be felt in white swellings of the joints. The swelling also is either preceded or accompanied with some degree of pain though, when the affection is internal, the patient may not always be very accurate with regard to the precise seat of this pain. When cut into, the parts also affected with scrophulous swellings are always found more vascular, than usual; in short, all the symptoms occur, by which the state of inflammation is characterized." (*On Inflammation, p.* 313, 314.) In another place Dr. Thomson admits, that the matter, which is formed in chronic suppurations, does not always accurately resemble that which is formed in acute abscesses; yet he contends, that it is so analogous both in its physical and chemical characters, as well as in the circumstances in which it is produced, that he can see no reason, why it should not be called pus, or a puriform fluid. (*P.* 315.) Sir A. Cooper also inculcates the common doctrine, that the formation of matter is preceded by inflammation, which, he says in healthy persons is active, while in the debilitated and scrophulous, it is often very slight, and the pus produced generally less perfect.

Sometimes there is even such a change of action, that the products entirely differ, being in scrophulous abscesses serous and curdlike, or even chalky. (*Lectures, &c. Vol.* 1, *p.* 120.)

QUALITIES OF PUS.

True pus has certain properties, which when taken singly, may belong to other secretions, but, which, conjointly, form the peculiar character of this fluid, viz. globules swimming in a fluid, which is coagulable by a solution of the muriate of ammonia, which no other animal secretion is, and, at the same time, a consequence of inflammation. This fluid like serum, is coagulable by heat. "Pus also contains abundance of fibrin: if water be poured upon pus, until the solid part, which remains at the bottom of the vessel be entirely deprived of its serum and globules, numerous portions of fibrin are found remaining, and although not exactly of the same size, yet they have a great uniformity of appearance. Thus pus is composed of serum, fibrin, and globules; and (says Sir A. Cooper) if I were to hazard a theory upon this subject, I should say that pus was composed of the constituent parts of the blood, slightly changed in their character by inflammation." (*Lectures, Vol.* 1, *p.* 121.)

The colour and the consistence of pus are the two qualities, which first attract the notice of every, the most superficial, observer. The colour arises from the largest portion of this fluid being composed of very small round bodies, much resembling the globules of cream. The fluid in which the globules of pus swim, might at first be supposed to be the serum of the blood, for it coagulates with heat, like the latter fluid. Pus is also probably mixed with a small quantity of coagulating lymph; as it partly coagulates, after it is secreted. However, the fluid part of pus is found to have properties, which serum has not. There being a similarity between pus and milk, experiments have been made to ascertain whether the fluid of pus could be coagulated with the gastric juice of animals: but, no coagulation could be effected in this manner; a solution of muriate of ammonia made the fluid part of pus coagulate; but, not any other secretion, or natural fluid; and, hence, it was concluded, that whenever globules were found swimming in a fluid, coagulable by muriate of ammonia, the matter was to be considered as pus.

The proportion, which the white globules bear to the other parts of pus, depends on the health of the parts producing the discharge. When the globules are very abundant, the matter is thicker and whiter, and is called healthy pus; the meaning of which is, that the solids, which produced it, are in good health; for, these appearances in the matter are no more than the result of certain salutary processes going on in the solids, the effect of which processes is to produce the disposition, on which both suppuration and granulation depend. *(Hunter.)*

Pus is specifically heavier than water, and is probably about as heavy as blood.

Besides the above properties, pus has a sweetish mawkish taste, very different from that of most other secretions, and the same taste takes place, whether it is pus from a sore, or an irritated inflamed surface.

Pus has a smell in some degree peculiar to itself; but this differs in different cases. Some diseases, it is said, may be known by the smell, as for instance, a gonorrhœa.

Pus sinks in water; mucus floats. Pus communicates to water an uniformly troubled white colour; mucus gives the appearance of stringy portions floating in it. Mucus is said to be more readily dissolved by sulphuric acid, than pus is. It has also been asserted, that if water be added to such solutions, the pus is precipitated to the bottom of the vessel; while the mucus, instead of being completely precipitated, forms swimming flakes. A solution of caustic alkali dissolves both pus and mucus; but, when water is added, pus is said to become separated, but not mucus.

Though solutions in chemical menstrua and precipitations have been thought a test of the distinction between these two fluids; yet, the method has been thought absurd and unphilosophical. It has been conceived, that all animal substances whatever, when in solution, either in acids or alkalies, would be in the same state, and therefore, that the precipitation would be the same in all. Calcareous earth, when dissolved in muriatic acid, is in that acid in the same state, whether it has been dissolved from chalk, limestone, marble, or calcareous spar, and precipitations from all are the same. Hence, experiments were made on organic, animal matter, such as muscle, tendon, cartilage, liver, and brain; and on inorganic, such as pus and the white of an egg. All these substances were dissolved in sulphuric acid, and precipitated with potassa. Each precipitation was examined with such magnifiers, as plainly showed the forms of the precipitates, all which appeared to be flaky substances. The precipitate by ammonia had exactly the same appearance. The same appearances were seen, when the above kinds of animal matter were dissolved by caustic potassa and precipitated with the muriatic acid. A flaky substance, void of any regular form, composed each precipitate. (*Hunter.*) For additional observations on the tests of pus, and an account of those suggested by Dr. Young, and Grasmeyer, see the *First Lines of the Practice of Surgery, Vol.* 1, *p.* 32, *Ed.* 4.

Pus does not irritate the particular surface which secretes it, though it may be very irritating to any other. Hence, no suppurating surface of any specific kind, can be kept up by its own matter; if this had not been the case, no sore of a specific quality, or producing matter of an irritating kind, could ever have been healed. This is similar to every other secretion of stimulating fluids, as the bile, tears, &c. which fluids do not stimulate their own glands, or ducts, but are capable of stimulating any other part of the body. *(Hunter.)*

Whenever a real disease attacks, either the suppurating surface, or the constitution, the production of true pus ceases, and the fluid becomes changed in some measure, in proportion to these morbid alterations. In general it becomes fetid, thinner, and more transparent, and partakes more of the nature of the blood, as is the case in most other secretions under similar circumstances.—*Sanies* is the term usually applied by surgeons, to pus, in this degenerated state. This unhealthy sort of matter has more of the serum, and, frequently more of the coagulating lymph in it, and less of the combination, which renders it coagulable by a solution of muriate of ammonia. It has also a greater proportion of the extraneous parts of the blood, which are soluble in water, such as salts; and it has a greater tendency, than true pus, to become putrid. Such unhealthy matter may even be irritating to the surface which produces it.

The secretion of matter is often suspended in fevers: while the constitution is thus disturbed, a sore will frequently appear almost dried up; but, on the subsidence of the fever, its surface will again secrete pus in abundance. This is a fact, which every young dresser must have noticed. A similar check to the secretion of pus is also produced, when a sore, or the parts immediately around it, are attacked by fresh inflammation. The diminished quantity of pus is likewise changed in its qualities, as it becomes a thin ichor, or a red fluid, composed of serum and red particles. (See *A. Cooper's Lectures, p.* 123, *Vol.* 1.)

The discharge, when of an irritating sort, is more stimulating to the adjoining parts with which it comes in contact, than to its own secreting surface. In this manner, it frequently produces excoriation of the skin, and ulceration. Thus the tears excoriate the skin of the cheek, in consequence of the quantity of salts which they contain. From this effect, matter has been called corrosive, a quality, which it has not; the only property which it possesses, being that of irritating the parts, which it touches, so as to cause their absorption. (*Hunter.*)

When the vessels thus lose the power of producing good pus, they also lose more or less the power of forming granulations. This may depend on some deviation from the due structure, and action, which such vessels should possess, in order to be qualified for the performance of these two operations.

Pus, from several circumstances, would appear in general to have a greater tendency to putrefaction than the natural juices have; but, perhaps, this is not the case with pure pus, which, when first discharged from an abscess, is commonly perfectly sweet. There are, however, some exceptions to this, but these depend on circumstances entirely foreign to the nature of pus itself. Thus, if the abscess has any communication with the air, while the matter is confined in it; or if the collection has been so near the colon, or rectum, as to have been infected by the feces, then we cannot wonder that the matter should become putrid. When blood is blended with pus; when sloughs are mixed with it; when the parts forming the seat of the abscess are in a gangrenous state from an erysipelatous affection; the matter has a greater tendency to putrefy than the pure pus discharged from sound abscesses, or healing sores. Pure matter, though easily rendered susceptible of change, by extraneous additions, is in its own nature tolerably uniform and immutable. It appears so unchangeable, that we find it retained in an abscess for weeks, without having undergone any alteration. These qualities, however, only belong to perfect pus. If a healthy sore inflames, the matter now produced from it, though unmixed with extravasated blood, or dead solids, becomes much sooner putrid, and much more irritating, than the discharge formed before this alteration of the ulcer. (*Hunter.*)

In the preceding paragraph, it is stated, that matter frequently remains unchanged in abscesses for weeks. This expression of Hunter's is not strictly correct; for, it is well known, that the surfaces of the cavities of abscesses are always absorbing, as well as secreting ones; consequently, there must be a continual mutation going on in the contained matter.

When there are diseased bones, or other extraneous bodies, exciting irritation, sometimes even in so great a degree as to make the vessels bleed, and often wounding them, the matter is always found to be very offensive. This state of the discharge is one mark of a diseased bone.

The discharge of an unhealthy sore blackens silver probes, and preparations of lead. This effect is imputed by Dr. Crawford to the sulphurated hydrogen gas, generated in the matter. (*Phil. Trans. vol.* 80, *Year* 1790, *p.* 385.) Further interesting observations on the nature of pus may be found in an Essay on the Differences between Pus and Mucus, by Dr. Darwin, junior; also in Dr. G. Pearson's Paper in Philos. Trans. 1811.

USE OF PUS.

By some it is supposed to carry off humours from the constitution. Suppuration is sometimes regarded as a constitutional disease, changed into a local one, which constitutional malady is discharged, or thrown out of the body, either in the form of pus, or together with this fluid. Critical abscesses have been thought to be cases of this sort. Suppuration has also been imagined to carry off local complaints from other parts of the body, on the old principle of derivation, or revulsion. For this reason, sores or issues are made in sound parts before allowing other sores to be dried up. Suppuration is sometimes excited with a view of making parts, such as indurated swellings, dissolve into pus; but, I have endeavoured to show, that no dissolution of the solids is concerned in the production of pus.

A secretion of pus is looked upon as a general prevention of many, or of all, the causes of disease. Hence, issues are made to keep off both universal as well as local diseases. However, the use of pus is perhaps unknown; for, it is formed most perfectly from healthy sores, and in healthy constitutions; and large discharges from parts not very essential to life, produce very little change in the constitution, and as little upon being healed up, whatever some may suppose to the contrary. (*Hunter.*)

This is certainly the case with many old ulcers, the suppuration from which seems to have little, or no effect, in impairing the health. Nor is there any real reason to be afraid of healing such ulcers, when possible, lest a worse disease should follow from the stoppage of a discharge, to which the system is supposed to be so habituated that the continuance of it must be essential to health.

Every one knows, that when there is no interference of art, that is, when the surface of a sore is left uncovered, the thin part of the matter evaporates, and the thick part dries and forms a scab. Nature, therefore, seems to have designed, that one use of pus should be to make a cover, or protection, for ulcerated surfaces. But I cannot agree with what has been asserted (*Hunter*), that the natural healing of a sore under a scab takes place more quickly, than when surgical dressings are employed.

On ulcers, as would appear from modern microscopical observations, "the coagulated pus is rendered tubular by the extrication of its carbonic acid gas, and that these tubes, or canals, are immediately filled with red blood, and thus connected with the circulation." If this point be established, Sir Everard Home conceives, that there will then be little difficulty in making out the succeeding changes, by means of which the coagulated pus afterwards becomes organized. (*On the Conversion of Pus into Granulations or new Flesh, in Phil. Trans. Vol.* 109, *p.* 109, *Lond.* 1819.) These statements are curious, and ought to have been noticed in the article *Granulations*, to which they more immediately relate.

Among the secondary uses of suppuration, may be mentioned, opening a communication between a disease and the external surface of the body; forming a passage for the exit of extraneous bodies, &c.

TREATMENT WHEN SUPPURATION MUST TAKE PLACE.

In cases of inflammation, arising from accident, but so circumstanced, that we know suppuration cannot be prevented, the indication is to moderate the inflammation, which, if the powers are great, and the injury done considerable, will probably be very violent. If the constitution should also be much affected, certain general means are proper, such as bleeding, purging, and nauseating medicines. While the constitution continues to be disturbed, suppuration cannot take place in the most favourable manner. In these cases, also, such medicines as produce a gentle perspiration greatly relieve the patient, for instance, the pulv. ipecac. comp.; antimonials; aq. ammon. acet.; saline draughts, &c. Opiates may produce a temporary diminution of action; but, it is not always the consequence of this medicine, as there are constitutions, which it renders more irritable, and of course where it aggravates the inflammatory action.

The applications to inflammations, which are to suppurate and form an abscess, commonly used, are poultices and fomentations. These, however, appear to be applied without much critical exactness, or discrimination; for, they are applied before suppuration has taken place, and when this event is not desired; and they are also applied after suppuration has taken place. With respect to suppuration itself, abstracted from all other considerations, the indication cannot be the same in every state; but if poultices and fomentations are found to be of real service in the two stages of the disease, there must be something common to both, for which they are of service, independently of simple suppuration. Poultices are useful, when the inflammation attacks the skin, either in the first instance or after an abscess has approached so near the skin, that this becomes secondarily affected. This benefit appears to arise from the skin being kept soft and moist. Such is the use of a poultice in inflammation, either before or after suppuration, until the abscess is opened. But, when poultices and fomentations are applied to inflamed parts, in which we wish to avoid suppuration, reason and principle will not justify the practice, though such applications may be proclaimed by experience to be very proper. (*Hunter.*)

TREATMENT AFTER SUPPURATION HAS TAKEN PLACE.

When suppuration cannot be stopped, or resolved, it is in general to be promoted.

How far suppuration can be usefully promoted by medicines, or applications, is questionable; but attempts are generally made, and, for this purpose, suppurating cataplasms and plasters, composed of the warm gums, seeds, &c. were formerly much recommended. Mr. Hunter doubted, whether such applications had any considerable effect in the way intended; for, if they were put on a sore, they would hardly increase the discharge from it, and, perhaps, even diminish it. However, in many cases, in which the parts are indolent, and hardly admit of true inflammation, in consequence of which a perfect suppuration cannot take place, stimulating the skin brings on a more salutary, and of course a quicker inflammation. Thus, the antimonial ointment, and blistering the skin, over chronic swellings and abscesses, are sometimes indicated.

These applications have been found, however, to bring the matter more quickly to the skin, even in the most rapid suppurations. This effect has been mistaken for an increased formation of pus; but, this consequence can only follow in cases, in which the inner surface of the abscess is within the influence of the skin. The accelerated progress of the matter to the surface of the body arises from another cause, viz. the promotion of ulceration in the parts, between the collection of matter, and the cuticle.

Emollient poultices are commonly applied to inflamed parts, when suppuration is known to have taken place. These can have no effect upon suppuration, except that of lessening the inflammation, or rather making the skin more easy. The inflammation must have reached the skin before poultices can have much effect, for they can only affect that part. The ease of the patient, however, should be considered, and we find, that fomentations and poultices are often beneficial in this way. By keeping the cuticle moist and warm, the sensitive operations of the nerves of the parts are soothed. On the contrary, if the inflamed skin is allowed to dry, the inflammation is increased, and as suppuration is probably not checked by the above treatment, it ought to be put in practice. As warmth excites action, the fomentation should be as warm as the patient can bear, without inconvenience. (*Hunter.*)

"The local treatment in phlegmonous abscesses (as Professor Thomson observes) is still more simple, than that by which we endeavour to procure resolution. It consists almost solely in the application of a moderate degree of warmth and moisture to the inflamed part, either by means of fomentations, or poultices. The manner in which these means act in promoting suppuration is unknown. Independently of their temperature, it seems very doubtful, whether fomentations and poultices have any power of promoting suppuration in the parts, to which they are applied. They keep the cuticle moist and warm, they promote perspiration, they soothe and allay pain in many inflammations, and these are probably the only immediate effects which they produce. The rest is the work of nature. In suppurations, attended by very severe pain, the use of warm fomentations is often found to afford singular relief, not only by their effect in easing pain, but also by their seeming to shorten the duration of the suppurative stage. In the cases of suppuration, in which they give relief, they should be repeated every four or six hours. The most common way of employing them, is by wringing linen, or woollen cloths, out of warm water, and applying these to the inflamed part, of as high a temperature as the feelings of the patient can bear. Decoctions of herbs were formerly much employed in the way of embrocation, and were then, and are still by many practitioners, supposed to possess peculiar virtues in promoting suppuration. Whether embrocations with the narcotic herbs might not in some cases be beneficial, by producing a sedative effect in allaying pain, I am unable to say, though I am inclined to believe, that even they act chiefly by their warmth and moisture. In cases where you find it necessary to use an embrocation with herbs, the flowers of camomile may in general be substituted in place of the leaves or flowers of almost every other plant. These flowers readily imbibe and retain moisture. They are, when moist, of a soft consistence, and can be easily moulded to the figure of the parts, to which they are applied." (*Thomson's Lectures, p.* 333.) Oatmeal, crumb of bread, and especially linseed meal, are the ingredients mostly preferred in this country for emollient poultices. When bread is used, it is generally boiled in milk. The observations, however, which have been offered on poultices in another place, are here equally applicable. (See *Inflammation.*)

OF THE TIME WHEN ABSCESSES SHOULD BE OPENED.

As abscesses, wherever formed, must increase that part of their cavity, which is next to the skin, more quickly than the bottom, they must become, in some degree, tapering towards the latter part, with their greatest breadth immediately under the skin. This shape of an abscess, when allowed to take place, is favourable to its healing, for it puts the bottom, which is the seat of the disease, more upon a footing with the mouth of the abscess, than it otherwise could be. As the bottom, or part, where the abscess began, is more or less in a diseased state; and as the parts between the seat of the abscess and the external surface are sound parts, having only allowed a passage for the pus, they, of course, have a stronger disposition to heal, than the bottom has.

To keep the mouth of an abscess from healing before its bottom, the collection of matter should be allowed to break of itself; for, although abscesses in general only open by a small orifice, more especially when sound, yet, in such cases, the skin over the general cavity of the matter is so thinned, that it has very little tendency to heal, and often ulcerates and makes a free opening. If the latter event should not spontaneously occur, it may now be more easily obtained by the interference of the surgeon.

Abscesses, which are the most disposed to heal favourably, are the quickest in their progress to the skin, and the matter comes to the surface almost at a point; the swelling is not so conical as in other cases, and when it bursts, the orifice is exceedingly small. On the other hand, when there is an indolence in the progress of the abscess, the collection spreads more, or distends the surrounding parts in a greater degree, in consequence of their not being so firmly united by inflammation, in the one as they are in the other instance; nor will ulceration so readily take the lead, and the matter will come to the skin by a broad surface, so as to thin a large portion of the cutis. (*Hunter.*)

It may be set down as a general axiom, that all phlegmonous abscesses should be allowed to break, and not be opened by the surgeon. When punctured unnecessarily, or prematurely, they never heal so favourably as when left to themselves.

Particular cases, however, should be opened, as soon as the existence of matter is ascertained. Abscesses should only be allowed to burst of themselves, when the confinement of the matter can do no mischief. Abscesses in the abdomen, or thorax, under the cranium, near the eye, or in joints, should be mostly opened very soon. When suppuration takes place beneath ligamentous expansions, or aponeuroses, which invariably retard the progress of the matter to the surface of the body, an early opening should be made. If this be not done, the matter spreads to a great extent, separating such ligamentous expansions from the muscles, and the muscles from each other, and, as the pus cannot get to the surface of the body, the length of the disorder is of course increased. When matter is so situated, as to be liable to insinuate itself into the chest, or abdomen, or into the capsular ligaments of the joints, it is highly proper to prevent this extension of mischief, by making a timely opening into the abscess.

"Those abscesses ought to be opened early (says Professor Thomson), that are situated in parts, through which the matter is liable to become widely diffused. This is particularly the case with abscesses, that are situated on the fore part of the neck, or in the cavity of the axilla, or by the side of the rectum. When matter is formed in the cavity of the axilla, if it does not speedily obtain an external outlet, it is very liable to pass up towards the clavicle in the course of the axillary plexus of nerves and vessels, or forwards under the pectoral muscle. I have repeatedly seen axillary abscess take both of these directions at the same time, forming one of the most painful and difficult cases to treat, which occurs in the management of abscesses." Dr. Thomson also considers an early opening proper and necessary, where the matter is lodged, as in some cases of whitloe, in the sheaths of the tendons; where matter is formed under the periosteum; where it collects under fasciæ, or in the vicinity of large arteries, joints, or the greater cavities of the body: also when the abscess is deep-seated. (See *Thomson's Lectures on Inflammation, p.* 336—338.)

With respect to making an early opening into abscesses, situated near large arteries, I am not aware, that any danger of the artery ulcerating in consequence of the nearness of the pus, really exists. Therefore, some doubts may reasonably be entertained of Professor Thomson's advice in this particular case, as the general rule of opening abscesses near large blood-vessels, in an early stage of the disease, would be objectionable on the ground of the practice exposing the vessels themselves to injury. Indeed, this well-informed writer distinctly mentions, in considering the subject in question, that the arteries are not very susceptible of ulcerating absorption.—(*P.* 337.)

OF THE PLACE WHERE THE OPENING SHOULD BE MADE.

If a free opening is not required, or making one is not practicable, it is at least proper to make whatever opening can be made in a depending situation. By this means the matter will more readily escape, and all pressure, arising from the confinement or lodgment of pus, will be prevented. A very small degree of pressure on that side of the abscess which is next to the skin, may produce ulceration there; and although such pressure might not, in many cases, be so great as to produce ulceration at the bottom of the abscess; yet it might be sufficiently great to prevent granulations from forming on that side, and thereby retard the cure, as no union can take place, but by means of granulations. The pressure is always most, and retards the formation of granulations in the greatest degree, at the most depending part of the abscess. Hence, if no opening be made in this situation, the upper part of the abscess readily heals to a small point, which becomes a fistula.

When circumstances forbid making an opening at the most depending part of an abscess, perhaps, nothing more can be done, than to evacuate the matter as often as necessary, and gently to compress the sides of the abscess together, when the situation of the case admits of the practice.

But abscesses are not always to be opened at the most depending part. The distance between the matter and the skin at this part is the common reason against the method. If an abscess is rather deeply situated, and points in a place which is higher than where the collection lies, it is proper to make the opening where the conical eminence, or, as it is termed, the *pointing*, appears. Thus, if an abscess should form in the centre of the breast, and point at the uppermost part, which is often the case, it would be improper to cut through the lower half of the mamma, in order to make a passage for the matter in that direction. If an abscess should form on the upper part of the foot, it would be wrong to make an opening through the sole of the foot to get at the most depending part of the abscess; for, besides cutting such a depth of sound parts, a great many useful ones would be destroyed.

When the abscess does not point in a depending situation, as in the instances just cited, since the place where the matter threatens to open a passage is likely to be the future opening, and this situation is disadvantageous to the healing of the deep part of the abscess, it is generally best to let the collection of matter first burst of itself, and then dilate the opening as freely as necessary. By allowing abscesses to burst spontaneously, the opening is not so apt to heal as if made by art, and, therefore, is better in such situations. (*Hunter.*)

In most cases, it is more advantageous even to cut through a certain thickness of parts, for the sake of obtaining a depending opening, than to make an opening, where the pointing appears, that is, where the parts are thinnest, and the matter nearest the surface. This remark is highly worthy of remembrance, when there is no doubt of the existence of matter at the depending place, and when the parts to be divided are not important ones. Collections of matter beneath the fasciæ of the fore-arm and thigh particularly demand attention to this direction, as they commonly point where those ligamentous expansions are thinnest, not where the matter can most readily escape.

Abscesses in the sheath of the rectus abdominis should also be opened in a low situation.

DIFFERENT METHODS OF OPENING ABSCESSES.

All abscesses will naturally burst of themselves, unless the matter be absorbed, and, in general, they ought to be allowed to take this course. There are, however, as I have already explained, particular circumstances which require an early opening; but, when the skin over the abscess is very thin, it is not of so much consequence, whether the case be permitted to burst of itself, or it be opened by the surgeon.

When abscesses are large, it is generally necessary to open them by art, whether they have burst of themselves or not; for, the natural opening will seldom be sufficient for the completion of a cure; and, although it may be sufficient for the free discharge of the matter, yet these abscesses will heal much more readily when a free opening is made; for, the thin skin over the cavity granulates but indifferently, and therefore unites but slowly with the parts underneath. (*Hunter.*)

Abscesses may be opened either by an incision or by making an eschar with caustic. To the latter plan, however, many urge strong objections: the use of caustic is not usually attended with any advantage which may not be obtained by a simple incision; upon a tender inflamed part it gives much more pain; it is more slow in its effects; and the surgeon can never direct the operation of the caustic so accurately as to destroy exactly the parts which he wishes, and no more. If the eschar be not made deeply enough, the lancet must, after all, be used. Caustic also leaves after its application, a disagreeable scar, a consideration of some importance in opening abscesses about the female neck or face. To these numerous objections we have to add, that the eschar is very frequently ten or twelve tedious days in becoming detached.

When there is a redundance of skin, or when there is a good deal of it thinned, however, an opening made with caustic will answer, perhaps, as well as an incision. The application of caustic may also sometimes be advantageously resorted to when there is a good deal of indolent hardness around a small abscess.

The *calx cum potassa*, or the *potassa* alone, is the best caustic for opening abscesses. The part is first to be covered with a piece of adhesive plaster, which has a portion cut out exactly of the same figure and size as the opening intended to be made in the abscess. The best way of making the eschar, is to dip the end of the caustic in water, and to rub it on the part till the skin becomes brown. The active substance is then to be immediately washed off with some wet tow, the plaster is to be removed, and an emollient poultice applied.

In almost all cases, it is better to use the lancet, or double-edged bistoury. Either of these instruments opens the abscess at once, and with less pain, than results from the use of caustic; it occasions no loss of substance, consequently a smaller cicatrix; and, by using it, the opening may be made in the most advantageous direction, and of the exact size required.

DRESSINGS AFTER OPENING ABSCESSES.

When an abscess has burst of itself, and it is unnecessary to enlarge the opening, the only thing requisite is to keep the surrounding parts clean. The continuation of the same kind of poultice, which was before used, is, perhaps, as good a practice as any; and when the tenderness, arising from the inflammation is over, lint and a pledget may be made use of, instead of the poultice.

But, an abscess, opened by a cutting instrument, is both a wound and a sore, and partakes more of the nature of a fresh wound in proportion to the thickness of the parts cut. Hence, it is necessary, that something should be put into the opening to keep it from healing by the first intention. If it is lint, it should be dipped in some salve, which will answer better than lint alone, as it will allow of being taken out sooner. This is advantageous, because such sores should be dressed the next day, or, at latest, on the second day, in order that the pus may be discharged again. When the cut edges of the opening have suppurated, which will be in a few days, the future dressings may be as simple as possible, for nature will, in general, complete the cure.

If the abscess has been opened with caustic, and the slough has either been cut out or separated of itself, the case is to be regarded altogether as a suppurating sore, and dressed accordingly.

Perhaps, dry lint is as good a dressing as any, till the nature of the sore is known. If it should be of a good kind, the same dressing may be continued; but, if not, then it must be dressed accordingly. Parts, which at first appear to be sound, sometimes assume every species of disease, whether from indolence, from irritability, from scrophulous, and other dispositions. This tendency to disease arises, in some cases, from the nature of the parts affected, as, for instance, bone ligament, &c. (*Hunter.*)

Consult particularly John Hunter's Treatise on the Blood, Inflammation, and Gunshot Wounds, a work, in which more interesting knowledge respecting Abscesses and Suppuration is contained, than in any other ever published. See also *Traité de la Suppuration de F. Quesnay,* 1749. *J. Grashuis, A Diss. on Suppuration, 8vo. Lond.* 1752. *Various parts of the Mémoires de l'Academie de Chirurgie. J. B. Boyer, De Suppuratione et Curatione Inflammationis per Suppurationem terminandæ. Monsp.* 1766. *L'Encyclopédie Méthodique, Partie Chirurgicale, article Abcès. Dissertations on Inflammation by John Burns,* 1800. *Sir E. Home's Dissertation on the Properties of Pus,* 1788*; and his Pract. Obs. on Ulcers. 2d Edit.* 1801. *James Hendy, Essay on Glandular Secretion, containing an experimental Inquiry into the Formation of Pus, &c. 8vo. Lond.* 1775. *N. Roumayne, De Puris Generatione, 8vo. Edinb.* 1780. *C. Darwin's Experiments, establishing a criterion between mucilaginous and purulent matter, &c. Lichfield,* 1780. *P. Clare, Essay on Abscesses, Lond.* 1781. *Several parts of Pott's Chirurgical Works, but especially his Treatise on the Fistula in Ano. T. Brand, Strictures in Vindication of some of the Doctrines misrepresented by Mr. Foot in his two pamphlets, entitled "Observations upon the new opinions of J. Hunter, in his treatise on the Venereal, including Mr. Pott's Plagiarisms, and misinformation on Pus," &c. 4to. Lond.* 1787. *Richter, Anfungsgründe der Wundarzneykunst, B.* 1, *Kap.* 2. *Dr. J. Thomson's Lectures on Inflammation, p.* 305, *&c. Edinb.* 1813*; a work, in which a profound knowledge of medical science, and of surgery in particular, is everywhere conspicuous. J. F. Crevecœur, De Diagnosi Puris; Longchamps,* 1793. *Pearson's Principles of Surgery, p.* 34, *&c. Edit.* 2. *Lassus Pathologie Chir. T.* 1, *p.* 21, *&c. &c. Edit. of* 1809. *Seb. J. Brugmans, De Puogenia, sive mediis quibus natura utitur in creando pure, 8vo. Groningæ,* 1785. *Dr. G. Pearson's Obs. and Experiments on Pus in the Philosophical Trans. for* 1811. *C. J. M. Langenbeck, Von der Behandlung der Fistelgänge, der Schusscanale, und grosser Eiter absondernder Höhlen, in Neue Bibl. für die Chirurgie,* 12*mo, Hannover,* 1817. *Gibson's Institutes, &c. of Surgery, Vol.* 1, *Philadelphia,* 1824.

SURGERY, or CHIRURGERY, (derived from chirurgeon, from χειρ, the hand, and εργον, work,) has been by many considered to be that branch of medicine, which principally effects the cure of diseases by the application of the hand alone, the employment of instruments, or the use of topical remedies. (*Encyclopédie Méthodique, Partie Chir. T.* 1, *Art. Chirurgie.*) But although this definition certainly conveys to us some idea of the nature of this most useful profession, it is not entirely accurate as applied to the present state of practice. It might, indeed, be correct during that short unfavoured period of surgery upon the Continent, some centuries ago, when its practice was denounced by the Council of Tours, as unfit for the hands of priests and men of literature, and when the surgeon became little better than a sort of professional servant to the physician, the latter alone not only having the sole privilege of prescribing internal medicines, but even that of judging and directing when surgical operations should be performed. Then the subordinate surgeon was only called upon to execute with his knife, or his hand, duties which the more exalted physician did not choose to undertake; and, in fact, he visited the patient, did what was required to be done, and took his leave of the case, altogether under the orders of his master. In modern times, however, the good sense of mankind has discovered that surgery is deserving of an eminent rank amongst such arts as ought to be cultivated for the general benefit of society; that the man; who is not himself accustomed to the performance of operations, cannot be the best judge of their safety and necessity; and that, in every point of view, the surgical practitioner merits as much favour and independence in the exercise of his profession, as he whose avocation is confined to physic. Hence, the surgeon is now exclusively consulted about many of the most important diseases to which the human body is liable. Being no longer under the yoke of the physician, he follows the dictates of his own judgment and knowledge; he prescribes whatever medicines the case may demand, internal as well as external; and under the encouragement of an enlightened age, he sees his profession daily becoming more scientific, more respected, and more extensively useful.

By some writers, physic is said to have for its object the treatment of internal; surgery, that of external diseases. This definition, however good and plausible it may at first appear, can only be received with numerous exceptions in regard to modern surgery; for instance, the psoas abscess, stone in the bladder, an extravasation of blood within the skull in consequence of accidental violence, are universally allowed to be strictly chirurgical cases; yet, no man in his senses would call these disorders external.

Others have defined surgery to be the mechanical part of physic, " *quod in therapeia mechanicum ;*" but, although, this has obtained the assent of so eminent a modern surgeon as Richerand, of Paris, (*Dict. des Sciences Medicales, T. 5, p.* 85,) I believe few on this side of the water will be of his opinion. As Mr. J. Pearson has observed: " Many people have imagined that when a man has learnt the art of dressing sores, of applying bandages, and performing operations with a little dexterity, he must necessarily be an accomplished surgeon. If a conclusion so gross and fallacious had been confined to the vulgar and illiterate, the progress of scientific surgery would have suffered little interruption; but if young minds are directed to these objects, as the only important matters upon which their faculties are to be exercised; if the gross informations of sense constitute the sum of their knowledge, little more can be expected from such a mode of study, than servile imitation, or daring empiricism. Indeed, some people have affected to oppose surgery as an *art*, to medicine as a *science ;* and if their pretensions were justly founded, the former would certainly be degraded to a mere mechanical occupation. But it is not very easy to comprehend the grounds of such a distinction. The internal and external parts of the body are governed by the same general laws during a state of health; and if an internal part be attacked with inflammation, the appearances and effects will bear a great similarity to the same disease situated externally; nor are the indications of cure, in general, materially different. If by science, therefore, be meant ' a knowledge of the laws of nature,' he who knows what is known of the order and method of nature, in the production, progress, and termination of surgical diseases, merits as justly the title of a scientifical practitioner as the well educated physician. The practical parts of physic and surgery are very frequently disunited: but their theory and principles are indivisible, since they truly constitute one and the same science." (*Principles of Surgery, Preface.*)

As a learned Professor notices, the limits between physic and surgery are not very precisely marked, and the respective functions of the physician and surgeon, long as those names have existed, are still but very inaccurately defined. " The most superficial acquaintance with the symptoms, progress, and termination of the various morbid affections to which the human body is liable, must be sufficient to convince every unprejudiced inquirer, that there is but a slight foundation, if indeed there be any, for this distinction, in the nature of the diseases, which these practitioners are required to treat, or in the modes of treatment, by which the diseases themselves may be cured, or relieved. Experience has long shown, that the use of internal remedies is not only required in a large proportion of the diseases, which are regarded as strictly chirurgical, but also, that there are few diseases, which come under the care of the physician, in which, morbid affections, requiring the manual aid, or practical skill of the surgeon, do not frequently occur.

" The treatment of febrile and internal inflammatory diseases, it will be allowed, belongs exclusively to the province of the physician wherever the distinction between physician and surgeon has been introduced, and is rigidly observed; yet in some species of fevers, and in all internal inflammatory diseases, blood-letting is often the principal, if not the only, remedy that is required. But this is an operation, however urgent the necessity for it be, which from engagement the physician cannot, and, from the fear of degrading his province of the profession, will not perform. Retention of urine not unfrequently takes place in symptomatic febrile diseases, and this is an affection which does not always yield to the use of internal remedies; but it is an affection also, from the painful uneasiness, which it immediately excites, as well as from the danger which it threatens, that will not admit of delay. When internal remedies, therefore, fail in relieving the patient, the urine must be speedily drawn off by means of a chirurgical operation: otherwise inflammation, mortification, and rupture of the bladder, must necessarily ensue. Febrile and internal inflammatory affections terminate not unfrequently in the formation of fluids, which it is necessary to let out by a chirurgical operation; and abscesses, fistulous openings, and ulcers are formed, which require the aid of the surgeon. In patients, also, affected with severe febrile diseases, from being long fixed down to their beds in one position, some of the parts of the body, upon which they rest, occasionally acquire a disposition to mortify, larger or smaller portions of the skin and subjacent cellular membrane becoming dead, separate from the living parts, and sores are formed, which are but too often the subject of unavailing chirurgical practice. To employ, in the different stages of this species of mortification, from its first commencement to the complete separation of the dead parts, and the formation of a new skin, the appropriate external and internal remedies, requires a greater share of chirurgical skill than can reasonably be expected in those who make a profession solely of physic. Unhappy, therefore, must be the lot of that patient, who in circumstances similar to those which I have described, has the misfortune to have for his sole medical attendant a physician ignorant of surgery.

" But (continues Professor Thomson), if a knowledge of surgery be necessary to the student who intends to practise physic, the knowledge of physic, on the other hand, is no less necessary to him who intends to devote his attention exclusively to the profession of surgery; for, indeed, there are few chirurgical diseases, which are not in some period, or another, of their existence, accompanied by morbid affections of the same nature with those which fall properly, and most frequently under the care of the physician. It will only be necessary to mention, as examples of these affections, the symptomatic fever, which attends inflammation, whether this affection has been induced by external injury, or has occurred spontaneously in the body from internal disease; the hectic fever, supervening to long continued processes of suppuration; the febrile state, and other morbid affections, which are sometimes brought on by the too sudden and injudicious use of mercury; bilious fevers, and the various derangements of the digestive organs, which are sometimes the cause, and at other times the consequence, of local diseases; the nervous affections, such as apoplexy, convulsions, paralysis, and mania, which arise not unfrequently from injuries of the head; and locked jaw, or tetanus, which, in warm climates particularly, is so very liable to be induced by punctured wounds. These are morbid affections, the proper study and treatment of which, when they occur without local injury, are supposed to belong to the physician, rather than the surgeon; but occurring very frequently as they do in chirurgical diseases, and always modifying, or aggravating, the effects of these diseases, ignorance of their nature, relations, and modes of cure, is not only inexcusable, but highly criminal in the practitioner, who ventures to undertake their treatment." (*Thomson's Lectures on Inflammation, Introduction*, Also *J. R. C. Bollman, Tentamen, ostendens Chirurgiam a Medicina haud impune separari*, 12*mo. Rintel.* 1803.)

From what has been stated, I think it very certain, that there never can be a complete scientific division of the healing art into physic and surgery; and that all attempts to distinguish the numerous diseases and injuries of the human body into medical and surgical cases, must, in a great measure, be decided by custom, and the mutual agreement of practitioners, rather than by any rules, or principles, which are at all consistent.

In the earliest periods, the same men cultivated the whole field of medicine. The writings of Hippocrates, Galen, Celsus, Paulus Œgineta, Albucasis, &c. prove, that the Greeks, Romans, and Arabians never had an idea of the human body being susceptible of only two classes of diseases, one of which formed the province of physic, while the other constituted a separate and distinct science called surgery. All these ancient authors treat successively of fevers, fractures, wounds, and nervous diseases, and none of them appear to have supposed, that there could be any disorders which really deserved to be called *external* and others *internal*. Nor was it until the middle of the twelfth century, that the ecclesiastics were restrained from undertaking any bloody operation. Surgery was then rejected from the universities, under the empty pretext, "*Ecclesia abhorret a sanguine*," often expressed, in its decrees, as Professor Thomson well observes, but never acted upon, except in this instance, by the church of Rome. It is to this epoch that we must refer the true separation of physic from surgery; the latter being abandoned to the laity, who, in those ages of barbarism, were totally illiterate.

It is an observation made by the celebrated Bichat, that two things are essentially necessary to form a great surgeon, viz. genius and experience. One traces for him the way; the other rectifies it; both reciprocally assist in forming him. Without experience, genius would be unprofitably fertile; without genius, experience would only be a barren advantage to him. (*Œuvres Chir. de Desault, par Bichat, T.* 1, *Discours Prelim.*) Out of the large number of hospital surgeons, who are to be met with in every country of Europe, and who enjoy ample opportunities of profiting by the lessons of experience, how few distinguish themselves, or ever contribute a mite to the improvement of their profession! Opportunity, without talents and an aptness to take advantage of it, is not of more use than light to a blind man. On the other hand, splendid abilities, without experience, can never be enough to make a consummate surgeon, any more than a man with the greatest genius for painting can excel in his particular art without having examined and studied the real objects which he wishes to delineate. In short, as a sensible writer has remarked, "*Les grands chirurgiens sont aussi rares, que le génie, le savoir, et les talens.*" (*Mem. de l'Acad. de Chir. T.* 1, *Pref. p.* 41, *Edit.* 12*mo.*)

The description of the qualities which a surgeon ought to possess, as given by Celsus, is excellent as far as it goes. A surgeon, says he, should be young, or, at any rate, not very old; his hand should be firm and steady, and never shake; he should be able to use his left hand with as much dexterity as his right; his sight should be acute and clear; his mind intrepid and pitiless, so that when he is engaged in doing any thing to a patient, he may not hurry, nor cut less than he ought, but finish the operation, just as if the cries of the patient made no impression upon him. (*A. C. Celsi Med. Præf. ad. lib.* 7.)

By the word "*immisericors*," as Richerand has observed, (*Nosogr. Chir. Tom.* 1, *p.* 42, *Edit.* 2,) Celsus did not mean that a surgeon ought to be quite insensible to pity; but that, during the performance of an operation, this passion should not influence him, as all emotion would then be mere weakness. This undisturbed coolness, which is still more rare than skill, is the most valuable quality in the practice of surgery. Dexterity may be acquired by exercise; but firmness of mind is a gift of nature. Haller, to whom nature was so bountiful, in other respects, was denied this quality, as he candidly confesses. "Although (says he) I have taught surgery seventeen years, and exhibited the most difficult operations upon the dead body, I have never ventured to apply a cutting instrument to a living subject through a fear of giving too much pain." (*Bibl. Chir.* 1775, *Vol.* 2.)

Surgery may boast of having had an origin, that well deserves to be called noble: for the earliest practice of it arose from the most generous sentiment which nature has implanted in the heart of man, viz. from that sympathetic benevolence, which leads us to pity the misfortunes and sufferings of others, and inspires us with an anxious desire to alleviate them. He who first saw his fellow creature suffer could not fail to participate in the pain, and endeavour to find out the means of affording relief. Opportunities of exercising this useful inclination were never wanting. In the first ages of the world, man in his destitute state was under the necessity of earning, by force or stratagem, a subsistence which was always uncertain, and in the combats into which this sort of life drew him, he frequently met with wounds and other injuries. Wherever the chase was in vogue as a means of livelihood, or amusement; wherever broils and contests occasionally arose; and man was the same animal he now is, liable to various diseases and accidental hurts; there must have existed a necessity for surgery; nor can there be a doubt, that the origin of this valuable practice is as ancient, as the exposure of mankind to several of the same kinds of injuries, as befal the human race at the present day. At length wars became more frequent and extensive; wounds were consequently multiplied; and the necessity for surgical assistance was increased, and its value enhanced.

In fact, among the ancients, the profession of medicine and surgery constituted a sacred kind of occupation, and the practice of it belonged only to privileged persons. Æsculapius was the son of Apollo. In the armies, the highest princes gloried in dressing the wounds of those who had fought the battles of their country. Amongst the Grecians, Podalirius, Chiron, and Machaon, were not only distinguished for their valour, but also for their skill in surgery, as we learn from the poem of the immortal Homer. The value which was placed upon the services of Machaon by the Grecian army may well be conceived from the anxiety which they evinced to have him properly taken care of when he was wounded in the shoulder with a dart. "O Nestor, pride of Greece, (cries Idomeneus) mount, mount upon thy chariot! and let Machaon mount with thee! Hasten with him to our ships; for a warrior, who knows, as he does, how to relieve pain, and cure wounds, is himself worth a thousand other heroes." (See *Iliad, lib.* xi.) Hippocrates was one of the first citizens of Greece; he nobly refused all the rich offers of several kings, enemies of his country, to entice him into their service; and, in particular, he disdained to accept those of Xerxes, whom he regarded as a barbarian.

It is in the immortal poems of the Iliad and Odyssey, that we find the only certain traditions, respecting the state of the art, before the establishment of the republics of Greece, and even until the time of the Peloponnesian war. There it appears that surgery was almost entirely confined to the treatment of wounds, and that the imaginary power of enchantment was joined with the use of topical applications.

In the cures, recorded in the sacred writings of the Christian religion, the intervention of a supernatural power is always combined with what is within the scope of human possibility. The same character evinces itself in the infancy of the art in every nation. The priests of India, the physicians of China and Japan, and the jugglers of the savage or half-civilized tribes of the old and new continents, constantly associate with drugs and manual operations certain mysterious practices, upon which they especially rely for the cure of their patients. Such was also, no doubt, the character of the medicine of the Egyptians, in the remote times, previous to the invention of the alphabet, and upon which so very little light is now thrown.

It is curious, however, to find, from some late observations made by the men of science, who accompanied the French expedition to Egypt, in 1798, that amongst the ruins of ancient Thebes there are documents, which fully prove that surgery in the early times of the Egyptians, had made a degree of progress, of which few of the moderns have any conception. It is noticed by Larrey, that, when the celebrated French General Desaix had driven the Mamalukes beyond the Cataracts of the Nile, the Commission of Arts had an opportunity of visiting the monuments of the famous Thebes, and the renowned temples of Tentyra, Karnack, Medynet Abou, and Luxor, the remains of which still display their ancient magnificence. It is upon the ceilings and walls of these temples that basso-relievos are seen, representing limbs that had been cut off with instruments very analogous to those which are employed at the present day for amputations. The same instruments are again observed in the hieroglyphics, and vestiges of other surgical operations may be traced, proving that, in these remote periods, surgery had made some considerable progress. (*Larrey, Mémoires de Chir. Militaire, T.* 1, *p.* 233; *T.* 2, *p.* 223.)

We next come to the epoch when, by the union and arrangement of scattered facts, the science truly arose. Hippocrates, born in the island of Cos, four hundred and sixty years before the common æra, collected the observations of his predecessors, added the results of his own experience, and composed his first treatises. In the hands of this great genius, medicine and surgery did not make equal progress. The former reached the highest degree of glory. Hippocrates drew up the history of acute diseases in so masterly a style, that twenty past centuries have hardly found occasion to add any thing to the performance. But surgery was far from attaining the same degree of perfection. The religious veneration for the asylums of the dead, and the impossibility of dissecting the human body, formed an insurmountable obstacle to the study of anatomy. An imperfect acquaintance with the structure of animals, reputed to bear the greatest resemblance to man, could only furnish venturesome conjectures, or false inferences. These circumscribed notions sufficed for the study of acute diseases. In these cases, the attentive observation of strongly marked symptoms, and the idea of the operation of a salutary principle, derived from remarking the regular succession of such symptoms, and their frequently beneficial termination, enlightened the physician in the employment of curative means; while surgery, deprived of the assistance of anatomy, was too long kept back in an infant state. Whatever praises may have been bestowed on those parts of the works of Hippocrates particularly relating to surgery, and which amount to six in number (*de officina medici; de fracturis; de capitis vulneribus; de articulis vel luxatis; de ulceribus; de fistulis*); when compared with his other acknowledged legitimate writings, they appear only as the rough sketches of a picture by a great master.

Excepting the fragments, collected or cited by Galen we possess no work written by any of the successors of Hippocrates until the period of Celsus; which leaves a barren interval of almost four centuries. In this space lived Erasistratus, as well as Herophilus, celebrated for the sects which they established, and particularly for having been the first who studied anatomy upon the human body.

Celsus lived at Rome in the reigns of Augustus, Tiberius, and Caligula. He appears never to have practised the healing art, on which, however, he has written with much precision, elegance, and perspicuity. His work is the more precious, inasmuch as it is the only one, which gives us information, with regard to the progress of surgery in the long interval between Hippocrates and himself. The four last books, and especially the seventh and eighth, are exclusively allotted to surgical matter. The style of Celsus is so elegant, that he has generally been regarded quite as the Cicero of medical writers, and long enjoyed high reputation in the schools. His surgery was entirely that of the Greeks, notwithstanding he wrote at Rome: for, in that capital of the world, physic was then professed only by persons who had either come from Greece, or had received instruction in the celebrated schools of this native soil of all the arts and sciences.

Let us pass over the interval which separates Celsus and Galen. This latter was born at Pergamus in Asia Minor, and came to Rome in the reign of the emperor Marcus Aurelius. He practised surgery and physic there about the year 165 of the Christian era. (*Galeni Opera Omnia*, 1521, *Edit. Aldi*, 5 *Vols. in fol.*) These two sciences were at that time still united, and though some writers of much earlier date speak of the division of physic into dietetical, chirurgical, and pharmaceutical, no such distinction was followed in practice. As Galen had been a surgeon at Pergamus, he continued the same profession at Rome; but, being soon attracted by the predominating taste of the age in which he lived, to a science, which more easily yields to the systems and dazzling speculations of philosophical sects, he afterwards neglected surgery which strictly rejects them. His writings prove, however, that he did not abandon it entirely. His commentaries on the treatise of Hippocrates, *De Officina Medici*, and his essay on bandages, and the manner of applying them, show that he was well versed even in the minor details of the art. Besides, it is known, that he paid great attention to pharmacy, and in his work upon antidotes, chap. 13, he tells us himself, that he had a drug shop in the Via Sacra, which fell a sacrifice to the flames that destroyed, in the reign of Commodus, the Temple of Peace, and several other edifices.

To Galen succeeded the compiler Oribasius, Œtius of Amida, a physician, who lived towards the close of the fifth century, Alexander of Tralles, and Paulus Œgineta, so called from the place of his birth, though he practised at Rome and Alexandria. Paulus collected into one work, still justly esteemed, all the improvements which had been made in surgery up to his own time. He concludes the series of Greek and Roman physicians, and may be looked upon as the last of the ancients, unless it be wished to let the Arabians have a share in the honours of antiquity. "He appears," says Portal, "to be one of those unfortunate writers, to whom posterity has not done justice. It seems as if he had been decried without having been read; for if pains had been taken to examine his works, he would neither have been regarded as a mere copyist, nor been called the 'ape of Galen,' with whom he does not always coincide. Nay, in some places, he ventures to oppose the doctrines of Hippocrates. He was perfectly acquainted with the practice of the ancients, and when he agrees with, or differs from them, it is not from a spirit of contradiction, but because the reasons, which led him to take one side, or the other, appeared to him well founded." (*Portal, Hist. de l'Anat. &c. T.* 1, *p.* 123.) All now agree, that surgery is much indebted to him. (See *R. A. Vogel, De Pauli Œginetæ Meritis in Medicinam imprimisque Chirurgiam*, *4to. Gott.* 1768.) Afterwards the downfall of surgery followed that of all the other sciences, and from the capture of Alexandria by the Saracens under Amrou, viceroy of Egypt, 1641, until the end of the tenth century, nothing prevailed but the dark clouds of ignorance and barbarism. The Arabians, who became masters of a great part of the Roman empire, dug up the Greek manuscripts, which lay buried under the ruins of the libraries; translated them; appropriated to themselves the doctrines which they contained; impoverished them with additions; and transmitted to posterity only enormous compilations. In a word, such are the treatises of Rhazes, Hali-Abbas, Avicenna, Averrhoes, and Albucasis, the most celebrated of the Arabian authors. Inventors of a prodigious number of instruments and machines, they appear to have calculated the efficacy of surgery by the richness of its arsenals, and to have been more anxious to inspire terror, than confidence. As an instance of the cruelty of their methods, I shall merely notice, that, in order to stop the bleeding after amputation, they plunged the stump in boiling pitch.

The fate of medicine was not more fortunate. In vain, the school of Salernum, founded about the middle of the seventh century, made some attempts to revive its splendour. As a modern writer observes, medical science, seated on the same benches, where the doctrine of Aristotle, accommodated to religious opinions, was the subject of endless controversies, imbibed, as it were by contagion, the argumentative and sophistical mania, and became enveloped in the dark hypotheses of scholastic absurdity. (*Richerand, Nosogr. Chir. T.* 1, *Ed.* 2.)

The universal ignorance, (continues this author); the pretended horror of blood—the dogma of a religion, which shed it in torrents for useless quarrels; an exclusive relish for the subtleties of the school, and speculative theories; are circumstances, further explaining the profound darkness, which followed these empty labours. About the middle of the twelfth century, (1163,) the Council of Tours prohibited the ecclesiastics, who then shared with the Jews the practice of medicine in christian Europe, from undertaking any bloody operation. It is to this epoch, that the true separation of medicine from surgery must be referred. The latter was abandoned to the laity, the generality of whom, in those ages of barbarism, were entirely destitute of education. The priests, however, still retained that portion of the art, which abstained from the effusion of blood. Roger Rolandus, Bruno, Gulielmus de Salicetus, Lanfranc, Gordon, and Guy de Chauliac, confined themselves to commentaries on the Arabians, and if the latter author be excepted, they all disgraced surgery by reducing it nearly to the mere business of applying ointments and plasters. Guy de Chauliac, however, the last of the Arabians, is to be honourably excluded from such animadversion. His work written at Avignon, in 1363, in the pontificate of Urban the fifth, to whom he was physician, continued to be, for a long while, the only classical book in the schools. It may be observed, that as he imitated in every respect the other Arabian physicians, and like them thought, that it did not become an ecclesiastic to deviate from the austerity of his profession, he passed over in silence the diseases of women.

At length, Antonio Beneveni, a physician of Florence, began to insist upon a truth, of the highest importance to the extension of surgical knowledge, viz. that the compilations of the ancients and Arabians ought to be relinquished for the observation of nature. (*De abditis rerum causis*, *Florent.* 1507, *4to.*) A new era now began. The moderns were convinced, that by treading servilely in the footsteps of their predecessors, they should never even equal, much less surpass them. The labours of Vesalius also gave birth to anatomy, illuminated by which science, surgery put on quite a different appearance in the hands of Ambroise Paré, the first and most eminent of the French surgeons. For the credit of Italy, however, it should be recorded, that the sensible writings published in that country prior to the time of Paré, had the greatest influence in creating a due sense of the value and importance of surgery, and in disposing men of talents and education to cultivate it as a liberal profession.

Obeying the dictates of his genius, Paré either compelled authority to yield to observation, or endeavoured to reconcile them. However, his superior merit soon excited the ignorant, the jealous, and the malignant against him; he became the object of a bitter persecution; and his discoveries were represented as a crime. Although he was the restorer, if not the inventor, of the art of tying the blood-vessels, the power of his persecutors compelled him to make imperfect extracts from Galen, and alter his text, in order to rob himself, in favour of the ancients, of the glory, which this distinguished improvement deserved.

Surgeon of King Henry the second, Francis the second, Charles the ninth, and Henry the third, of France, Paré practised his profession in various places, followed the French armies into Italy, and acquired such esteem, that his mere presence in a besieged town, was enough to reanimate the troops employed for its defence. In the execrable night of Saint Bartholomew, his reputation saved his life. As he was of the reformed religion, he would not have escaped the massacre, had not Charles the ninth himself undertaken to protect him. The historians of those days (*Mém. de Sully*) have preserved the remembrance of this exception, so honourable to him who was the object of it; but, which should not diminish the just horror, which the memory of the most weak and cruel tyrant must ever inspire. "Il n'en voulut jamais sauver aucun (says Brantome) sinon maistre Ambroise Paré, son premier chirurgien, et le premier de la chrétienneté; et l'envoya querir et venir le soir dans sa chambre et garderobe, lui commandant de n'en bouger; et disait qu'il n'était raisonnable qu'un qui pouvait servir à tout un petit monde, fût ainsi massacré."

Ambroise Paré was not content, like his predecessors, with exercising his art with reputation; he did not follow the example of the Quatre-Maîtres of Pitard, so justly celebrated for having composed the first statutes of the College of Surgeons at Paris, in the reign of St. Lewis, whom he had attended in his excursions to the Holy Land; and of several other surgeons, the fruits of whose experience were lost to their successors. Paré transmitted the result of his own experience in a work that will remain immortal. (See *Œuvres d' Ambroise Paré, Conseiller et premier Chirurgien du Roi, divisées en* 28 *livres*, *in folio*, *Edit.* 4*to. Paris*, 1535.)

His writings, so remarkable for the variety and number of facts in them, are eminently distinguished from all those of his time, inasmuch as the ancients are not looked up to in them with superstitious blindness. Freed from the yoke of authority, he submitted every thing to the test of observation, and acknowledged experience alone as his guide. The French writers are with reason proud of their countryman Paré to this day: they allege, that he must ever hold amongst surgeons the same place that Hippocrates occupies amongst physicians. Nay, they add, that, perhaps, there are none either of the ancients, or moderns, who are worthy of being compared with him. (*Richerand Nosogr. Chirurg. T.* 1.)

After the death of this great man, surgery, which owed its advancement to him, continued stationary, and even took a retrograde course. This circumstance is altogether ascribable to the contemptible state, into which those who professed the art fell, after being united to the barbers by the most disgraceful association.

Pigrai, the successor of Ambroise Paré, was far from being an adequate substitute for him. A spiritless copier of his master, he abridged his surgery in a Latin work, where the unaffected graces of the original, the sincerity, and the ineffable charm, inseparable from all productions of genius, entirely disappeared. He received, however, equal praise from his contemporaries; doubtless, because he filled a high situation: but, as Richerand remarks, his name, which is to-day almost forgotten, proves sufficiently, that dignities do not constitute glory.

Rousset and Guillemeau distinguished themselves, however, in the art of midwifery; while Covillard, Cabrol, and Habicot enriched surgery with a great number of curious observations. See (*Obs. Chir. pleines de remarques curieuses, Lyon*, 1639, *in* 8*vo. Alphabet Anatomique, Genève*, 1602, *in* 4*to. Semaine Anatomique; Question Chir. sur la Bronchotomie, Paris*, 1620, *in* 8*vo.*)

In the next or seventeenth century, a fresh impulse produced additional improvements. Then appeared in Italy, Cæsar Magatus, who simplified the treatment of wounds, (*de rarâ vulnerum medicatione, libri* 2, *Venet.* 1616, *in folio;*) Fabricius ab Aquapendente, even less praiseworthy as a surgeon, than as a physiologist, (*Opera Chir. Paris,* 1613, *in fol.;*) and Marcus Aurelius Severinus, that restorer of active surgery. (*De efficaci Medicina, libri* 3, *Francofurt.* 1613. *in folio. De recondita abscessuum natura libri* 7, *Neapoli,* 1632, *in* 4*to. and Trimembris Chirurgia, &c. Francofurt.* 1653, *in* 4*to.*) Amongst the English surgeons flourished Wiseman, who was the Paré of England (see *Several Chirurgical Treatises, Lond.* 1676, *in fol.*)*;* and William Harvey, whose discovery of the circulation of the blood had such an influence over the advancement of medical science in general, and that of surgery in particular, that he must be classed among the principal improvers of the latter profession. (See *Exercitatio Anatomica de motu cordis et sanguinis in animalibus. Francofurti,* 1653, *in* 4*to.*) In Germany, Fabricius Hildanus, (*Obs. et Curationum, Centuriæ* 6, 2 *Vol. in* 4*to.* 1641,) who was far superior, as a surgeon, to the Italian Fabricius. Scultetus, so well known for his work, entitled *Armamentarium Chirurgicum*; *Ulmæ,* 1653, *in folio.* Purmann and Solingen, who had the fault of being too partial to the use of numerous complicated instruments. (See *Cursæ Obs. Chir. Lipsiæ,* 1710, *in* 4*to. Manuale Obs. der Chirurgie, Amsterdam,* 1684, *in* 4*to.*)

Holland, restored to liberty by the generous exertions of its inhabitants, did not long remain a stranger to the improvement of surgery. This nation, so singular in many respects, presents us with one particularity, which claims the notice of a medical historian. Ruysch, who was an eminent anatomist, and merits equal celebrity for his *Obs. Anatomico-Chirurgicarum Centuriæ, Amstelodam.* 1691, *in* 4*to.* carried with him to the grave the secret of his admirable injections. (See also his *Thesaur. Anat.* x, *in* 4*to. Adversariorum anatomicorum medico-chirurgicorum Decad.* 3, *in* 4*to. Amstelodam.*) Roonhuysen also made a secret of his lever, which, before the invention of the forceps, was the only resource in difficult labours. Raw, who successfully cut fifteen hundred patients for the stone, took such pains to conceal his manner of operating, that Heister and Albinus, his two most distinguished pupils, have each given a different explanation of it. Such a disposition, which is extremely hurtful to the advancement of medical and surgical knowledge, would materially have retarded the progress of surgery in Holland, had not Camper, in the following century, effaced the imputation by the great number of his discoveries, and his zealous desire to render them public.

While great improvements were going on in Italy, England, and Holland, surgery languished in a humiliated state in France. The accoucheur Mauriceau (*Traité des Maladies des Femmes grosses, Paris,* 1668, *in* 4*to.*) Dionis, (*Cours d'Opérations de Chirurgie, Paris,* 1707, 8*vo.*) Saviard, (*Nouveau Recueil d'Obs. Chir. Paris,* 1702, *in* 12*mo.*) and Belloste, (*Chirurgien d'Hôpital, Paris,* 1696, *in* 8*vo.*) were the only French surgeons of note, who could be contrasted with so many distinguished men of other nations. Richerand observes, that the splendid days of Louis the fourteenth were an iron age for discouraged surgery. And yet this monarch seems to have been personally interested in the melioration of this important art; for he was very nearly falling a victim to a surgical disease, a fistula in ano, and was not cured till after a great number of blundering operations, and useless experiments.

Chronology teaches simply the history of dates. In the study of the sciences, the only method of impressing the memory with facts, consists in connecting the epoch of them with the learned men by whom they have been illustrated. But, the greatest surgeons of the eighteenth century have not altered the face of their profession, although they have powerfully contributed to its advancement. In surgery, as an author has remarked, some feeble rays always precede brilliant lights, and it approaches perfection in a very gradual way. In the last century, however, amongst the distinguished surgeons of France, there are two of extraordinary genius, round whom, as it were, all the others might be grouped and arranged, and whose names deserve to be affixed to the two most brilliant epochs of French surgery. These are first J. L. Petit, whose glory was shared by the Academy of Surgery; and, secondly, the celebrated Desault.

It is not with surgery, as with physic, strictly so called; the epochs of the latter are distinguished by hypotheses; while those of surgery are marked by discoveries. The eminent men in this last branch of the profession have not, like the most renowned physicians, created sects, built systems, destroyed those of their predecessors, and constructed a new edifice, which in its turn has been demolished by other hands. All of them have been satisfied with combating ancient errors, discovering new facts, and continuing their art, the sphere of which they have enlarged by their discoveries, without making it bend under the yoke of systems, which it would have ill supported. To this steady and uniform course (says Richerand,) which is a striking proof of the superiority of surgery, and of the certainty and invariableness of its principles, shall we oppose the numerous revolutions of physic? The christian religion, which abounds in sects, has not a greater number of them, than physic. "Naturistes, solidistes, humoristes, vitalistes, animistes, semi-animistes, mécaniciens, chimistes; le plus grand nombre des médecins honore Hippocrate d'un culte presque superstitieux; ceux-ci marchent sous les bannieres de Staahl; ceux-la s'appuient du grand nom de Boerhaave; tels autres invoquent Sydenham, Hoffmann, Stoll, absolument comme les theologiens combattent pour Luther, Zuingle, Calvin, ou Jansen." (*Nosogr. Chir. T.* 1.)

The elogy on J. L. Petit, delivered in the midst of the Royal Academy of Surgery, of which he was one of the first and most distinguished members, represents him as blending the study of anatomy with his amusements when a boy; and ardently seeking every opportunity to increase his knowledge by observation. He had had experience enough to publish at an early period of his life his *Traité sur les Maladies des Os, Paris,* 1705, *in* 12*mo.;* a work, which for a century was esteemed the best upon the subject. His success was most virulently opposed by the envious critics; and it was not till after more than thirty years of academical labours and extensive practice, that he was unanimously chosen the head of his associates. This acknowledged superiority, however, was the more flattering, as the honour was obtained at a period when surgery was in a flourishing state in France, and when Petit held no office, from which he could derive an influence foreign to his personal merit. While Mareschal, La Peyronie, and La Martiniere assured him of the royal favour, Quesnay, Morand, and Louis, who corrected his writings, made him speak a language which does honour to that famous collection, to which he contributed his observations, (see *Mémoires et Prix de l'Academie Royale de Chirurgie*, 10 *Vols. in* 4*to.*) and in which, if some theoretical explanations be put out of consideration, nothing has lost its value by age. J. L. Petit was also the author of a "*Traité des Maladies Chirurgicales et des Opérations qui leur conviennent. Ouvrage Posthume*;" a production that will always stand high in the estimation of the judicious surgeon.

The history of this epoch, so glorious for the profession of surgery, is completely detailed in the Memoirs and Prizes of the Royal Academy of Surgery; a work which is absolutely indispensable, and the various parts of which cannot be too often considered. In it are preserved the labours of Mareschal, Quesnay, La Peyronie, Morand, Petit, De la Martinière, Le Dran, Garengeot, de la Faye, Louis, Verdier, Foubert, Hevin, Pibrac, Fabre, Le Cat, Bordenave, Sabatier, Puzos, Levret, and several other practitioners, who, though less famous, contributed by their exertions and knowledge to form this useful body of surgical facts. Many of the preceding surgeons also distinguished themselves by other productions, which, however, I shall not here enumerate, as they are quoted in many other parts of this work.

To the foregoing list of eminent French surgeons must be added, the names of La Motte, Mâitre-Jean, Goulard, Daviel, Ravaton, Mejean. Pouteau, David, and Frère Cosme.

While surgery was thus advancing in France, other nations were not neglectful of it. At this period, flourished in England, White, Cheselden, Douglas, the two Monros, Sharp, Cowper, Warner, Alanson, Percival Pott, Hawkins, Smellie, and the two Hunters.

White's *Cases in Surgery*, 1770; Cheselden's *Treatise on the High Operation for the Stone, London*, 1723, *in 8vo.* and his *Treatise on the Anatomy of the Human Body;* Douglas's Tract, entitled, "*Lithotomia Douglassiana;*" Sharp's *Treatise of the Operations;* and his "*Critical Inquiry into the present State of Surgery;*" *Monro's Works by his son; Warner's Cases in Surgery*, 1754, *and his Description of the Eye and its Diseases*, 1775; *Alanson's Treatise on Amputation; Pott's Chirurgical Works; Smellie's Midwifery;* and *John Hunter on the Blood, Inflammation, &c.; his Treatises on the Venereal Disease, Animal Economy, the Teeth*, and all the papers written by himself and his brother, in the ***Phil. Trans. Med. Obs.*** *and Inquiries, and Trans. of a Society for the Improvement of Med. and Chir. Knowledge;* are productions, which reflect the highest credit on the state of surgery in England.

But, of all these eminent men, none contributed more powerfully than Mr. Percival Pott, to the improvement of the practice of surgery in England. His life, indeed, forms a sort of epoch in the history of the profession. Before his inculcations and example had produced a desirable change, the maxim of, "*dolor medicina doloris*," as we learn from Sir James Earle, remained unrefuted. The severe treatment of the old school, in the operative part and in the applications, continued in force. The first principles of surgery, the natural process and powers of healing, were either not understood, or not attended to; painful and escharotic dressings were continually employed; and the actual cautery was in such frequent use, that at the times, when the surgeons visited the hospital, it was regularly heated, and prepared as a part of the necessary apparatus. Where shall we find more sensible, or more truly practical observations on the treatment of abscesses, than in his excellent treatise on the fistula in ano? Where shall we meet with better remarks on the local treatment of gangrenous parts, than in his valuable tract on the mortification of the toes and feet? What author abounds with so many just observations on the injuries of the head, blended it is true with rather too great a partiality to the trepan, the so frequent necessity for which is now less generally acknowledged? His description of the inflammation and suppuration of the dura mater, and of the treatment, is matchless. The account, which he has left us of the disease of the vertebræ, attended with paralysis of the limbs, is perhaps his most original production. His celebrated essay on fractures, was also very original, and has had in this country considerable influence over the treatment of these injuries; but, there can now be no doubt, that the effects of position were exaggerated in this part of his writings, and that surgeons ought still to make every possible exertion to render their apparatus for broken bones more effectual. (See *Fractures.*) A more really valuable production of this eminent surgeon is his remarks on amputation. The necessity for that operation in certain cases is there convincingly detailed; and the most advantageous period for its performance clearly indicated. The urgency for its prompt execution, after particular injuries, he has indeed so perfectly explained, that the late inculcations on the subject by Larrey, and several other modern surgeons, appear to be in a great measure anticipated; the only difference being that Pott's remarks applied principally to compound fractures, while Larrey's refer to gun-shot wounds. All these, however, are cases of accidental violence, and of course, should be treated upon the same general principles.

A longer comment on the writings and improvements of Percival Pott would here be requisite to do him every degree of justice; but, his name, advice, and opinions are so conspicuous throughout this volume, that I shall be excused for not saying any thing more in the present place, than that he was in his time the best practical surgeon, the best lecturer, the best writer on surgery, the best operator, of which this large metropolis could boast.

Another character of still greater genius and originality, though of inferior education, was the ever memorable John Hunter, surgeon to St. George's Hospital, who was at once eminent as a surgeon, an anatomist, a physiologist, a naturalist, and philosopher. If Pott materially improved many parts of the practice of surgery in England, and evinced himself to be the most skilful operator of his time, John Hunter was also not less importantly employed in extending the boundaries of physiological knowledge, and in the investigation of human, and particularly comparative anatomy. The knowledge, which he derived from his favourite studies, he constantly applied to the improvement of the art of surgery, and he omitted no opportunity of examining morbid bodies, whereby he collected facts, which are invaluable, as they tend to explain the real causes of the symptoms of numerous diseases.

In the practice of surgery, whenever operations proved inadequate to their intention, Mr. Hunter always investigated with uncommon zeal the causes of ill success, and in this way, he detected many fallacies, as well as made some important discoveries in the healing art. He ascertained the cause of failure, common to all the operations in use for the radical cure of the hydrocele, and was enabled to propose a mode of operating attended with invariable success. He ascertained, by experiments and observations, that exposure to atmospherical air, simply, can neither produce, nor increase inflammation. He discovered in the blood so many phenomena, connected with life, and not to be referred to any other cause, that he considered it alive in its fluid state. He improved the operation for the fistula lachrymalis, by removing a circular piece of the os unguis, instead of breaking it down with the point of a trocar. He explained better than any of his predecessors, all the highly interesting modern doctrines, relative to inflammation, union by the first intention, suppuration, ulceration, and mortification. His writings also throw considerable light on the growth, structure, and diseases of the teeth. As instances of his operative skill, it deserves to be mentioned, that he removed a tumor from the side of the head and neck of a patient at St. George's Hospital, as large as the head, to which it was attached; and by bringing the cut edges of the skin together, the whole wound was nearly healed by the first intention. He likewise dissected out of the neck a tumor, which one of the best operators in this country had declared, rather too strongly, that no one but a fool, or a madman, would meddle with; and the patient got perfectly well. But, perhaps, the greatest improvement, which he made in the practice of surgery, was his invention of a new mode of performing the operation for the popliteal aneurism, by taking up the femoral artery on the anterior part of the thigh, without opening the tumor in the ham. (See *Trans. of a Society for the Improvement of Med. and Chir. Knowledge.*) The safety and efficacy of this method of operating have now been fully established, and the plan has been extended to all operations for the cure of this formidable disease. (See *Aneurism.*)

According to Sir Everard Home, Mr. Hunter was also one of the first, who taught, that the excision of the bitten part was the only sure mode of preventing hydrophobia; and he extended the time, during which this proceeding might be reasonably adopted, beyond the period which had been generally specified.

His researches into the nature of the venereal disease, and his observations on the treatment, will for ever be a lasting monument of his wonderful powers of reasoning and investigation. If he left some points of the subject doubtful and unsettled, he has admirably succeeded in the elucidation of others; and his work on this interesting disorder, is, with all its defects, the best which is yet extant.

Even the language and mode of expression of this great man were his own; for, so original were his sentiments, that they could hardly be delineated by any ordinary arrangement of words. His phrases are still adopted in all the medical schools of this country, and continue to modify the style of almost every professional book. Great as Mr. Hunter's merit as a surgeon was, it was still greater as a comparative anatomist and physiologist. The museum of the Royal College of Surgeons, and his papers in the Phil. Trans. will for ever attest his greatness in these characters.

At the period, when the preceding distinguished men upheld the character of their profession in Great Britain, Lancisi, Morgagni, Molinelli, Bertrandi, Guatiani, Mascagni, Matani, Troja, and Moscati, were doing the same thing in Italy. Bertrandi's Treatise on the Operations of Surgery, and Troja's work on the Regeneration of Bones, are even at this day works of the highest repute. Of late years, the credit of the Italian surgeons has been honourably maintained, by Monteggia, Scarpa, Paletta, Quadri, Assalini, Morigi, and others. In Holland flourished Albinus, Deventer, Sandifort, and Camper; and, in Germany, and the north of Europe, the immortal Haller, Heister, well known for his "*Institutiones Chirurgiæ*;" Platner; Rœderer (*Elementa Artis Obstetriciæ, Goett.* 1752. *Obs. de Partu Laborioso. Decad.* 11, 1756.) Stein, Bilguer, Acrell, Callisen, (*Systema Chirurgiæ Hodiernæ*, 2 *Vol* 8*vo.*) Brambilla, Theden, (*Progrès ulterieurs de la Chirurgie.*) Schmucker, (*Vermischte Chirurgische Schriften, B.* 3, *and Chir. Wahrnehmungen.*) Richter, (*Traite des Hernies*, 2 *Vol.* 8*vo. Bibl. für die Chirurgie; Ansfangsgr. der Wundarzn.* 7 *B. and Obs. Chirurgicarum Fasc.*) Also Arnemann, Weidmann, Beer, Soemmering, Creutzenfeldt, Hesselbach, Hufeland, Graefe, Klein, Himly, Langenbeck, Walther, J. A. Schmidt, G. J. Beer, &c. should not be forgotten, several of whom are still pursuing their useful and honourable career. Be it also recorded as a part of the great merit of the Germans, that they now rank amongst the best and most minute anatomists; that they are zealous cultivators of comparative anatomy; that their industry allows no improvement in medical science, wherever made, to escape their notice; and that surgery is greatly indebted to them for the best descriptions of the diseases of the eye.

On the Continent, the Royal Academy of Surgery at Paris was long considered quite as the solar light of this branch of science. Nothing, indeed, contributed so materially to the improvement of surgical knowledge, as this establishment, a noble institution, which, for a long while, gave our neighbours infinite advantage over us, in the cultivation of this most useful profession. The French Revolution, which, by a fatal abuse, involved in the same prohibition, both useful and pernicious societies, did not spare even this beneficial establishment, in which emulation and talents had been so long united for the benefit of mankind. The various dissertations, published by its illustrious members, will serve as a perpetual memorial of the spirit, ability, and success with which its objects were pursued; and centuries hence, practitioners will reap from the pages of its memoirs the most valuable information. Although the Academy was deprived of the talents of Louis, who died a short time before its suppression, it yet had at this period several members, worthy of continuing its labours, and supporting its reputation: Sabatier, Desault, who may be regarded as the Pott of France, Chopart, Lassus, Peyrilhe, Dubois, Percy, Baudeloque, Pelletan, Sue, &c.

The Academy of Surgery in France was succeeded by what is named the Ecole de Médécine. Desault, who had been almost a stranger in the former, became quite the leading character in the latter. Several things recommended him strongly to the remembrance and admiration of posterity; the exactness and method, which he introduced into the study of anatomy: the ingenious kinds of apparatus which he invented for the treatment of fractures: a noble ardour in his profession, which he knew how to impart to all his pupils: his clinical lectures upon surgery, which were the first ever delivered; and the boldness and simplicity of his modes of operating. Indeed, such was his genius, that even when he practised only methods already understood, he did them with so much adroitness, that he rather appeared to be the inventor of them. From the Ecole de Médécine have issued Dupuytren, Boyer, Richerand, Dubois, Lheritier, Manoury, Lallemant, Petit de Lyon, Bichat, &c.

Amongst the public institutions in Europe for the improvement of medical and surgical knowledge, the present Medical and Chirurgical Society of London certainly stands pre-eminent, whether the reputation and number of its members, the importance of many of the papers which it has published, or the extent and value of its library, be taken as the criterion of the character, which is here assigned to it. Many of the facts, which it has collected and published, are of considerable practical importance, especially those relating to the subjects of aneurism, hemorrhage, the diseases of the joints, calculi in the bladder, and that least intelligible of all diseases, syphilis. Its library, which is already the most select, valuable, and complete collection of medical literature in Great Britain, more especially with reference to modern works, is continually receiving additions, both by large purchases at home and abroad, and by the numerous donations of its members and others. The intercourse and correspondence, which such a society always maintain amongst the innumerable, scattered members of the profession, cannot fail to be attended with the most beneficial effects upon medical science in general: a generous and useful sort of emulation is thus kept alive; the spirit of inquiry is kept from slumbering; and every individual, who ascertains a new fact, has now the means of making it known to the world, with all the expedition, which its importance may demand. By this observation, I do not mean, that it will always appear in print soon after its communication to the society; for, that is a circumstance, which must necessarily depend upon there being, or not, a sufficient quantity of interesting matter in the Society's possession to form an additional part to its Transactions; but, the very reading of the paper at a public meeting gives it immediate notoriety in the profession, and, if its novelty and merit be great, it soon excites very general attention.

The researches of Bichat, who quitted surgery, powerfully contributed to the advancement of physiological science. His mind, richly stored with the positive facts which he had learned in the study of surgery, conceived no less a project, than that of rebuilding the whole edifice of medicine. Some courses of lectures upon the materia medica, internal clinical medicine, and morbid anatomy, announced this vast design, which was frustrated by a premature death. Bichat, as a physiologist, and man of very original genius, may be considered as the John Hunter of France; but his qualities were of a different cast, and hardly admit of comparison with those of Hunter, whose investigations were not limited to man, but extended to the whole chain of animated beings. Bichat died in the midst of his labours, and in dying his greatest regret was that of not having completed them. His example, says Richerand, proves most convincingly what Boerhaave always inculcated, and every man of experience knows, how indispensable the study and even the practice of surgery are to him, who would wish to be a distinguished and successful physician. (*Nosogr. Chir. T.* 1, *p.* 25.)

In the course of the last thirty years, great and essential improvements have been made in almost every branch of surgery.

Before the time of Mr. Hunter, our ideas of the venereal disease were surrounded with absurdities; and it is to this luminary that we are in an eminent degree indebted for the increased discrimination and reason, which now prevail, both in the doctrines and treatment of the complaint. It must be confessed, however, that much yet remains to be made out, respecting the nature and treatment of syphilitic disorders. Need I mention a greater proof of the truth of this remark, than the remarkable change of practice in some of the principal hospitals in London, mercury being now exhibited in not more than one out of every eight or ten cases, for which this medicine a few years ago was always deemed indispensable? Numerous cases, having all the characters of primary venereal sores, seem also now to be curable by simple dressings and cleanliness; and the necessity for violent salivation, in any cases, begins now to be generally disbelieved. In short, so different is every thing from what it used to be, that many surgeons are tempted to suppose the nature of the venereal disease totally altered. See *Venereal Disease.*

Strictures in the urethra, an equally common and distressing disease, were not well treated of before Mr. Hunter published on the venereal disease. Until his time, we were unacquainted with a good practical method of applying caustic within the urethra, a method which has been still further perfected with the armed bougies, invented by Sir Everard Home. The latter gentleman, indeed, has taken a very scientific view of the whole subject, and, perhaps, his only error is that of not having sufficiently limited a plan of treatment, which may sometimes be preferable to all others.

In modern times, hernial diseases, those common afflictions in every country, have received highly interesting elucidations from the labours of Pott, Camper, Richter, Sir Astley Cooper, Hey, Gimbernat, Hesselbach, Scarpa, Lawrence, Langenbeck, Cloquet, &c.

The treatment of injuries of the head has been materially improved by Quesnay, Le Dran, Pott, Hill, Desault, and Abernethy.

The disease of the vertebræ, which occasions paralysis of the limbs, formerly always baffled the practitioner; but, the method, proposed by Mr. Pott, is now frequently productive of considerable relief, and sometimes of a perfect cure. The diseases of the joints in general may also be said to be at present viewed with much more discrimination, than they were a very few years ago; and this great step to better and more successful practice reflects great honour on Mr. Brodie, while it keeps up a well-founded hope, that morbid anatomy, the study, which has of late banished so much confusion from this part of surgery, will yet be the means of bringing to light other useful facts and observations, relative to the pathology of the joints.

In the time of Mr. Pott, few patients, afflicted with lumbar abscesses ever recovered; for, soon after a free opening had been made, according to the method then in vogue, the constitution was usually seized with violent irritative fever, which hardly admitted of any control. Mr. Abernethy ascertained, that much of this risk might be avoided by making only a small opening, healing it by the first intention, after the matter had been let out, and then repeating the same plan, from time to time, so as to prevent the cavity of the abscess from ever being distended, and give it the opportunity of diminishing by a natural process. Of course, success cannot be expected to attend even this treatment, when the vertebræ are carious, or any other serious organic disease prevails.

The almost infallible plan of curing hydroceles by means of an injection, as described by Sir James Earle, may be enumerated as one of the most decided improvements in modern surgery: at least, no doubt is entertained on this point by any surgeon of eminence in France, the British dominions, or the United States of America.

The increasing aversion to the employment of the gorget in lithotomy, the many distinguished advocates for the use of better instruments, and, above all things, the clearer exposition of the right principles of the operation, now made, both by lecturers and authors, I regard as an agreeable indication of the augmented degree of success with which lithotomy is now likely to be practised, in every fair case for the operation. The urethral-forceps, recommended by Sir A. Cooper, for removing calculi through the urethra, and Dr. Civiale's ingenious apparatus, called a lithontriptor, designed to reduce the stone to powder, so that it may be voided with the urine through the urethra, (each plan thus superseding, when it answers, all occasion for lithotomy) are great and signal improvements, which entitle their inventors to a distinguished rank amongst those men of genius, from whose labours the present and future generations will receive inestimable benefit.

The diseases of the eyes, cases, to which English surgeons seemed to pay much less attention, than was bestowed by foreign practitioners, now obtain due attention in this country. Although we have always had what are called oculists, our regular surgeons have generally been wonderfully ignorant of this part of their profession, and, uninformed on the subject, they have given up to professed oculists and quacks one of the most lucrative and agreeable branches of practice. However, the able writings of Daviel, Wenzel, and Ware, begin now to be familiarly known to practitioners: and the observations of Scarpa, Richter, Beer, Schmidt, Himly, Wardrop, Travers, Saunders, and Guthrie, will soon have immense effect in diffusing in the profession a due knowledge of the numerous diseases, to which the organs of vision are liable. As likewise the hospital surgeons of London, long and grossly neglected the study of these cases, and conscientiously refused to have any thing to do with them, the public at length saw the necessity of establishing Eye Infirmaries, where such afflictions might be more attentively observed and relieved. Some of these have now become excellent schools, in which the rising generation of surgeons have abundant opportunities of studying the nature of all the diseases of the eyes, and the most approved methods of treatment.

While, however, I am thus commending separate institutions for disorders of the eye, it becomes me to express my regret at the long continued neglect, and the ignorance of these diseases, manifested by several hospital surgeons, circumstances, which were the original causes of these distinct establishments. For, according to my conceptions, it would have been far better to have had the practice in eye-cases exhibited in the common great schools of surgery, the large hospitals of London; not only because I think these diseases would then have met with more general and public observation; but, also because I have always considered all unnecessary subdivisions of practice, in short all measures which tend to increase the expenses of a medical education, and to throw particular cases into the hands of a few individuals, hurtful to the best interests, and degrading to the character of the profession.

In the treatment of aneurismal diseases, English surgeons have much to be proud of. All the boldest operations in this branch of surgery have been devised by the genius, and executed by the spirit and skill of British surgeons. Even M. Roux himself is here obliged to confess our superiority. (*Parallèle de la Chirurgie Angloise, &c. p.* 249.) The carotid artery, the external and internal iliac, and the subclavian, have all been successfully tied by surgeons of this country. The first operation, in which the external iliac was tied, I was a spectator of: it was performed by Mr. Abernethy in Bartholomew's hospital, and it has subsequently been repeated in many examples, both in this country and others, with considerable success. I had also the honour of seeing the same gentleman tie the carotid, in the first instance of that operation in England. This important measure, which has now been frequently practised with success, constitutes one of the great improvements in the operative part of modern surgery.

In the article Aneurism, I have cited many examples, in which the carotid artery has been successfully tied; and the safety and propriety of the operation are now generally known and acknowledged. Indeed, so little are surgeons now afraid of the ill effects upon the brain, that the carotid artery has been tied merely for the purpose of enabling the operator to take away a large tumor, including the whole of the parotid gland, from the side of the neck, without risk of hemorrhage; a mode of proceeding, however, which ought not to be encouraged into a common practice. (See *Med. Chir. Trans. Vol.* 7, *p.* 112.) The example of skill, judgment, and boldness, set by the surgeons of this country, has not been lost upon foreign practitioners. In France, in Germany, and, particularly, in the United States of America, operations for aneurism are now familiarly practised. Indeed, in the two latter countries, the arteria innominata has been tied; a proceeding, which, though it was originally suggested here, I believe, has not yet been ventured upon in Great Britain. Mr. Weiss's aneurismal needle, for the conveyance of the ligature under very deep arteries, where there is but little room, is also an invention, likely to prove of very material service in this branch of surgery, where sometimes the most skilful surgeons have either been quite baffled in their endeavour to pass the ligature under the vessel, or have detained their patient so long in the operating room, exposed to the greatest agony, ere the business was accomplished, that the irritated and reduced state of the constitution seriously lessened the chance of a happy issue. Before I quit this subject, my feelings call upon me to express the high opinion which I entertain of Mr. Hodgson's Treatise on the Diseases of Arteries and Veins, published in 1815, a work, which reflects great credit on English surgery, and contains practical precepts far superior to those of Scarpa. A new edition of it, enriched with later observations, and the further experience and reflections of the respected author, would be a general service to the profession.

In the modern practice of surgery, a variety of old prejudices are gradually vanishing. Peruvian bark, not many years ago, was regarded as a sovereign remedy and specific for nearly all cases of gangrene; and in these and many other instances, it was prescribed without any discrimination, and in doses beyond all moderation. But, the false idea, that this medicine has any specific effect in checking mortification, no longer blinds the senses of the most superficial practitioner. He neither believes this doctrine, nor the still more absurd opinion, that strength can be mysteriously extracted from this vegetable substance, and communicated to the human constitution, in proportion to the quantity, which can be made to remain in the stomach.

The valuable discoveries, recently made in France, relative to quinine and cinchonine, the essential parts of Peruvian bark, comprised in a very small compass, will lead to great amendment in the modes of prescribing this medicine in every case, where it may deserve trial.

At the present day, the subject of mortification opens to us a point for investigation, of the first-rate consequence. Every surgeon is aware, that when a limb is deeply affected with mortification, amputation is commonly necessary. This is generally acknowledged; but, the performance of the operation has since the time of Mr. Pott, only been sanctioned when the mortification has manifestly ceased to spread, and a line of separation is formed between the dead and living parts. All other instances, in which the disorder was in a spreading state, were left to their fate. It is true, some of the old surgeons occasionally ventured to deviate from this precept; but, as they did so, without any discrimination, or knowledge of the particular examples, which ought to form an exception to the general rule, their ill success cannot constitute a just argument against the plan of amputating earlier in a certain description of cases.

Now, if modern experience prove, that many lives may be saved by a timely performance of amputation, under circumstances, in which it has until lately been generally condemned, it must be allowed that the established innovation will be one of the greatest improvements in the practice of the present time.

For reviving the consideration of this question, and venturing to deviate from the beaten path, the world is much indebted to that eminent military surgeon, Baron Larrey. How different his doctrines and practice are from those usually taught in the schools, the article *Mortification* will sufficiently prove.

Connected with this topic is *Hospital Gangrene*, a case, which deserves here to be pointed out, as having received considerable attention of late years, and being much better treated, now that the efficacy of the solution of arsenic, and strong nitrous acid, has been so completely proved, by the observations of Blackadder and Welbank.

In the treatment of ununited fractures, the simple and ingenious practice, suggested by Dr. Physick of Philadelphia, merits particular notice: various successful trials have been made of it in this country and France, (See *Medico Chir. Trans. Vols.* 5 *&* 7, and *Boyer's Traité des Maladies Chir.*) as well as in America, and, though liable to failure, it is yet entitled to be regarded as a valuable addition to the plans hitherto devised for these cases, which too often render the patient a helpless cripple during life.

The inestimable treatise of Dr. Jones on Hemorrhage has now produced quite a revolution in all the principles by which the surgeon is guided in the employment of the ligature for the stoppage of bleeding, and the cure of aneurisms. Instead of thick clumsy cords, small firm silks, or threads, are now generally used; and so far is the practitioner from being fearful of tying arteries too tightly, lest the ligature cut through them, that it is now a particular object with him to apply the silk, or thread, with a certain degree of force, in order that the inner coat of the vessel may be divided. If this be not done, the effusion of coagulating lymph, within the artery, an important part of the process of obliteration, cannot be expected as a matter of certainty, and secondary hemorrhage is more likely to occur. But, in order to convey an adequate idea of the beneficial changes, which Dr. Jones's observations are tending to produce in practice, I have been careful, in the article *Hemorrhage*, to give a tolerably full account of the results of all his interesting experiments.

Besides using very small, firm, round threads, instead of large, flat tapes, or cords, as was the custom, a few years ago, modern surgeons begin to suspect, that much benefit may also arise from cutting off both portions of the ligature close to the knot, after amputation, the removal of the breast, &c. No one has insisted so much as Mr. Lawrence upon the propriety of examining further the merits of this innovation. If no bad effects result from leaving so small a particle of extraneous substance in the flesh, as the little bit of silk composing the knot and noose on the artery, the practice will form a considerable improvement. The wound may then be brought together at every point; the quantity of extraneous matter in the part will be lessened to almost nothing; the danger of convulsive affections will be reduced in proportion as a serious cause of pain and irritation is diminished; and the chance of accomplishing perfect union by the first intention will be materially increased. Mr. Lawrence has tried the plan in many instances, and hitherto his experience has not found any ill consequences follow, while it has proved, that many advantages are undoubtedly the result of it. Mr. Cross, of Norwich, however, has detailed some observations, which are rather against the practice, and it is certainly far from being generally, or even commonly adopted. After amputation, it was practised by several military surgeons in the late war; and, although they probably did not employ exactly such ligatures as this mode absolutely requires, few of them met with any instances of future trouble from the minute bits of ligature enclosed in the wound, with the exception of Mr. Guthrie, and one or two other army surgeons of my acquaintance. However, if large ligatures be used, the practice is not fairly tried, or rather the practice is not tried at all; because the great principle, on which it answers, is the very small atom of silk, composing the extraneous substance, left in the wound, when such ligatures as Mr. Lawrence particularly recommmends, are employed. Delpech and Roux have also sometimes adopted the plan of removing the ends of the ligature close to the knot. (See *Parallèle de la Chir. Angloise avec la Chir. Françoise, p.* 131.) See *Amputation*, *Aneurism*, *Hemorrhage* and *Ligature*.

Amongst other real improvements in modern practice, I must not forget the present more rational method of dressing the wound, after the majority of capital operations, with light, cooling applications, instead of laying on the part a farrago of irritating pledgets and plasters, and a cumbersome mass of lint, tow, flannel, and other bandages, woollen caps, &c. The fewer the adhesive strips are the better, if they only hold the lips of the wound together. This is all they are intended to do. Whereas, if you apply more than are necessary for this purpose, they do harm by heating the part, and covering the wound so entirely as to prevent the issue of the discharge. Over the adhesive plasters, let the surgeon be content with placing a simple pledget of spermaceti cerate, and some linen wet with cold water, which will often avert hurtful degrees of pain, and inflammation, by keeping the parts cool.

Wars, which are unfavourable to most other sciences, are rather conducive to advances in surgery. The many new and interesting observations, which Baron Larrey has made in the course of his long and extensive military experience, are a proof of the foregoing remark. Pitard, almost the founder of surgery in France, was a military surgeon. Ambroise Paré and Wiseman also collected their most valuable knowledge principally in the service of the army. Mr. Hunter himself gained much of his practical information in the same line of life. To Baron Larrey surgeons are indebted for many highly important observations, relating to amputation in cases of gunshot wounds. In particular, he has adduced a larger and more convincing body of evidence, than was ever before collected, to prove, that, in gunshot injuries, the operation of amputation should always be performed without the least delay, in every instance, in which such operation is judged to be unavoidable, and the ultimate preservation of the limb either impossible, or beyond the scope of all rational probability. He has established the truth of this most important precept in military surgery by innumerable facts, drawn chiefly from his own ample experience, and partly from the practice of many able colleagues. The great operations of the shoulder-joint and hip-joint amputations, he has executed with success. The necessity for the former, however, he proves may sometimes be superseded, and the limb be saved, by making a suitable incision for the extraction of the splintered portions of the upper part of the humerus. This method, which was in many instances done with success in the peninsular war, and has been also repeatedly performed with the same result by Baron Percy, was, I believe, originally proposed and practised by Boucher. (See *Mem. de l'Acad. de Chir. T. 2, 4to.*) However, it was first more particularly described, and even practised, by Mr. C. White of Manchester. (See his *Cases in Surgery.*) Mr. Morell also performed it successfully in the York Hospital. (See *Med. Chir. Trans. Vol. 7.*) See *Amputation.*

Amputation at the hip-joint, performed only in the most dreadful cases, because itself the most dreadful operation in surgery, Baron Larrey has performed five times, and twice (I believe) with success. It has also now been done by Messrs. Brownrigg and Guthrie, Sir Astley Cooper, Graefe, Walther, Delpech, and others, and most of these cases (though not all) terminated in the recovery of the patients. As must be the case, however, on account of the desperate circumstances under which the operation is performed, and the severity of the operation itself, the examples of recovery bear only a small proportion to the large number of deaths, known to have followed amputation at the hip in the many cases, in which it has now been undertaken. However, the unfortunate truth should not be exaggerated into a reason for an unqualified condemnation of the practice, which is adopted as the only means affording a chance of saving life. But, as there may be difficulty in deciding whether the patient will have the best chance with, or without the operation, it is to be hoped that no surgeons will perform it, except under the authority of the united opinion of a board, or consultation, of the best informed practitioners, whom circumstances will allow to assemble. It is to be hoped, likewise, that there is no man in the profession, so destitute of honor and principle, as to aim at notoriety through the medium of this terrible operation, and court the opportunity of doing it merely with this view, instead of being compelled to undertake it by the really desperate circumstances of the case. If there be such an individual in existence, his scheme of wading through blood to reputation, now that the novelty of the operation has vanished, would have but little chance of success. Be it also recollected by the profession, that while the operation itself requires only ordinary talents, the business of avoiding it, and of discriminating the exact cases, in which it should be done, implies an extensive acquaintance with the principles of surgery, ample experience, and more than common abilities and judgment. See *Amputation.*

In military surgery, the useful innovation of *ambulances*, or light caravans, furnished with a proper number of surgeons' assistants and orderlies, and capable of keeping up with the vanguard, if requisite, is undoubtedly the best means of affording speedy surgical assistance to the wounded on the field of battle, and ought to be enumerated as one of the greatest modern improvements. Barons Percy and Larrey, deserve the chief praise for their successful exertions in organizing and bringing to perfection so indispensable an establishment. The account of this subject well deserves perusal; and it may be seen either in *Larrey's Mémoires de Chirurgie Militaire*, or in the *Dict. des Sciences Medicales, T. 5.*

Another improvement in surgery, of an humbler, but not less useful description, than some things, to which I have already adverted, is the elastic gum seton, which, for cleanliness and convenience, is far superior to what has generally been employed by practitioners. The needle for it, and the slips of elastic gum, may be procured of Mr. Weiss. The invention, I believe, is one of the results of French ingenuity.

The excision of more or less considerable portions of the lower jaw, in cases of irremediable disease of it, is a new proceeding, exemplifying the still continued progress of the boldest parts of operative surgery. The practice also merits notice on another account: it is an extension of the most effectual part of surgery to a class of miserable and hopeless cases, first devised and executed, I believe, by our transatlantic brethren, in the United States, Dr. Mott having been the means of conferring this honour upon them. Indeed, it appears to me, that the zeal and talent, with which the practice of surgery is now cultivated in that part of the world, will soon render it a frequent source of new and useful suggestions.

The last illustration, which I shall quote, of the modern advances of surgery is, the discovery of various new active remedies, or improved forms of medicine, as iodine, morphine, quinine, and cinchonine. The first, as the most powerful medicine for bronchocele, and for certain chronic enlargements of the breast and testicle, supposed to be of a scrofulous nature, is a decidedly valuable addition to the surgical pharmacopœia; perhaps, the most valuable one, that has been made in modern times. With respect to morphine, if experience prove, that it possesses all the anodyne qualities of opium, without the stimulating ones, in how many cases and circumstances its exhibition may be ventured upon, where the practitioner would be fearful of the common preparations of opium! As for quinine and cinchonine, they are considered to possess all the essential qualities of bark; and as the doses are very small, they admit of being prescribed, when the more bulky preparations of it would dangerously disturb both the stomach and bowels.

SUSPENSORY. A bandage for supporting the scrotum; a bag-truss. Bandages of this kind are now usually sold at the shops, and seldom made by surgeons themselves; therefore a particular description of them is not essential in this work. In cases of hernia humoralis, varicocele, cirsocele, some particular ruptures, and several other affections of the testicle, and spermatic chord, a suspensory bandage is of infinite service.

SUTURES. (from *suo*, to sew.) A mode of uniting the edges of a wound, by keeping them in contact with stitches.

Mr. Sharp remarks, that "when a wound is recent, and the parts of it are divided by a sharp instrument, without any further violence, and, in such manner, that they may be made to approach each other, by being returned with the hands, they will, if held in close contact for some time, reunite by inosculation, and cement, like one branch of a tree ingrafted on another. To maintain them in this situation, several sorts of sutures have been invented, and formerly practised, but the number of them has, of late, been very much reduced. Those now chiefly described, are the *interrupted*, the *glover's*, the *quilled*, the *twisted*, and the *dry*, sutures; but, the interrupted and twisted are almost the only useful ones, for the quilled suture is never preferable to the interrupted; the dry suture is ridiculous in terms, since it is only a piece of plaster, applied in many different ways, to reunite the lips of the wound; and the glover's, or uninterrupted stitch, which is recommended in superficial wounds, to prevent the deformity of a scar, does rather, by the frequency of the stitches, occasion it, and is therefore to be rejected, in favour of a compress and sticking plaster." (*Oper. of Surgery.*) The twisted suture is described in speaking of the *hare-lip;* and *gastroraphe*, which also properly belonging to the present subject, forms a distinct article in this Dictionary.

Interrupted Suture.—The wound being cleansed from all clots of blood, and its lips being brought evenly into contact, the needle, armed with a ligature, is to be carefully carried from without, inwards to the bottom, and so on from within outwards. Care must be taken to make the puncture far enough from the edge of the wound, lest the ligature should tear quite through the skin and flesh. This distance, according to Mr. Sharp, may be three, or four-tenths of an inch. The other stitches required are only repetitions of the same process. The threads having been all passed, "you are in general to begin tying them in the middle of the wound; though, if the lips be held carefully together, it will not be of great consequence, which stitch is tied first." (*Operations*, *Chap.* 1.)

Surgical writers in general state, that the number of stitches must, in a great measure, depend upon the extent of the wound. The common rule is, that one suture is sufficient for every inch of the wound; but, that, in some instances, a stitch must be more frequently made, particularly when a wound gapes very much, in consequence of a transverse division of muscles. As we have already explained, it is necessary to pierce the skin, at a sufficient distance from the sides of the wound, lest the thread should cut through the flesh in a short time: but, though Mr. Sharp lays down the necessary distance, in general, as three, or four-tenths of an inch, and others advise the needle to be always carried through the deepest part of the wound, we must receive these directions, particularly the last, as subject to numerous exceptions. When a wound is very deep, it would be conspicuously absurd, and even, in many instances, dangerous to drive the needle through a vast thickness of parts. Other wounds, of considerable length, might not be, in some places, four-tenths of an inch deep; though it is true, sutures could never be requisite at such points.

The needles for making the interrupted suture will pass, with the greatest facility, when their shape corresponds exactly with the segment of a circle, and they should always form a track of sufficient size to allow the ligatures, which they draw after them, to pass through the flesh with the utmost ease.

The interrupted suture obviously receives its name from the interspaces between the stitches; and it is the one most frequently employed. Its action is always to be assisted, and supported, either with the uniting bandage, (see *Bandage*,) or with strips of adhesive plaster, compresses, &c.

Quilled Suture.—As Mr. John Bell has observed: "when the wound was deep among the muscular flesh, the old surgeons imagined, that so large a wound could not be commanded by the common interrupted suture, however deep the stitches might be driven among the flesh; they were, besides, fearful of using the continued (glover's) suture in deep gashes, lest the wound should be made to adhere superficially, while it was still open within, forming perhaps a suppuration, or deep collection of matter. They believed, that a deep muscular wound could not be safely healed, without a degree of suppuration; while they wished to bring it together at the bottom, they were afraid to close it very exactly at the mouth, lest the matter should be collected in the deeper parts of the wound; it was for this purpose (says Mr. John Bell) that they used, what they called the *compound*, or *quilled suture*. It is merely the interrupted suture, with this difference, that the ligatures are not tied over the face of the wound, but over two quills, or rolls of plaster, or bougies, which are laid along the sides of the wound. In performing this suture, we make first two, three, or four stitches, of the interrupted suture, very deep, and then, all the ligatures being put in, we lay two bougies along the sides of the wound; then slip one bougie into the loop of the ligatures on one side, drawing all the ligatures from the other side, (Mr. Bell should rather have said, towards the other side,) till that bougie is firmly braced down. Next we lay the other bougie, and make the knots of each ligature over it, and draw it also pretty firm; and thus the ligatures, in form of an arch, go deep into the bottom of the wound, and hold it close, while the bougies, or quills, keep the middle of the wound, and lips of it, pressed together with moderate closeness, and prevent any strain upon the threads, or any coarse and painful tying across the face of the wound." In a note, Mr. J. Bell says, that Dionis violently reprobates the quilled suture; but, that De la Faye (the annotator on Dionis) says, it is good for deep muscular wounds. The quilled suture is now scarcely ever employed; nor has it any advantages, except, perhaps, in some wounds in the belly. (See *Principles of Surgery*, *Vol.* 1. *p.* 50.)

I think the reader will more easily comprehend the manner of making the quilled suture, from the following simple directions. Take as many needles, as stitches intended to be made; arm them with a double ligature, or one capable of being readily split into two; introduce the ligatures through the wound; cut off the needles: lay a piece of bougie along one side of the wound, and tie the ends of the ligatures over it. Next draw the other extremities of the ligatures, so as to bring the first piece of bougie into close contact with the flesh; lay the second piece of bougie along the opposite side of the wound, and tie the other ends of the ligatures over it, with sufficient tightness.

Glover's Suture.—This had also the name of the continued suture. It was executed by introducing the needle first into one lip of the wound, from within outwards, then into the other in the same way; and, in this manner the whole track of the wound was sewed up.

The glover's suture has long been rejected by all good surgeons, as improper to be employed in cases of common wounds. It was not, however, till very lately, that this suture was totally abandoned; for, Mr. Sharp, and several eminent writers, since his time, have advised its adoption in wounds of the stomach and intestines. From what has been said in the articles *Wounds of the Abdomen*, and *Hernia*, the reader will perceive, that, even in such particular instances, the glover's suture would not be advisable; so that it may, in every point of view, be now considered as totally disused in every case of surgery, which can possibly present itself. When we remember, in making this suture, how many stitches are unavoidable; how unevenly, and in what a puckered state, the suture drags the edges of the skin together; and what irritation it must produce; we can no longer be surprised, at its now being never practised on the living subject. It is commonly employed for sewing up dead bodies;

a purpose for which it is well fitted; but, for the honour of surgery, and the sake of mankind, it is to be hoped, that it will never again be adopted in practice.

False, or Dry Suture.—Modern surgeons commonly understand by this expression nothing more, than the plan of bringing the sides of a wound together, by means of adhesive plaster; nor did Mr. Sharp attach any other meaning to the phrase, which he sets down as highly ridiculous, as there is no sewing employed. For the following remarks, I am indebted to Mr. Carwardine, of Earls Colne Priory, near Halsted, Essex. Alluding to what was stated in the third edition of this Dictionary, concerning the dry suture, he observes, "you do not appear to be aware, any more than Mr. Sharp, of the precise mode of its application, or why it was so called. Indeed, it is a curious circumstance, how this method of dry suture should have been so lost, as not to be described by any modern surgeons, who laugh at the very term, speaking of it as a mere application of a strip of adhesive plaster. In the *sutura sicca*, so called in opposition to the *sutura cruenta*, where blood followed the needle, some adhesive plaster was spread on linen, having a selvage. A piece of this was applied along each side of the wound (the selvages being opposed to each other), and then drawn together by sewing them with a common needle, without bloodshed. Hence the term *sutura sicca*. The dry suture was used in all wounds of the face, to avoid scars. You will find it thus described by our countryman Thomas Gale, in his Enchiridion, 1563; and also by A. Paré, who gives a figure of it in his folio work, 1579." I feel much obliged to my friend Mr. Carwardine for this explanation, without which the expression *dry suture* is undoubtedly absurd. As the common way of dressing wounds with sticking plaster will come under consideration in a future part of this work (see *Wounds*), I shall not here detain the reader upon that topic.

Sutures, by which I mean such as were made in the flesh with a needle and ligature, were much more frequently employed by the old surgeons, than they are by the moderns. The best practitioners of the present day never resort to this method of holding the sides of a wound in contact, except in cases in which there is a real necessity for it, and other modes will not suffice.

There were, indeed, certain instances, in which the employment of sutures was long ago forbidden. Of this kind were envenomed wounds, in which accidents the destruction of the poison always formed a principal indication in the treatment.—Wounds, accompanied with considerable inflammation, were not deemed proper for the use of sutures, as the stitches had a tendency to increase the inflammatory symptoms. Also, as contused wounds necessarily suppurated, and, consequently, could not be united, sutures were not recommended for them; nor were they judged expedient for wounds attended with such a loss of substance as prevented their lips from being placed in contact. Formerly, wounds penetrating the chest, were not united by sutures; nor were those in which large blood-vessels were injured; at least, until all danger of hemorrhage was obviated by the vessels being tied.

Dionis believed, with several other authors, that wounds should not be united, when bones were exposed, on account of the exfoliations, which might be expected. This precept is no longer valid: for when bones are neither altered nor diseased, and are only simply denuded, or divided with a cutting instrument, no exfoliations will commonly follow, if the surgeon take care to replace the fresh-cut soft parts, so as to cover the exposed portion of the bone. The practicableness of uniting wounds, attended with the division of a bone, is confirmed by numerous facts. De la Peyronie communicated to the French Academy of Surgery, a case conclusive on this point. A man was wounded with a cutting instrument, in an oblique direction, on the external and middle part of the arm. The bone was completely cut through, together with the integuments and muscles, in such a manner that the arm only hung by an undivided portion of the skin, about an inch wide, under which were the large vessels. De la Peyronie tried to unite the parts, being convinced that it would be time enough to amputate afterwards, if the case should require it. He placed the two extremities of the divided bone in their natural situation, made several sutures, for promoting the union of the soft parts, and applied a bandage to the fracture. In this bandage, there were slits, or apertures, over the wound, to allow the dressings to be applied. Spirit of wine, containing a little muriate of ammonia, was used as a topical application, and the fore arm, and hand, which were cold, livid, and insensible, were also fomented with the same. By these means, the natural warmth was restored, and the wound was dressed. In a week the dressings were removed, through the opening in the bandage; in a fortnight they were changed, a second time, and the wound seemed disposed to heal. On the eighteenth day, the healing had made considerable progress; the part had a natural appearance; and the beating of the pulse was very perceptible. De la Peyronie now substituted a common roller for the preceding bandage, and care was taken to change the dressings every ten days. In about seven weeks all applications were left off, and, at the end of two months, the patient was quite well, with the exception of a little numbness in the part. This case is one of the most important in all the records of surgery; for it displays, in a most striking manner, what very bad wounds it is the duty of the surgeon to attempt to unite; and, above all, it exemplifies the propriety of attempting to save many compound fractures, which, judged of only from first appearances, would lead almost any one to resort to amputation. In such cases, when the divided parts are put in contact, the appearances are quite altered.

From what has been already stated, it appears, that surgeons, a considerable time back, did not at once sew up every sort of wound; though the considerations, which led them not to close the wound, were erroneous, as may, perhaps, be said with respect to the apprehension of bleeding and exfoliations. The best modern practitioners employ sutures much less frequently than their predecessors. Pibrac's dissertation on the abuse of sutures, inserted in the third volume of the Memoirs of the Academy of Surgery, has had considerable effect in producing this change, and I may safely add, this improvement in practice. That judicious and enlightened practitioner opposed the method of uniting wounds by means of sutures, which, he contended, ought never to be adopted in practice, except in certain cases in which it was absolutely impossible to keep the sides of the wound in contact, by means of a suitable posture, and the aid of a methodical bandage. Such circumstances Pibrac represents as exceedingly rare, if they ever occur at all. He speaks of sutures as seldom fulfilling the intention of the surgeon, who, in the majority of cases in which he employs them, finds himself necessitated to remove them, before they have accomplished the wished-for end. Pibrac believes, that sutures are generally more hurtful, than conducive to the union of wounds; and that when they succeed, they do not effect a cure more speedily than a proper bandage. He cites numerous cases of very extensive wounds of the abdomen, neck, &c. for the cure of which a bandage proved effectual, and this even in many instances in which sutures had previously failed, and cut their way through the flesh. Louis, who adopted the opinions of Pibrac, published, in the fourth volume of *Mém. de l'Acad. de Chirurgie*, a valuable dissertation, in which he endeavours to prove, that even the hare-lip can be better united, by means of the uniting bandage than with sutures; a case, however, which the best modern surgeons very rightly agree to consider, for particular reasons, elsewhere noticed, (see *Hare-lip*,) as an example in which a suture is advisable.

As far as I can judge, the fair statement of the matter is, that sutures are by no means requisite in the generality of wounds; but that there are particular cases, in which either their greater convenience, or superior efficacy, still makes them approved. Since they cannot be practised without additional wounds being made, and pain occasioned, and since the threads always act as extraneous bodies in the parts, exciting more or less inflammation, and suppuration round them; there can be no doubt that their employment is invariably wrong, whenever the sides of a wound can be maintained in contact by less irritating means, with equal steadiness and security. For, what is it which generally counteracts the wishes of the surgeon, and renders his attempts to make the opposite surfaces of wounds grow together unavailing? Is not the general cause too high a degree of inflammation, which necessarily ends in suppuration? Are not sutures likely to augment inflammation, both by the additional wounds of the needles, and the still more pernicious irritation of the threads, which always act as foreign bodies, sometimes producing not merely an increase of inflammation and suppuration in their track, but frequently ulceration, or sloughing of the parts; and, in particular constitutions, a very extensive erysipelatous redness.

In consequence of the ulcerative process, sutures very often cease to have the power of any longer keeping the edges of wounds in contact; as the observations of Pibrac, and, indeed, what every man may daily remark in practice, fully testify; and the violent inflammatory symptoms, which are excited, frequently oblige the surgeon to cut the threads, and withdraw them altogether.

But, even admitting, that, by the general adoption of sutures, some wounds would be united, which could not be so were this means abandoned, still it must be allowed, on the other hand, that the cause of other wounds not uniting is entirely ascribable to the irritation occasioned by the sutures themselves. Hence, if it be only computed, that as many wounds are prevented from uniting by the irritation of sutures, as other wounds which are united by their means, and could be united by no other methods, we must still perceive, that mankind would be no sufferers, and surgery undergo no deterioration, were sutures altogether rejected from practice. I believe, however, that every man, who has had opportunities of observation, and has made use of them, with an unprejudiced mind, will feel persuaded, that more wounds are hindered from uniting by sutures, than such as are healed by them, and *could not be united by other means*.

But, prudent practitioners are not obliged either to condemn or praise the use of sutures, in every instance, without exception. Men of independent principles will always adopt the line of conduct which truth points out to them as that which is right; nor will they obstinately join Pibrac and Louis, in contending that sutures are always improper and disadvantageous, nor with other bigoted persons, who may use sutures in every kind of wound whatever. Perhaps, sutures are still rather too much employed, and, in all probability, will long be so. It will be difficult, entirely to eradicate the prejudices, on which their too frequent use is founded, as long as, what may be called, the teachers of surgery are seen holding up the practice for imitation in every principal hospital in the kingdom. Such surgeons, however, as are ready to imbibe fair and candid sentiments on the subject, and to qualify themselves for practising this part of surgery with judgment, should by no means neglect to read both what Pibrac and Louis have written on the subject. I know that the latter authors are a little too sanguine in their representations; but, as I have already remarked, sutures are still rather too much used, and something is yet necessary for the abolition of a certain unwarranted habit of having recourse to them without real necessity. Nothing will tend to produce this desirable change so much, as the perusal of every argument against their employment.

I am decidedly of opinion, not only from what I have read, but what I have actually seen, that the sides of the generality of wounds are capable of being effectually kept in contact, by means of a proper position of the part, and the aid of strips of adhesive plaster, compresses, and a bandage. I believe that such success can be obtained with every advantage which can be urged in favour of sutures, and without their disadvantages; such as greater pain, inflammation, &c. I even think, with Louis, that the hare-lip might in general be united very well by means of a bandage; but still I am of opinion, that the twisted suture is attended with least trouble, is most suited for universal practice, and that, unless such pains were taken as many practitioners would not, and others could never take, the method by bandage would frequently fail.

I find it exceedingly difficult to lay down any fixed principles for the guidance of the surgeon, in respect to when he ought, and when he ought not, to use sutures.

Perhaps, sutures should be made use of for all cuts and wounds, which occur in parts which are subject to an unusual degree of motion, such as would be apt to derange the operation of bandages, sticking plaster, and compresses. Hence, the propriety of using the twisted suture for the hare-lip.

Sutures are probably, for the most part, advantageous in all wounds of the abdomen, of a certain length, and attended with hazard of the viscera making a protrusion. In this situation, the continual motion and action of the abdominal muscles, in respiration, besides the tendency of the viscera to protrude, may be a reason in favour of the use of sutures.

When two fresh-cut surfaces positively cannot be brought into contact, by sticking plaster, bandages, the observance of a proper posture, &c. there can be no doubt of the advantage of using sutures, if they will answer the purpose. Some wounds of the trachea, some wounds made for the cure of certain fistulous communications between the vagina and bladder, or others for the cure of similar affections in the perinæum, afford instances of cases to which I allude.

I observe, that many surgeons in this metropolis use sutures for bringing the sides of the wound together after several operations; as that of removing a diseased breast, castration, and operations for strangulated hernia.

The reason for using sutures in the scrotum, I suppose, arises from the difficulty of keeping the edges of the wound in contact, owing to the great quantity, and looseness, of the part. In this case, I cannot determine whether sutures are really necessary, or not; but, after the amputation of the breast, I have no hesitation in pronouncing their employment wrong and injudicious.

I shall conclude with referring to what Pibrac and Louis have written on the above subjects, in *Mém. de l'Acad. de Chir. T.* 3 *and* 4. *Sharp, Dionis, Gooch, Le Dran, Bertrandi, Sabatier, B. Bell, and J. Bell, have all treated of sutures.* See also *C. E. Boecler, Suturæ Vulnerum; Upsal*, 1772.

SYMPATHETIC BUBO. See *Bubo.*

SYNCHYSIS. (from συγχυω, to confound.) The term *synchysis* sometimes denotes the confusion of the humours of the eye, occasioned by blows, and attended with a rupture of the internal membranes and capsules. Beer understands, by the expression, a dissolution of the vitreous humour, or the state of it in which its consistence is entirely destroyed. (See *Lehre von den Augenkr. B.* 2, *p.* 257.)

SYNECHIA. The case, in which the iris adheres to the cornea is termed *synechia anterior;* that in which the uvea adheres to the capsule of the lens, *synechia posterior.* Beer has delivered two valuable chapters on these subjects. The synechia posterior, on account of the frequent delicacy of the adhesions, is apt not to be detected, unless the eye be examined with particular care. A magnifying glass should be used, and the pupil be first dilated with hyosciamus, or belladonna. The treatment, as far as the prevention and removal of such adhesions are practicable, strictly belongs to the subject of iritis. (See *Ophthalmy.*) With the view of dispersing them, Beer praises the good effects of applying to the eye itself ointments containing preparations of mercury, or a collyrium hydrarg. oxymuriatis, to which some of the thebaic tincture is added. As an inward medicine, he says, calomel is the most effectual. When eye-salves are used, Beer recommends a little of the extract of hyosciamus to be mixed with them, so that they may dilate the pupil, and thus suddenly break any slight threads of lymph. (*B.* 2, *p.* 58.) For additional information on the synechia posterior, and anterior, see *Lehre von den Augenkr. B.* 2, *p.* 54 *and p.* 263. Also *Beger, De Synechia seu preternaturali adhesione corneæ cum iride. Haller, Disp. Chir. T.* 1, *p.* 435.

SYNTHESIS. (from συν, together, and θεσις, position, situation.) A generic term, formerly used in the schools of surgery, and comprehending every operation, by which parts that had been divided, were reunited.

SYPHILIS. Lues Venerea. The venereal disease. (See *Venereal Disease.*)

T.

T BANDAGE. A bandage, so named from its figure. It is principally used for supporting the dressings after the operation for the cure of fistula in ano, in diseases of the perinæum, and those of the groins, anus, &c. It is composed of two longitudinal pieces of cloth, of greater or lesser breadth, according as occasion requires. The transverse piece of cloth serves to go round the body above the hips: the perpendicular piece is sewed, at one of its ends, to the middle of the latter; and, in general, its other extremity is slit into two portions, or tails, about six or eight inches long. The perpendicular piece of the T bandage applies itself between the glutæi muscles, and to the perinæum: while its two ends, just described, are to be carried between the thighs and the pudenda to the right and left, and fastened to the transverse piece surrounding the body. Besides the common T bandage, there is another one named *double*, which has two perpendicular pieces, sewed to the transverse one, about four inches apart. The double T bandage is said to be more particularly applicable after lithotomy, and for the diseases of the perinæum; because one may make the two perpendicular pieces cross each other on the part affected, and leave the anus uncovered; an advantage which the simple T bandage certainly has not. The T bandage may be used in some other ways, which have been noticed in the article *Bandage.*

TALPA. (a mole). A tumor, under the skin compared to a mole under the ground. Such is the etymology. Sometimes it means an encysted tumor on the head. (See *Atheroma* and *Tumors, Encysted.*)

TAPPING. See *Paracentesis.*

TARAXIS. from *ταϱασσω*, to disturb.) A slight ophthalmy, or inflammation of the eye.

TAXIS. (from *τασσω*, to put in order.) The operation of reducing a hernia with the hand. (See *Hernia.*)

TENDONS, RUPTURE OF. The tendons, liable to be broken by the violent action of the muscles with which they are connected, are the tendo Achillis, that of the extensor muscles of the leg, and the tendon of the triceps extensor cubiti. The ancient surgeons seem not to have been well acquainted with the rupture of the tendo Achillis, which they probably might mistake for a sprain, or some other complaint. In cases, in which this part had been cut, they recommended approximating the separated portions, and maintaining them in contact by means of a suture.

When the ruptured tendo Achillis was afterwards better understood, the plan just mentioned was even adopted in this case, the integuments having been previously divided, for the purpose of bringing the tendon into view. But there is no necessity for having recourse to this painful proceeding. *(Encyclopedie Méthodique, Partie Chir. T.* 1, *p.* 55.)

The superficial situation of the tendo Achillis always renders the diagnosis of its rupture exceedingly obvious, and the accident can only become at all difficult to detect, when there is a considerable degree of swelling, which is very rare. When the tendon has been cut, the division of the skin even allows the accident to be seen. When the tendon has been ruptured, the patient hears a sound, like that of the smack of a whip, at the moment of the occurrence. In whatever way the tendon has been divided, there is a sudden incapacity, or, at least, an extreme difficulty either of standing or walking. Hence, the patient falls down, and cannot get up again. Besides these symptoms, there is a very palpable depression between the ends of the tendon, which depression is increased when the foot is bent; and diminished, or even quite removed, when the foot is extended.

The patient can spontaneously bend his foot, none of the flexor muscles being interested. The power of extending the foot also is still possible, as the peronæi muscles, the tibialis posticus, and long flexors of the toes (see *a case recorded by J. L. Petit*) remain perfect, and may perform this motion. (*Œuvres Chir. de Desault, par Bichat, T.* 1.)

The indications are, to bring the ends of the divided part together, and to keep them so, until they have become firmly united. The first object is easily fulfilled, by putting the foot in a state of complete extension; the second, namely, that of keeping the ends of the tendon in contact, is more difficult.

In order to have a right comprehension of the indications, we should consider what keeps the ends of the tendon from being in contact. The flexion of the foot has this effect on the lower portion; the contraction of the gastrocnemius, and solæus, on the upper one. The indications then are, to put the foot in an unalterable state of extension, and to counteract the action of the above muscles.

The action of the muscles may be opposed:— 1. By keeping these powers in a continual state of relaxation. For this purpose, the leg must be kept half bent upon the thigh. 2. By applying methodical pressure to the muscles; methodical, because it is to operate on the fleshy portion of the muscles, and not on the tendon, the ends of which, being depressed by it, would be separated from each other, and, instead of growing together, would unite to the adjacent parts. The pressure should also operate, so as to prevent the ends of the tendon from inclining either to the right or left.

J. L. Petit seems entitled to the honour of having first devised the plan of treating the ruptured, or divided tendon Achillis, by keeping the leg and foot in a particular posture, with the aid of an apparatus. Seeing that the extension of the foot brought the ends of the tendon into contact, it occurred to him, that such extension should be maintained during the whole of the treatment, in order to bring about a permanent union. This aim is, in fact, the common basis of all the numerous methods of cure, which have been since recommended.

Dr. Alexander Monro, primus, happened to rupture his tendo Achillis. When the accident took place, he heard a loud crack, as if he had suddenly broken a nut with his heel, and he experienced a sensation as if the heel of his shoe had made a hole in the floor. This sensation, he says, has also been observed by others, though some have complained of a smart stroke, like what would be produced by a stone or cane. Immediately suspecting what had happened, the doctor extended his left foot, in which the occurrence had taken place, as strongly as he could with his right hand, while with the left he pressed the muscles of the calf downward, so as to bring the ends of the broken tendon as near together as possible. In this position he sat, until two surgeons came to his assistance. They applied compresses, and a bent board to the upper part of the foot and forepart of the leg, both which they kept, as nearly as possible, in a straight line, by a tight bandage made with a long roller. But as this mode of dressing soon became very uneasy, it was changed for the following one. A foot-sock, or slipper, was made of double quilted ticking, from the heel of which a belt or strap projected, of sufficient length to come up over the calf of the leg. A strong piece, of the same materials, was prepared of sufficient breadth to surround the calf, and this was fastened with lacings. On the back part of this was a buckle, through which the strap of the foot-sock was passed, so that the foot could be extended, and the calf brought down at pleasure. The leg and foot were wrapt up in soft flannel, fumigated with benzoin, and the bandage was kept on day and night, the belt being made tighter when the doctor was about to go to sleep, and loosened when he was awake, and on his guard. For a fortnight he did not move his foot and leg at all, but was conveyed in a chair on castors from one part of the room to another. After this, he began to move the ankle-joint, but in such a gentle manner as not to give any pain. The degree of motion was gradually increased, as the tendon became capable of bearing it, care being taken to stop when the motion began to create uneasiness. The affected limb was moved in this way for half an hour at a time. In a few days the hollow, between the separated ends of the tendon, became imperceptible, though the part continued soft much longer. It became, however, gradually thicker and harder, until a knot was at last formed in it, apparently of a cartilaginous nature. Though this was, at first, as large as a middling plum, and gradually became softer and smaller, yet it did not disappear entirely. Having occasion to go out six weeks after the accident, the doctor put on a pair of shoes, with heels two inches high, and contrived a steel machine to keep his foot in the proper position. This machine, however, he afterwards changed for another, made of the same materials as the former. It was not till five months after the accident, that he thought proper to lay aside all assistance, and to put the strength of the tendon to a trial. (See *Monro's Works, p.* 661.)

Both in a wound and rupture in the tendo Achillis, the ancient method of using a suture, for keeping the ends of the tendon in contact, is at present quite exploded, and position of the limb is the grand agent, by which the cure is now universally accomplished. The following was Desault's method, which, though it was expressly designed to fill all the above-mentioned indications, may not be a more valuable practical plan than what was adopted by Dr. Monro. After the ends of the tendon had been brought into contact, by moderate flexion of the knee, and complete extension of the foot, Desault used to fill up the hollows, on each side of the tendon, with soft lint and compresses. The roller, applied to the limb, made as much pressure on these compresses as on the tendon; and hence this part could not be depressed too much against the subjacent parts. Desault next took a compress, about two inches broad, and long enough to reach from the toes to the middle of the thigh, and placed it under the foot, over the back of the leg and lower part of the thigh. He then began to apply a few circles of a roller round the end of the foot, so as to fix the lower extremity of the longitudinal compress. After covering the whole foot with the roller, he used to make the bandage describe the figure of 8, passing it under the foot, and across the place where the tendon was ruptured; and the method was finished by encircling the limb upward, with the roller, as far as the upper end of the longitudinal compress. (See *Monro's Works. Encyclopédie Méthodique, article Achille, tendon de; and Mémoire sur la Division du Tendon d'Achille, in Œuvres Chir. de Desault, par Bichat, T.* 1, *p.* 306.)

A rupture of the tendon of the extensor muscles of the leg would require nearly the same kind of treatment as a fracture of the patella. However, pressure exactly on the broken part of the tendon should be avoided, the limb should be kept extended, and somewhat raised; a bandage might be put round the thigh, and antiphlogistic treatment be at first adopted. In the course of two or three weeks, the surgeon should cause the joint to be very gently moved, without any muscular exertion on the part of the patient himself. When the tendon of the triceps extensor cubiti is ruptured, the limb is to be kept straight; cold applications are to be used for a few days; and, if necessary, strict antiphlogistic treatment pursued.

TENT. A roll of lint for dilating openings, sinuses, &c.

TEREBELLA. (dim. of *terebra*, a perforating instrument.) A trepan, or instrument for sawing out circular portions of the skull. A trephine.

TEREBRA. (from τερεω, to bore.) A trepan, or trephine. Also an instrument called a perforator.

TESTICLE, DISEASES OF. For an account of many of these affections, I must refer to distinct articles in this Dictionary; for instance, *Cirsocele, Fungus Hæmatodes, Hernia Humoralis, Hæmatocele, Hydrocele, &c.*

Mr. Pott defines *sarcocele* to be a disease of the body of the testicle, and, as the term implies, it consists, in general, in such an alteration, made in the structure of that organ, as produces a resemblance to a hard, fleshy substance, instead of that fine, soft, vascular texture, which it naturally presents. "*Sarcocele* (says Callisen) is a name applied to every chronic swelling of the testicle, attended with a total, or partial, conversion of the part into a heterogeneous substance." (*Systema Chirurgiæ Hodiernæ, Pars* 2, *p.* 144.) According to these definitions, sarcocele becomes a term admitting of almost general application to morbid affections of the testicle, since most of them are attended with induration and swelling of the part. In fact, we find that the old writers, and a great many of the moderns, call all diseased indurations and enlargements of the testicle *sarcoceles*, whether the disorder be a simple, chronic, indolent tumor, unaccompanied with any symptoms of specific disease, or malignancy, or whether it be a scrophulous, or, what is still more different and more serious, a truly scirrhous disorder of the organ. Even the fungus hæmatodes of the testicle was, until lately, often termed sarcocele.

That this vague method of employing the word sarcocele can be attended with no advantage, but on the contrary, must have a tendency to destroy all useful discrimination, is a proposition, the truth of which is self evident. I am well aware, that Mr. Pott, and many late writers, set out with an idea, that every sarcocele has a propensity to change into scirrhus, and actual carcinoma, and, therefore, the latter states are considered by these authors only as stages of the same disease. Indeed, it is mostly believed, that a common indolent sarcocele, a simple fleshy enlargement of the testicle, may change into the peculiar malignant disease, called scirrhus, or cancer. But, yet it is by no means proved, that all the diseases, which are comprehended under the name of sarcocele, are accompanied with a risk of their assuming the nature of scirrhus and cancer; for nothing can be more certain, than that the enlargement of the testicle, produced by fungus hæmatodes, is, from the first to the last, always of one character, and can never change into ordinary scirrhus, or carcinoma. Neither do indolent scrophulous swellings of this organ ever undergo such an alteration as deserves the epithets of *scirrhous* and *cancerous*. In opposition to the belief of Mr. Hunter, (see *his Treatise on the Venereal*

Disease, *p.* 59), some surgeons still imagine, that there is really one kind of chronic enlargement of the testicle, arising from a venereal cause. (*Roux*, *Parallèle de la Chirurgie Angloise*, *&c. p.* 305. *Richerand*, *Nosographie Chir. T.* 4. *p.* 300, *Edit.* 4.) Now this also has usually been called a sarcocele; it was so named by Pott himself; and if there be such a case, no one will suppose that it, or any other form of lues venerea, is capable of changing into a true scirrhous or cancerous disease. Perhaps, therefore, it might be more consistent and advantageous to restrict the appellation of *sarcocele* to an indolent fleshy enlargement of the testicle, unaccompanied with any present symptoms of malignancy, or any marks of its being the effect of a specific disease; and as soon as the case evinces another character, the name should correspond with the particular nature of the disease.

We need not here enter into a minute account of the various sarcomatous diseases, to which the testicle is subject; for, they have no peculiarity in them, except what depends upon their situation; and the general characters of the different species of sarcoma will be considered in a future article. (See *Tumour.*) The testicle is especially liable to three kinds of sarcoma, which have been named, by Mr. Abernethy, the *common vascular*, the *cystic*, and the *medullary*. The latter case, which used to be called *soft cancer of the testicle*, is described in this work, under the name of *Fungus Hæmatodes*. Sometimes the testicle is converted into a truly *scrophulous* mass. It is increased in size, and when cut into, a whitish, or yellowish, coagulated matter is discovered, mixed with pus. The complaint is not attended with so much pain and induration, as a scirrhous disorder of the testicle; nor does it produce any unfavourable state of the health.

As Dr. Baillie observes, the testicle is often found converted into a hard mass, of a brownish colour, and generally intersected with membranes. Sometimes there are cells in the tumor, which are filled with a sanious fluid. (*Morbid Anatomy*, *&c. p.* 352, 353, *Edit.* 2.) This is the truly *scirrhous testicle*, which is attended with great hardness, severe pains darting along the spermatic chord to the loins, and an unequal knotty feel. In general the health becomes impaired. To use Mr. Pott's words, sometimes the fury of the disease brooks no restraint; but, making its way through all the membranes, which envelope the testicle, it either produces a large, foul, stinking, phagedenic ulcer, with hard edges, or it thrusts forth a painful gleeting fungus, subject to frequent hemorrhage. (*Pott's Chirurgical Works, Vol.* 2, *p.* 390, *Edit.* 1808.) These latter states of the disease are denominated *cancer of the testicle.*

Sooner, or later, the scirrhous induration extends from the epididymis, upward along the spermatic chord, even within the abdominal ring. In the latter circumstance, the lymphatic glands in the groin usually become diseased; and this extension of mischief, together with the impossibility of removing the whole of the diseased chord, too frequently deprives the patient of every chance of getting well.

I have already stated that some of the most simple sarcomatous enlargements of the testicle are capable of assuming, in a very sudden manner, a malignant, and cancerous tendency; and that sometimes the scirrhous induration of the chord makes a rapid progress upward. Hence, that surgeon acts with prudence, who recommends the early extirpation of every testicle which is incurably diseased, and so deprived of its original organization, as to be totally unfit for the secretion of the semen.

Chronic enlargements of the testicle are sometimes attended with an accumulation of limpid fluid in the tunica vaginalis, and the disease is then termed, *hydrosarcocele*, an appellation first employed by Fabricius ab Aquapendente.

The hardness and swelling of the epididymis remaining after an acute inflammation of the testicle (see *Hernia Humoralis*) do not constitute a complaint, which surgical authors class with sarcocele; for, the disease hardly ever increases so as to give trouble.

I have stated, that sarcoceles, in common with the generality of other sarcomatous tumours, may change into distempers, which, in point of malignity, and the manner in which they injure the health, are quite as bad as cancer itself. It is said, however, that sarcocele of the epididymis rarely becomes malignant, and is much more easy of cure, than the same disease of the glandular portion of the testicle; but both parts are often diseased together.

Sarcoceles sometimes continue for years, without undergoing any particular change; in other instances, they increase with surprising rapidity. The inconveniences, which they excite, often proceed chiefly from their weight and magnitude: their weight occasions an uneasy, and even a painful sensation in the loins, especially when the patient neglects to wear a suspensory bandage, or a bag-truss for the support of the part. The danger of a sarcocele arises from the increase and extension of the hardness up the spermatic chord, and from the change of the tumor from its indolent state into a painful, ulcerated, and incurable disease.

A sarcocele sometimes bears a resemblance to hydrocele of the tunica vaginalis. It sometimes has the usual pyramidal shape of the latter disease, and like it, is always situated at the lower end of the spermatic chord. The chief difference between the two cases seems to be, that the sarcocele is hard, while the hydrocele has a soft, yielding, elastic feel. It should be known, however, that the fungus hæmatodes of the testicle is remarkable for the deceitful feel of fluctuation and elasticity, which it presents; and every surgeon ought to be aware, that a sarcocele is not always particularly hard, and that hydroceles are sometimes exceedingly indurated. The sarcocele, indeed, is not transparent; neither is the hydrocele in certain instances; and these are cases, in which a mistake may easily be made. Still, with due attention, both diseases may be discriminated with tolerable precision. The sarcocele, when held in the surgeon's hand, seems heavier, than the hydrocele. Every part of a diseased testicle is seldom equally indurated, so that the sarcocele is usually much softer in some places, than others. The hydrocele presents the same kind of feel at every point, except behind, where the testicle is felt. When in the case of hydrocele, pressure is made in this latter situation, the patient experiences a much more acute sensation, than when the pressure is made upon any other part of the tumor; but, in the example of sarcocele, the patient commonly has the same kind of feel, let the pressure be applied to any part of the swelling whatsoever. When the upper portion of the spermatic chord can be felt, and it seems quite hard and thickened, the surgeon has reason for suspecting the case to be a sarcocele. Lastly, though a hydrocele, when gently handled, may seem very hard, yet on being more strongly compressed, it will generally betray a soft elastic feel, which, excepting in instances of fungus hæmatodes, is never the case with an indurated sarcocele.

It has been already explained, that a sarcocele is sometimes conjoined with a hydrocele, which case is well known amongst surgeons by the appellation of *hydro-sarcocele.* As the diseased testicle is then surrounded with fluid, it cannot be felt and examined by the fingers. However, when an unusual degree of hardness is perceptible at the back part of the tumor, where the testicle is situated, or when the upper portion of the spermatic chord is found to be quite indurated, there is reason for suspecting, that the testicle is diseased. The sarcocele also is commonly the original and principal complaint, the hydrocele not occurring till some time after the enlargement of the testicle.

In some unusual cases, the substance of the scrotum is converted into an indurated mass, which occasionally attains a vast size, and presents the appearance of an enormous sarcocele. An example in which the tumor weighed 70lb. has been lately published by Dr. Titley. (See *Med. Chir. Trans. Vol.* 6, *p.* 73.) In one case, recorded by Dr. Cheston, a swelling of this kind was as large as a child's head. On dissection of the parts, the testicle and tunica vaginalis were found to be quite free from disease. The tumor proceeded entirely from an induration of the cellular membrane, which immediately covers the external surface of the vaginal coat. This curious disease is more common in warm climates, and several instances of it were met with in Egypt by Baron Larrey. (See *Mem. de Chir. Militaire*, *T.* 2, *p.* 110 *et seq.*) Mr. E. Tothill, of Staines, lately shewed me a case, in which he had removed from the scrotum a large mass of fat, containing the testes, and also a hydrocele.

The operation of castration is the most certain means of relieving the patient from sarcocele. This measure, however, is not invariably practicable, nor is it always necessary; for sometimes the induration of the testicle admits of being dispersed by the judicious employment of internal medicines and external applications. The hope of accomplishing this desirable object may be reasonably entertained, when the swelling is not very large, when it has not existed a considerable time, and when it is not attended with very great induration. Experience has proved, that some kinds of sarcocele have yielded to the exhibition of emetics (*Warner*, *Pringle*, *and Home in Chemical Experiments*); to a decoction of ononis spinos. (*Bergius Mat. Med. Richter's Chir. Bibl.* 7 *B. p.* 605); to cicuta and bark (*Warner*); to mercurial frictions (*Le Dran*, *B. Bell*, *Richerand*, *Delpech*); to the external use of the liquor ammon. acetatis (*Richter's Chir. Bibl. B. p.* 127); to poultices containing opium (*Fothergill*, *in Med. Obs. & Enq. Vol.* 5); to a lotion made of a strong decoction of hemlock (*Warner*); to the steam of vinegar; the repeated employment of leeches, and the application of cold, &c. It also behoves me particularly to mention, that the internal and external use of the preparations of iodine, are found to be attended with strongly marked efficacy in various chronic affections of the testicle, especially those reputed to be scrophulous. Many facts of this kind have been reported to me by my professional friends, and they are well worthy of being remembered in practice. (See *Iodine.*) The operation of all these means may be advantageously promoted by the continual use of a bag-truss, the observance as much as possible of an horizontal position, and attention to a suitable low diet.

Mr. Pott believed, that the man, who has the misfortune to be afflicted with a sarcocele, has very little chance of getting rid of the disease by any plan, except extirpation; and all the time the operation is deferred, he carries about him a part, not only useless, but burdensome, and which is every day liable to become worse, and unfit for such an operation. Now, although there is a great deal of truth in this opinion, yet, I conceive, it is rather exaggerated, and that it would tend to authorize the practice of castration to an extent beyond all necessity. I certainly think, with Mr. Pott, that there never was a sarcocele cured, where the organization of the testicle had been destroyed by disease, or where its structure had suffered so much as to render it incapable of the office for which it is destined. But, such state cannot always be known by inspection, or manual examination, and were a surgeon to condemn to the knife every testicle which he finds affected with indolent swelling and induration, he would remove many, which, under some of the above plans of treatment, might be perfectly cured. That there are some chronic enlargements of the testicle, which may be resolved, is a truth, of which experience must have convinced the generality of surgeons.

The scrophulous induration, and several other swellings of this organ, which are very imperfectly understood, may sometimes be benefited, and even entirely cured, just like some analogous affections of the breast. What is termed the *venereal sarcocele* (Mr. Pott allows) always gives way to a mercurial course, properly conducted. The diagnosis of this case, it must be confessed, is not very clearly explained by surgical writers, nor was its reality acknowledged by Mr. Hunter. According to Mr. Pott, it is seldom an early symptom, and he does not remember ever to have seen an instance, in which it was not either immediately preceded or accompanied by some other appearances plainly venereal. He adds, that it has neither the inequality, nor darting pains of scirrhus. But, the question whether the case is truly syphilitic or not, is far less interesting, than the question, whether there are not many sarcoceles, which may be diminished and cured by mercury? The affirmative cannot be questioned. I have seen many such cases myself, and there are numerous examples on record. A statement of several has been lately published by Richerand. (See *Nosographie Chirurgicale, T.* 4, *p.* 300 *et seq. Edit.* 4.) The authority of Delpech is also on the same side. (*Précis Elémentaire des Maladies Reputées, Chir. T.* 3, *p.* 564.)

Indeed this last writer maintains, that many common sarcoceles and scirrhi of the testicle are so much alike in their symptoms, that the difference of their nature cannot always be at once detected by the practitioner. Hence, although I am an advocate for the early performance of castration in cases of sarcocele, where there is reason to suppose the disease so far advanced, that the organization of the testicle is totally destroyed; or where internal and external remedies have been tried a certain time in vain; yet, these sentiments do not incline me to recommend the operation for other examples, in which the disease is quite recent, and no plan of treatment whatsoever has been fairly tried. I have already enumerated various plans of treatment, which have been proved by experience to be sometimes capable of affording relief. The disease of the testicle, which is usually called the *scrophulous sarcocele*, like other forms of scrophula, often gets well spontaneously after a certain time, and it may frequently be considerably benefited by administering internally the conium maculatum and small doses of the submuriate of mercury; lotions of sea-water, or poultices of sea-weeds, being applied to the scrotum. The good effects of iodine in such cases, I have already noticed. Several other indolent enlargements of the testicle yield to frictions with camphorated mercurial ointment on the scrotum. The late Mr. Ramsden thought, that some sarcoceles might be relieved by removing with bougies, a supposed morbid irritability of the urethra, with which his theories led him to connect the origin of the complaint. (See *Pract. Obs. on Sclerocele, &c.*) The novelty of this suggestion for a time attracted considerable notice; but the interest which it once excited, has now died away; a sufficient proof, to my mind, that the practice inculcated was not of much value.

From the preceding observations, it may be inferred, that all chronic enlargements of the testicle are not incurable; but, that we ought at the same time to be duly impressed with the expediency of not wasting too much time in the trial of means, which are not to be depended upon, and which, if continued immoderately long, might allow the disease to advance too far to be capable of being afterwards effectually extirpated. According to Mr. Pott, the circumstances, in which the operation of castration is advisable, or not, are of two kinds, and relate either to the general habit of the patient, and the disorders and indispositions of some of the viscera, or to the state of the testicle, and spermatic chord.

A pale, sallow complexion in those who used to look otherwise; a wan countenance, and loss of appetite and flesh, without any acute disorder; a fever of the hectic kind; and frequent pain in the back and bowels, are, in those who are afflicted with a scirrhous testicle, such circumstances as would induce a suspicion of some latent mischief in some of the viscera; in which case, as Mr. Pott truly observes, success from the mere removal of the testicle is not to be expected. They, whose constitutions are spoiled by intemperance, previous to their being attacked with this disease; who have hard livers, and anasarcous limbs; he says, are not proper subjects for such an operation. Hard tumors within the abdomen in the regions of the liver, spleen, kidneys, or mesentery, implying a diseased state of the said viscera, are very material objections to the removal of the local evil in the scrotum. In short, whenever there are manifest appearances, or symptoms of a truly diseased state of any of the principal viscera, the success of the operation becomes very doubtful.

"The state of the mere testis can hardly ever be any objection to the operation; the sole consideration is the spermatic chord; if this be in a natural state, and free from disease, the operation not only may, but ought to be performed, let the condition of the testicle be what it may; if the spermatic chord be really diseased, the operation ought not to be attempted." And Mr. Pott afterwards remarks, "when the spermatic vessels are not only turgid and full, but firm and hard; when the membrane, which invests and connects them, has lost its natural softness and cellular texture, and has contracted such a state, and such adhesions, as not only greatly to exceed its natural size, but to become unequal, knotty, and painful, upon being handled, and this state has possessed all that part of the chord, which is between the opening in the oblique muscle and the testicle, no prudent, judicious, or humane man, will attempt the operation; because he will, most certainly, not only do no good to his patient, but will bring on such symptoms as will most rapidly, as well as painfully destroy him.

"On the other hand," says Pott, "every enlargement of the spermatic chord is not of this kind, nor by any means sufficient to prohibit or prevent the operation.

"These alterations, or enlargements, arise from two causes, viz. a varicose dilatation of the spermatic vein, and a collection or collections, of fluid in the membrane investing and enveloping the said vessels." Shortly afterwards the same practical writer continues:—"The diseased state of a truly scirrhous testicle, its weight, and the alteration that must be made in the due and proper circulation of the blood, through both it and the vessels from which it is dependent, may and do concur in inducing a varicose dilatation of the spermatic vein, without producing that knotty, morbid alteration and hardness, which forbid our attempts. Between these, a judicious and experienced examiner will generally be able to distinguish.

"In the former, (the truly diseased state) the chord is not only enlarged, but feels unequally hard and knotty; the parts of which it is composed are undistinguishably blended together; it is either immediately painful to the touch, or becomes so, soon after being examined; the patient complains of frequent pains shooting up through his groin into his back; and from the diseased state of the membrane composing the tunica communis, such adhesions and connexions are sometimes contracted, as either fix the process in the groin, or render it difficult to get the finger and thumb quite round it.

"In the other (the mere varicose distension) the vessels, though considerably enlarged and dilated, are nevertheless smooth, soft, and compressible; the whole process is loose and free, and will easily permit the fingers of an examiner to go quite round it, and to distinguish the parts of which it is composed; it is not painful to the touch; nor does the examination of it produce, or occasion, those darting pains, which almost always attend handling a process malignantly indurated."

Mr. Pott next explains that "in the cellular membrane, leading to a diseased testicle, it is no very uncommon thing to find collections of extravasated fluid. These, as they add considerably to the bulk, and apparent size of the process, make the complaint appear more terrible; and, as I have just said, less likely to admit relief.

"When the extravasation is general, through all the cells of the investing membrane, and the spermatic vessels themselves are hardened, knotty and diseased, the case is without remedy; for, although a puncture, or an incision, will undoubtedly give discharge to some, or even the greatest part of the fluid; yet this extravasation is so small, and so insignificant a circumstance of the disease, and the parts, in this state, are so little capable of bearing irritation, that an attempt of this kind must be ineffectual, and may prove mischievous.

"But on the other hand collections of water are sometimes made in the same membrane, from an obstruction to the proper circulation through the numerous lymphatics in the spermatic process, while the vessels themselves are really not diseased, and therefore very capable of permitting the operation. In this case, the fluid is generally in one cyst, or bag, like to an encysted hydrocele, and the spermatic chord, cyst and all, are easily moveable from side to side; contrary to the preceding state, in which the general load in the membrane fixes the whole process, and renders it almost immoveable.

"A discharge of the fluid will, in this case, enable the operator to examine the true state of the process, and, as I have twice or thrice seen, put it into his power to free his patient from one of the most terrible calamities which can befal a man." (See *Pott on Hydrocele, &c.*)

The testicle is subject to a disease often called *soft cancer*, which, though of a very malignant and incurable nature, is different from the true cancer already described. It has been particularly noticed by Mr. Abernethy, under the name of *Medullary Sarcoma.* In most of the instances, which this gentleman has seen, the tumor, when examined after removal, appeared to be of a whitish colour, resembling on a general and distant inspection, the appearance of the brain, and having a pulpy consistence. He has also often seen it of a brownish red appearance.

This disease is now generally considered to be fungus hæmatodes. If there are any differences, they consist in the parts sloughing out, and then healing, instead of a fungus shooting out, and continually increasing in size. (See *Fungus Hæmatodes.*)

Dr. Baillie has noticed some affections, in which the testicle becomes bony, cartilaginous, &c.; but on these it is not necessary for us to dwell in this Dictionary. The preceding observations may be considered as relating expressly to the diseases, for which castration is generally performed. (See *Castration.*)

Besides the fungus, which arises from the testicle in the advanced stage of carcinoma, and the bleeding fungous growth, which arises from this organ in the ulcerated state of fungus hæmatodes, there is another superficial fungous excrescence, to which the testicle is subject, and which is entirely free from all malignancy. The disease to which I refer, has been noticed by Callisen, under the name of *lipoma of the testicle.* "Si ex superficie albugineæ vel ipsa tunica vaginali excrescentiæ surgunt, totum demum testem involventes, et scirrhum seu fungum, mentientes, ipsius tamen testis substantia parum aut vix de statu naturali aberrante; malum naturam lipomatis sequitur, vix unquam in scirrhum et carcinoma abiens." (See *Systema Chirurgiæ Hodiernæ, Vol.* 2, *p.* 145, *Edit.* 1800.) The *superficial fungus*, or *lipoma of the testicle*, was noticed in an early edition of another publication; and described as "a particular affection of the testicle, in which a fungus grows from the glandular substance of this body, and, in some instances, from the surface of the tunica albuginea. This excrescence is usually preceded by an enlargement of the testicle, in consequence of a bruise, or some species of external violence. A small abscess takes place, and bursts, and from the ulcerated opening the fungus gradually protrudes." I then proceeded to represent how unnecessary and improper it was to extirpate the testicle, on account of this affection, if, after the subsidence of the inflammation, the part should not seem much enlarged and indurated. I recommended the fungus to be cut off, or else destroyed with caustic; and I founded my advice on a successful attempt of the first kind, which was made in St. Bartholomew's Hospital, by Sir James Earle, a little while before my book was published. (See *First Lines of the Practice of Surgery, p.* 399.)

An interesting little paper has also been written on the subject, by my friend Mr. Lawrence, who has favoured the public with a more particular account, and nine cases illustrative of the causes, symptoms, and progress of the disorder. According to Mr. Lawrence, the patient generally assigns some blow, or other injury, as the cause of the complaint; in other instances, it originates in consequence of the hernia humoralis from gonorrhœa, and sometimes appears spontaneously. A painful swelling of the gland, particularly characterized by its hardness, is the first appearance of the disease. After a certain length of time, the scrotum, growing gradually thinner, ulcerates; but, the opening, which is thus formed, instead of discharging matter, gives issue to a firm, and generally insensible fungus. The surrounding integuments and cellular substance are thickened and indurated by the complaint, so that there appears to be altogether a considerable mass of disease. The pain abates, and the swelling subsides considerably, when the scrotum has given way. In this state, the disorder appears very indolent; but if the fungus be destroyed by any means, the integuments come together, and a cicatrix ensues, which is inseparably connected with the testicle. Mr. Lawrence next informs us, that if the part be examined while the fungus still remains, the excrescence is found to have its origin in the glandular substance of the testicle itself; that the coats of the part are destroyed to a certain extent; and that a protrusion of the tubuli seminiferi takes place through the aperture thus formed. Mr. Lawrence says, he has often ascertained the continuity of the excrescences with the pulpy substance of the testicle, of which more or less remains, according to the difference in the period of the disorder. The same gentleman thinks, that the glandular part of the testicle experiences an inflammatory affection in the first instance, in consequence of the violence inflicted on it; and that the confinement of the swollen substance, by the dense and unyielding tunica albuginea, sufficiently explains the peculiar hardness of the tumor, and the pain which is always attendant on this stage of the disorder. The absorption of the coats of the testis, and of the scrotum, obviates the tension of the parts, and thereby restores ease to the patient, at the same time that the fungus makes its appearance externally.

With regard to the treatment, Mr. Lawrence is of opinion, that, if the complaint were entirely left to itself, the swelling would probably subside, the fungus shrink, and a complete cure ensue, without any professional assistance; but, he adds, that the disorder is so indolent in this stage that a spontaneous cure would not be accomplished till after much time. He says, that the excrescence may be removed with a knife, or, if the nature of its attachment permit, with a ligature, or that it may be destroyed with escharotic applications. Mr. Lawrence very judiciously gives the preference to removing the tumor to a level with the scrotum, by means of the knife, as the most expeditious and effectual mode of treatment. He can discern no ground whatever for proposing castration in this malady, since, in no part of its progress, nor in any of its possible consequences and effects, can it expose the patient to the slightest risk.

Mr. Lawrence also mentions the possibility of there being other kinds of fungi, which may be met with, growing from the testicle, and quotes an instance, in which Dr. Macartney found a fungus, of a firm and dense structure, growing from the tunica albuginea, while all the substance of the testicle itself was sound. Dr. Macartney was so kind as to show me the preparation, affording a clear specimen of the second kind of fungus. The cases, drawn up by Mr. Lawrence, are, in my opinion, highly interesting, and may be read in the *Edinb. Med. and Surg. Journal, for July*, 1808.

I have already noticed, that Callisen represents the lipoma, as sometimes originating from the surface of the tunica vaginalis, a kind of case, which has not yet fallen under my observation.

In the preface to the third edition of this Dictionary, p. 10, I quoted a case, published by Dr. H. Weinhold, in which the operation for bubonocele was performed, and as the testicle was diseased, the surgeon made a complete division of the spermatic chord, tied the spermatic arteries, and then left the testicle in its natural situation. After a time, the absorbents had diminished the part to a very inconsiderable little tumor. (See *Journ. der Pract. Heilkunde von C. W. Hufeland und K. Himly*, 1812, *Zehntes. Stück, p.* 112.) This case merits attention, and ought to have been cited in the article *Castration*, because it is the first instance, I believe, in which such practice was tried. Subsequently, the following work has been published: "*Nouvelle Methode de traiter le Sarcocele, sans avoir recours à l'extirpation du Testicule, par C. Th. Maunoir, 8vo. Geneve*, 1820." The new plan consists in dividing and tying the spermatic arteries, and leaving the rest of the chord and the testis undisturbed.

TETANUS. (from τεινω, to stretch.) Tetanus is defined by all authors to be a more or less violent, and extensive contraction of the muscles of voluntary motion, attended with tension and rigidity of the parts affected.

The excessive contraction of the muscles is kept up, without any intervals of complete relaxation, in which respect the disorder differs from ordinary spasms, and convulsions, where the contractions and relaxations alternate in rapid succession. In tetanus, the powers of sensation and intellect also remain unimpaired, in which particularity it forms a contrast to epilepsy. (*Rees's Cyclopedia, art. Tetanus.*)

When its effects are confined to the muscles of the jaw or throat, it is called *trismus*, or *locked-jaw;* when all the body is affected and becomes rigid, but retains its ordinary straightness, the case is named *tetanus*. When the body is bent forwards, the disease is termed *emprosthotonos;* and *opisthotonos*, when the muscles of the back are principally affected.

To these four forms, some writers have added a fifth, which they denominate *pleurosthotonos*, and which is characterized by the body being drawn to one side. It is the *tetanus lateralis* of Sauvages.

The different terms, which are applied to tetanic affections, do not imply so many particular diseases; but, only the seat and various degrees of one and the same complaint.

A far more important division of tetanus, is into the *acute* and *chronic*, according to its greater or lesser intensity. The first is exceedingly dangerous, and usually fatal; while the latter, on account of the more gradual progress of the symptoms, affords more opportunity of being successfully treated. (*Larrey, in Mém. de Chirurgie Militaire, T.* 1, *p.* 235, 236.)

Tetanus may also be distinguished into the *traumatic*, or that arising from wounds, being the case with which surgeons have principally to deal; and into the *idiopathic*, or that proceeding from a variety of other causes.

Traumatic tetanus sometimes comes on in a surprisingly sudden manner, and quickly attains its most violent degree. The most rapidly fatal case, that has ever been recorded, is one, that we have on the authority of the late Professor Robison of Edinburgh. It occurred in a negro, who scratched his thumb with a broken china plate, and died of tetanus a quarter of an hour after this slight injury. (See *Rees's Cyclopædia, art. Tetanus.*) But, commonly, the approaches of the disorder are more gradual, and it slowly advances to its worst stage. In this sort of case, the commencement of the disorder is announced by a sensation of stiffness about the neck, a symptom, which increasing by degrees, renders the motion of the head difficult and painful. In proportion as the rigidity of the neck becomes greater, the patient experiences about the root of the tongue, an uneasiness, which soon changes into a difficulty of mastication and swallowing, which after a time become totally impossible. The attempt at deglutition is attended with convulsive efforts, especially when an endeavour is made to swallow liquids; and so great is the distress, which accompanies these convulsions, that the patient becomes very reluctant to renew the trials, and refuses all nourishment. Sometimes it even inspires him with a dread of the sight of water, and a great resemblance to hydrophobia is produced.

One of the next remarkable symptoms is a very severe pain at the bottom of the sternum, darting from this point backward to the spine, in the direction of the diaphragm. As soon as this pain commences, the spasms of all the muscles about the neck become exceedingly violent, and the head is drawn backwards, or forwards, according as the contraction of the extensor, or flexor muscles, happens to be strongest; but, in the majority of cases, the head and trunk are curved backwards, (*Boyer, Traité des Mal. Chir. T.* 1, *p.* 288,) and the contractions increasing in force, the body is frequently raised in the form of a bow, resting upon the head and feet alone; a state, which is more particularly denominated *opisthotonos.* (See *Rees's Cyclopædia, art. Tetanus.*) At the same time, the muscles, which close the lower jaw, and which were affected with spasm and rigidity in the very beginning of the disorder, now contract with great power, so as to maintain the lower jaw-bone inseparably applied to the upper one. The last state, which has been considered as a particular affection under the name of *trismus*, or the *locked-jaw*, Boyer conceives, may be regarded as the pathognomonic symptom of tetanus, which in many instances is limited to such an affection of the jaw.

The muscles affected in tetanic cases are never altogether relaxed, as long as the disease continues; but, still they become more violently contracted in the frequent paroxysms of spasm, which always attend the complaint, and increase as it advances.

The continuance of the disease is marked by the increasing spasm of the diaphragm, which now returns every ten or fifteen minutes, and is instantly succeeded by a stronger retraction of the head and rigidity of the muscles of the back, and even of those of the lower extremities. The abdominal muscles are also strongly contracted, so that the belly feels as hard and tense as a board. By the violence of the contractions, indeed, the recti muscles have been known to be lacerated, as I shall relate an example of hereafter. Sometimes the spasm and tension extend only to the muscles on one particular side of the body: the *tetanus lateralis* of Sauvages, and the *pleurosthotonos* of other nosologists.

When the disease reaches its most violent stage, the flexor muscles of the head and trunk contract so powerfully, that they counterbalance the force of the extensors, and hold those parts in a straight, fixed, immoveable position. This is the condition, to which the appellation of *tatanus* more particularly belongs. The muscles of the lower extremities become rigid; and even the arms, which till now were little affected, also partake of the general spasm and stiffness, with the exception of the fingers, which often retain their moveableness to the last. The tongue likewise continues a long while endued with the power of voluntary motion; but, at length, the violent spasms do not leave it unaffected, and it is then liable to be forcibly propelled between the teeth, where it is sometimes dreadfully lacerated.

In the extreme period of the disorder, all the muscles, destined for voluntary motion, are affected; amongst others, those of the face; the forehead is drawn up into furrows; the eyes, sometimes distorted, are generally fixed and motionless in their sockets; the nose is drawn up; and the cheeks are retracted towards the ears; so that the features undergo a most extraordinary change. When tetanus arrives at this stage, and the spasms are universal, a violent convulsion usually puts an end to the patient's misery.

Wherever the muscular contractions are situated in cases of tetanus, they are always accompanied with the most excruciating pain. They sometimes last, without any manifest remission, to the end of the disorder; but, in almost all cases, their violence, and the sufferings excited by them, undergo periodical diminutions every minute, or two. The relaxation, however, is never such as to let the muscles, which experience it, yield to the action of their antagonists; and it is in nearly all cases followed, in ten or twelve minutes, by a renewal of the previous contractions and suffering. The recurrence of these aggravated spasms frequently happens, without any evident cause; but, it is often determined by efforts, which the patient makes to change his posture, swallow, speak, &c.

As Dr. Cullen observes, the attacks of this disease are seldom attended with any fever. When the spasms are general and violent, the pulse is contracted, hurried, and irregular; and the respiration is affected in like manner; but, during the remission, both the pulse and respiration usually return to their natural state. The heat of the body is commonly not increased; frequently the face is pale, with a cold sweat upon it; and, very often, the extremities are cold, with a cold sweat over the whole body. When, however, the spasms are frequent and violent, the pulse is sometimes more full and frequent, than natural; the face is flushed, and a warm sweat is forced out over the whole body.

"Although fever be not a constant attendant of this disease, especially when arising from a lesion of nerves; yet, in those cases, proceeding from cold, a fever sometimes has supervened, and is said to have been attended with inflammatory symptoms. Blood has often been drawn in this disease; but, it never exhibits any inflammatory crust; and all accounts seem to agree, that the blood drawn seems to be of a looser texture than ordinary, and that it does not coagulate in the usual manner.

"In this disease the head is seldom affected with delirium, or even confusion of thought, till the last stage of it; when by the repeated shocks of a violent distemper, every function of the system is greatly disordered.

"It is no less extraordinary, that in this violent disease, the natural functions are not either immediately, or considerably affected. Vomitings sometimes appear early in the disease; but commonly they are not continued; and it is usual enough for the appetite of hunger to remain through the whole course of the disease; and what food happens to be taken down, seems to be regularly enough digested. The excretions are sometimes affected, but not always. The urine is sometimes suppressed, or is voided with difficulty and pain. The belly is costive; but, as we have hardly any accounts, excepting of those cases, in which opiates have been largely employed, it is uncertain, whether the costiveness has been the effect of the opiates or of the disease. In several instances of this disease, a miliary eruption has appeared upon the skin, but whether this be a symptom of the disease, or the effect of a certain treatment of it, is undetermined. In the mean while, it has not been observed to denote either safety or danger, or to have any effect in changing the course of the distemper."—(*First Lines of Physic*, *Vol.* 3.)

According to Baron Larrey, the opisthotonos is not so often observed in Egypt as the emprosthotonos, and the experience of this gentleman taught him, that the former was the most rapidly fatal. We must not adopt, however, his curious opinion, that the violent extension of the vertebræ of the neck, and the manner, in which the head is thrown back, cause strong compression of the spinal marrow, and a permanent contraction of the larynx and pharynx, (*Mém. de Chirurgie Militaire, T.* 1, *p.* 240,) since this sort of compression, if it did not at once destroy the patient, would at any rate paralize most of the muscles, and instantly stop their extraordinary contraction.

This experienced writer notices how much the nerves of the neck and throat seem generally to be affected on the invasion of this disease. The consequent contraction of the muscles of these parts, he says, is soon attended with difficulty of deglutition and respiration. The patients then experience, if not a dread of liquids, at least a great aversion to them, which often prevents the administration of internal remedies; and if the wound is out of reach of the interference of art, the patient is doomed to undergo the train of sufferings attendant on this cruel and terrible disorder. Nothing can surmount the obstacles, which present themselves in the œsophagus. The introduction of an elastic gum catheter into this canal, through the nostrils, is followed by convulsions and suffocation. "I have tried this means (says Larrey) on the person of M. Navailh, a surgeon of the second class, who died of a locked-jaw, brought on by a wound of the face, accompanied with a comminuted fracture of the bones of the nose, and part of the left orbit.

"In the examination of the bodies of persons dead of tetanus, I have found the pharynx and œsophagus much contracted, and their internal membrane red, inflamed, and covered with a viscid reddish mucus.

"Hydrophobia, hysteria, and several other nervous diseases, likewise produce their chief effects upon these organs, and the result appears to be the same. So, I have just remarked, when tetanus is arrived at its worst degree, the patients have a great aversion to liquids, and, if they are forced to swallow them, immediate convulsions are excited. This circumstance was particularly observed in M. Navailh."—(*Mém. de Chirurgie Militaire, T.* 1, *p.* 247, 248.)

Sometimes tetanic affections deviate from their ordinary course and nature. The most singular of these anomalies is recorded by Sir Gilbert Blane; it is a case, in which tetanus prevailed to a very considerable extent, without any degree of pain. The spasms were accompanied with a tingling sensation, which was even rather agreeable than distressing. The case, however, terminated fatally; but, to the last, no pain was experienced. In two examples, mentioned by the same author, the spasms affected only the side of the body, in which the wound was situated.

The dissection of patients, who have died of tetanus, has thrown no light upon the nature of this fatal disorder. Sometimes, slight effusions are found within the cranium; but, in general, no morbid appearance whatever can be detected in the head. There is always more or less of an inflammatory appearance in the œsophagus and in the villous coat of the stomach about the cardia. But those, who are conversant with dissections, must be well aware, that these appearances are common to a great number of diseases, and are uniformly met with in every case of rapid, or violent death. Besides the redness and increased vascularity of these parts, Baron Larrey, as I have already stated, found the pharynx and œsophagus much contracted, and covered with a viscid reddish mucus. He also found numerous lumbrici in the bowels of the several patients who died.—(See *Mém. de Chir. Militaire, T.* 3, *p.* 287.) This, however, could only be an accidental complication, and not a cause. In several cases, Dr. M'Arthur found the intestines much inflamed, and in two of them a yellow, waxy fluid, of a peculiar offensive smell, covered their internal surface; but, whether the inflammation was primary, or only a consequence of the pressure of the abdominal muscles, which contract so violently in this disease, he is unable to decide.—(See *Med. Chir. Trans. Vol.* 7, *p.* 475, *and Rees's Cyclopædia*, *art. Tetanus.*)

Dr. Lionel Chalmers, of Charlestown, South Carolina, states, that when the disease forms very quickly, and invades the unfortunate persons with the whole train of its mischievous symptoms, in a few hours, the danger is proportioned to the rapidity of the attack, and that the patients thus seized, generally die in 24, 36, or 48 hours, and very rarely survive the third day. But, when the disease is less acute, few are lost after the ninth, or eleventh. (See *Med. Obs. and Inq. Vol.* 1, *p.* 92, 93.

From the valuable report of Sir James Macgregor, it appears, that several hundreds of cases of tetanus occurred in our army, during the late campaigns in Spain and Portugal. The disease was observed to come on at uncertain periods after the receipt of the local injury; but, it terminated on the second, third, and fourth days, and even as late as the seventeenth and twentieth day; though it was usually not protracted beyond the eighth. (*Med. Chir. Trans. Vol.* 6, *p.* 353.)

—I had a patient, however, who lingered in the military hospital at Oudenbosch five weeks, with chronic tetanus, before he died. This happened in the year 1814, soon after the assault on Bergen-op-Zoom, where the patient had been wounded, and suffered amputation of the thigh.

Although tetanus is a disease, which has been observed, in almost all parts of the world, experience proves, that its frequency is much the greatest in warm climates, and especially in the hot seasons of those climates. It is also more common in marshy situations, and countries bordering upon the sea, than in places which are very dry, elevated, and at a distance from the sea-coast. Every class of individuals is exposed to its attacks; but infants, a few days after their birth, and middle-aged persons, are said to be oftener affected, than older subjects, or others in the youthful period of life. The male sex more frequently suffer, than the female; and the robust and vigorous more frequently, than the weak.

According to Dr. Cullen and other medical writers, the causes of tetanus, are cold and moisture, applied to the body, while it is very warm, and especially the sudden vicissitudes of heat and cold. Or the disease is produced by punctures, lacerations, or other injuries. Cullen admits, however, that there are probably some other causes, which are not distinctly known.

Baron Larrey observed, that gunshot wounds in the course of the nerves, and injuries of the joints, often produced tetanus in the climate of Egypt, particularly when the weather, or temperature, passed from one extreme to the other, in damp situations, and in those which were adjacent to the Nile, or the sea. What he terms dry and irritable temperaments, were the most subject to the disorder, the event of which was found to be almost always fatal. (*Larrey, Op. et Loc. cit.*)

Traumatic tetanus is remarked to proceed oftener from wounds of the extremities, than from similar injuries of the trunk, head, and neck. Sometimes, it originates at the moment of the accident, as in the instance mentioned by the late Professor Robison of Edinburgh; but, in general, it does not come on till several days afterwards, sometimes not till the wound is nearly or perfectly healed, and free from all pain and uneasiness. Wounds of every description may give rise to tetanus, and in warm climates, very trivial injuries produce it. Thus, in Egypt, Larrey had one case, which proceeded from the lodgment of a small piece of fish-bone in one of the sinuses of the fauces. (*Mém. de Chir. Militaire, T.* 1, *p.* 254.) In colder regions, traumatic tetanus seldom happens except from contused, punctured, or lacerated wounds; or wounds of the ginglimoid joints, with laceration of the tendons and ligaments; compound fractures, or dislocations; deep pricks in the sole of the foot; and especially lacerations of the fingers and toes. A partial division of a nerve has been suspected as a cause; but, as some nerves must be imperfectly cut through in almost every wound, and yet tetanus does not arise, the reality of this cause is doubtful. Besides, if it were true, the cure would be easily effected by making the division of the nerve complete, which experience contradicts. Baron Larrey, however, has recorded a fact, which favours the opinion, as I shall presently notice; and a case, in which the branch of the median nerve, going to the thumb, was found partly torn through, and its extremity inflamed and thickened, has been related by Mr. Liston. (*Ed. Med. and Surg. Journ. No.* 79, *p.* 292.) The inclusion of the nerves in ligatures, applied to arteries, is another alleged cause of tetanus; but, as this fault is very common, and tetanus rather rare in this country, while it may follow all sorts of wounds, whether accidents, or operations, the accuracy of this opinion may also be doubted. In support of it, however, there are some cases and observations adduced by Larrey, which will be quoted in the sequel of this article. (See *T.* 3 of his *Mem. de Chir. Mil.*) At the same time, I do not mean to hint, that the nerves are not sometimes tied in tetanic cases, or that the practice is not on every account blameable. Amputation and castration are the only great surgical operations to which I have seen tetanus succeed; though it may follow the employment of the knife on less severe occasions.

In warm countries, tetanus is an ordinary consequence of all kinds of wounds.

There cannot be a doubt, that difference of climate makes considerable difference in the degree and danger of tetanus. Larrey found, that, in Egypt, the disease was more intense, and bore a greater resemblance to hydrophobia, than in the colder climate of Germany. In both these countries, he remarked, that, when the wounds, causing tetanus, injured nerves situated on the forepart of the body, emprosthotonos was occasioned; that if the posterior nerves were hurt, opisthotonos followed; and that when the wound extended quite through a limb, so as to injure equally both descriptions of nerves, complete tetanus ensued. He noticed, also, that the disease commonly arose from wounds, when the seasons and temperature passed from one extreme to another. Exposure to the cold damp nocturnal air, he found particularly conducive to it. (See *Mém. de Chir. Milit. T.* 3, *p.* 286.)

In the late campaigns of our armies in Spain and Portugal, according to the report of Sir James Macgregor, tetanus occurred in every description, and in every stage of wounds, from the slightest to the most formidable: it followed the healthy and the sloughing; the incised and the lacerated; the most simple and the most complicated. It occurred at uncertain periods; but, it was remarked, that, if it did not commence before 22 days, from the date of the wound, the patient was safe. (See *Med. Chir. Trans. Vol.* 6, *p.* 453.) In Egypt, as we learn from Larrey, the latest period of the commencement of tetanus after a wound, was from the fifth to the fifteenth day. (*Mém. de Chir. Militaire, T.* 1, *p.* 263.)

It is observed by Dr. Dickson, that as the acute form of tetanus is so uniformly fatal, it is of the greatest consequence to attend to whatever may assist in detecting the disease early, or in warding it off. Richerand states, that, in wounds threatening convulsions and tetanus, a persevering extension of the limbs during sleep often manifests itself, before any affection of the lower jaw; and we should naturally pay more attention to any admonition of this kind in punctured, or extensive lacerated wounds, particularly of tendinous, or ligamentous parts, and especially in injuries of the feet, hands, knee-joint, back, &c. Some prelusive indications of danger may often be derived from the increase of pain, irritation, restlessness, nervous twitchings, pain and difficulty in deglutition, or in turning the head; spasms, or partial rigidity of some of the voluntary muscles; pain at the scrobiculus cordis; a suppressed, or vitiated state of the discharge, &c. which mark the slower approaches of the disease. Larrey adduces several instances of tetanus, in which the wound was either dry, or afforded only a scanty serous exudation, and where the symptoms were relieved on suppuration being re-established; and Dr. Reid, in the Edinburgh Medical and Surgical Journal for July 1815, remarks, that, on removing the dressing, the wound was covered with a darkish unhealthy-looking matter, and that he had seen this change the forerunner of tetanus in two other instances. A torpor of the intestines has generally been observed to precede, as well as accompany the disease, and Boyer, in particular, enumerates an obstinate constipation amongst the predisposing causes. (*Traité des Mal. Chir. T.* 1, *p.* 287.) Mr. Abernethy also informs us, that in four cases, where he inquired into the state of the bowels, the evacuations were not like feces; and he proposes as a question, in investigating the cause, what is the state of the bowels, between the infliction of the injury, and the appearance of this dreadful malady? (*Abernethy's Surgical Works*, *Vol.* 1, *p.* 104.) Dr. Parry thinks the velocity of the circulation an useful criterion of the danger of the disease, and observes, that, if the pulse be not above 100 or 110, by the fourth, or fifth day, the patient almost always recovers; but that if it be quickened early, the disease mostly proves fatal, and yet there are a few instances of recovery, where the pulse has risen to 120 on the first day. Baron Larrey remarks, that, when the perspiration, which so often attends the disease, is symptomatic, it begins upon the head and extremities; but, that when it is critical, it occurs over the chest and the abdomen. (*Mémoires des Chir. Militaire*, *T.* 1, *p.* 256.) It must be confessed, however, that, in many cases, perspiration flows, very freely, without bringing relief. (*Rees's Cyclopædia*, *art. Tetanus.*)

I next proceed to consider the treatment of tetanus, a subject of infinite difficulty, because the disease frequently baffles every mode of practice, and, in certain instances, gets well under the employment of the very same remedies, which decidedly fail in other similar cases of the disorder. Every plan has occasionally succeeded, and every plan has still more frequently miscarried. The great difficulty, therefore, is to ascertain, amongst numerous discordant accounts, what practice is found on the whole to be attended with the least ill-success? For, in the present state of our knowledge, the most credulous practitioner will not flatter himself with the supposition, that any effectual remedy for tetanus has yet been discovered. As, however, acute tetanus was regarded by Hippocrates and the ancients as certainly mortal, and it does not always prove so in modern times, it seems allowable to conclude, that the recoveries, which now happen, must be ascribed to improvements in practice. This reflection should lead us not to give up the subject as hopeless; but to redouble our exertions for the discovery of a more successful method of treatment, and if possible, of some new medicine, possessing more specific power over the disorder.

As it is justly observed by a well-informed writer, when we reflect upon the obscurity, which involves both the *ratio symptomatum*, and the proximate cause of tetanic affections, we need not wonder, that the practice in these disorders should still be entirely empirical. The indication of cure, which is generally applicable in all diseases, namely, the removal of the exciting causes, has but little place in a morbid condition, which is the consequence of causes, that in general have ceased to act, or which it is not in our power either to remove or control. In those cases, where we could suppose local irritation to be still operating, the most effectual method of counteracting its effects on the system, would obviously be to intercept all communication between the seat of the irritation and the sensorium. If, however, the disease has already established itself, and the severe symptoms have come on, it does not appear, that this would succeed in arresting the course of the disorder. Experience has but too fully proved, that the amputation of the limb, from the injury of which the tetanus has arisen, will very seldom procure even a mitigation of the symptoms, if performed after a certain period from their first appearance. (*Rees's Cyclopædia*, *art. Tetanus.*) Baron Larrey has been the greatest modern advocate for the performance of amputation in cases where tetanus depends upon a wound of the extremities; but, the facts which he has adduced in its favour are not numerous, and *he limits his recommendation of the measure chiefly to chronic cases*, and extends it to no others, except on the very first accession of the symptoms.

"The equally unexpected and entire success (observes Larrey), obtained, by the amputation of the injured limb, in the person of an officer attacked with *chronic* tetanus, leads me to propose the question, *whether, in this disorder, occasioned by a wound of some part of the extremities, it would not be better to amputate the injured limb immediately the symptoms of tetanus commence, rather than expect from the resources of nature, and from very uncertain remedies, a cure which so seldom happens?*

"If tetanus is chronic, as is sometimes observed, amputation may be done at every period of the disorder, provided a choice be made of the time, when there is an intermission of the symptoms. The operation would not answer so well in acute tetanus, if the disease were advanced, and the muscles to be divided were strongly contracted and rigid, as I have observed at the siege of Acre in a soldier, who was seized with tetanus, in consequence of a gunshot wound of the left elbow." (*Mém. de Chir. Militaire*, *T.* 1, *p.* 262.)

Larrey did, indeed, try amputation in a few instances of acute tetanus. In the case last cited, the symptoms were already considerably advanced, when the experiment of amputating the arm was made; yet, says he, the operation was followed by considerable ease. The symptoms recurred, however, a few hours afterwards, and proved fatal on the third day. In another example, this gentleman repeated the experiment, though acute tetanus had begun. The operation is described as having stopped all the symptoms, as it were, by enchantment; the patient even passed twelve hours in perfect ease; but, being exposed to the damp cold air, the disorder returned, and carried him off. (See *Mém. de Chir. Militaire, T.* 1, *p.* 263—269.) In a case of acute tetanus, where Mr. Liston amputated the wounded hand, the opisthotonos subsided the following day; yet, the case ended fatally, and it is a question, whether the degree of temporary benefit, which was obtained, did not proceed from other remedies, tried in conjunction with the operation? (See *Ed. Med. and Surg. Journ. No.* 79, *p.* 293.)

Larrey records some cases in favour of amputation at the commencement of tetanus from wounds, and especially for the relief of the disease in the chronic form. He has likewise adduced an interesting example, in which speedy relief and a cure followed cutting off all communication between the nerves of the wounded part and the sensorium by a suitable incision.

In this place I think it right to remind the reader, that although Baron Larrey once or twice amputated when acute tetanus was somewhat advanced, he does not advise the practice, and he expressly restricts his sanction of amputation to chronic or quite incipient cases of tetanus, and to a few instances, in which the ginglimoid joints are fractured, accidents, which independently of tetanus would generally require the operation. (See *Mém. de Chir. Mil. T.* 3.) The report of Sir James Macgrigor fully confirms the statement of Larrey; namely, that free incisions are of little avail in the acute and fully formed disease, and that amputation fails in the same kind of case. After the battle of Toulouse this operation was extensively tried; but, without success. The French are also said to have lost an immense number of soldiers from tetanus after the battle of Dresden, when Sir James infers, that the practice of amputation must have been fairly tried. (See *Med. Chir. Trans. Vol.* 6, *p.* 456.) We have seen, however, that according to the precepts of Larrey, the French surgeons would only have performed the operation, in chronic cases, which are not the most frequent, or if in other instances, only on the very first accession of the symptoms. But, upon the whole, notwithstanding the partial degree of success, attending Larrey's experiments, I have no hesitation in declaring my belief, that amputation of the injured part, in cases of chronic tetanus, will never be extensively adopted. The uncertain efficacy of this severe measure, and the occasional possibility of curing this form of the complaint by milder plans, will for ever constitute insuperable arguments against the practice.

Since the third edition of this Dictionary was printed, Sir Astley Cooper has published his sentiments, respecting the plan of amputating in cases of tetanus, and they tend to confirm the opinion, which I have always given upon the subject. In one case of tetanus, from a compound fracture just above the ankle, the operation seemed to precipitate the fatal event. In another case, the finger was amputated, without any good; and a third case is referred to, in which the operation also failed in saving the patient's life. In chronic tetanus, amputation is regarded by Sir A. Cooper as unjustifiable, as the patient often recovers without this proceeding. The medicine, which has appeared to this gentleman most useful in such cases, is the submuriate of mercury, joined with opium. (*Surgical Essays, Part* 2, *p.* 190.)

Mr. Abernethy, in his lectures, also disapproves of amputating any material part of the body, with the view of relieving tetanus, unless the injury require the operation on other grounds: he acknowledges, however, that he has seen tetanus mitigated by the practice, though the patients ultimately fell victims to the disease.

On the subject of making incisions for the purpose of separating the nerves of the wounded part from the sensorium, Larrey states, that they should be practised before inflammation has come on; for if this has made progress, they would be useless and even dangerous. They should comprehend, as much as possible, all the nervous filaments and membranous parts; but he condemns all incisions into joints, as exasperating the symptoms of tetanus, instances of which he has witnessed. The Baron has recorded some convincing proofs of the benefit, sometimes arising from completely dividing the trunk of the injured nerve. In one instance, tetanic symptoms followed an injury of the supraorbitary nerve, but were immediately stopped by dividing some of the fibres of the occipito-frontalis, and the nerves and vessels, down to the bone.

On the principle of destroying the parts, which are the seat of the local irritation, Larrey also frequently applied the actual and potential cautery to the wound. The application of caustics, says he, may be practised with advantage on the first attack of the symptoms, the same precept being observed as in making the incisions. Bleeding, if necessary, and the use of topical emollients and anodynes, may follow these operations; though in general they have little effect. (*Mém. de Chir. Militaire, T.* 1, *p.* 249.) In the third volume of this interesting work, p. 297, &c. are several cases, in which the cautery was employed with success. We must not conclude, however, that much dependence ought to be placed in the use of the cautery, since Larrey observes in another place: "The moxa and actual cautery, recommended by the Father of Medicine, have been equally unavailing. The moxa was employed at Jaffa upon three wounded men; the disease notwithstanding followed its usual course, and terminated fatally.

"I have cited a striking instance of the inefficacy of the second method, in a case of opisthotonos." (*T.* 1, *p.* 258.) This author also adduces some cases, which tend to support the opinion, that tetanus occasionally proceeds from the inclusion of a large nerve in the ligature applied to an artery. The son of General Darmagnac died of tetanus consequent to amputation, and upon examining the stump, the median nerve was found included in the ligature with the artery, and its extremity reddish and swollen. (*Mém. de Chir. Mil. T.* 3, *p.* 287.) In another case, Larrey suspected the tetanic disorder to proceed from a principal branch of the crural nerve being tied together with the femoral artery, and he cut the ligature; but, the relief was only partial and temporary. The cautery was therefore applied deeply to the whole surface of the stump. A marked amendment took place a few hours afterwards, and the patient recovered. A diaphoretic mixture, with camphor and opium, was also exhibited. (*T.* 3, *p.* 297.)

Amongst other local means for the relief of tetanus, we might as well notice the employment of blisters as near as possible to the wound, or their application, or that of the ointment of cantharides, to the wound itself. Almost all modern writers have observed, that tetanus is accompanied at its commencement and in its progress with an interruption, or total cessation of suppuration in the wound. Hence, the indication to excite this process again by the means which I have specified. Larrey seems to have adopted both plans; but he particularly applied the ointment of cantharides to the wound itself in an early stage of the symptoms, and in cases where there not only was a suppression of the discharge, but where he suspected the nerves of the wounded part had suffered from exposure to the cold damp air, on the detachment of the sloughs. For facts, in favour of these local means, the reader must refer to the first and second volumes of the Mémoires de Chirurgie Militaire.

It appears also from Larrey's experience in Egypt, that poultices, made of the leaves of tobacco, and applied to the wounds of persons labouring under tetanus, are followed by no advantageous effect. The alkalies also proved of no service. (*T.* 1, *p.* 257.)

I shall conclude these remarks on, what may be called, the local treatment of tetanus with mentioning, that the celebrated Dr. Rush recommended the wound to be dilated and dressed with oil of turpentine. (See *Trans. of the American Philos. Society, Vol.* 2); and that some naval surgeons use tincture of opium as a dressing.

A great degree of obscurity prevails, respecting the most eligible *general* or *constitutional* plans of treating tetanus, and I am afraid, it must be confessed, that our internal remedies cannot be more depended upon, than the local means, already described. This opinion is fully confirmed by adverting to the discouraging fact, recorded by Sir James Macgrigor, viz. that out of several hundreds of cases, which occurred in the British army during the late campaigns in Spain and Portugal, there were very few, which terminated successfully, or in which the remedies, however varied, seemed to have any beneficial influence, after the disease had made any progress. (*Med. Chir. Trans. Vol.* 6, *p.* 449.) The possibility of doing much good by internal medicines is also sometimes totally prevented by the inability of swallowing which afflicts the patient. In short, the present state of our knowledge, respecting tetanus, will not allow us to indulge much hopes of cure from any means yet discovered, except in the chronic form of the complaint, the instances of success in the treatment of acute tetanus being by no means numerous, and not the result of any determinate plan of treatment.

Of all medicines, opium is that which has raised the greatest expectation, and been the most extensively tried in cases of tetanus. Indeed, there cannot be a doubt, that in many chronic, mild cases, it is competent to effect a cure. But, for this purpose, it is absolutely necessary, that its use be begun from the earliest appearance of the symptoms; that it be given in very large doses; and that the doses be repeated at short intervals, so that the system be kept constantly under the influence of the remedy. It is, indeed, astonishing how the system, when labouring under a tetanic disease, will resist the operation of this and other remedies, which, in its ordinary state, would have been more than sufficient to overpower and destroy it. Patients with tetanus will bear, with impunity, quantities of opium, which at any other time would have been certainly fatal. Instances are upon record of five, ten, and even twenty grains, being taken every two or three hours, for many days, without any extraordinary narcotic effects being produced upon the sensorium. It is always advisable, however, to begin with comparatively moderate doses, such as forty or sixty drops of the tincture of opium, which may be repeated at intervals of three or four hours, and increased at each repetition, until some sensible effect is produced on the spasms. It seems requisite to augment the dose rapidly, as the disease presses upon us every hour, and no time must be lost while there is yet a chance of controlling its fury. The approaching closure of the jaw, and difficulty of deglutition, which may increase so as to render it hardly possible to introduce medicines into the stomach, are additional motives for pushing our remedies before such obstacles arise. (*Rees's Cyclopædia, art. Tetanus.*) I once supposed it possible to overcome this impediment by introducing a flexible catheter down the œsophagus from one of the nostrils; but the attempt to do this always brings on a violent paroxysm of spasms, attended with such a sense of suffocation that it cannot be endured. The experience of my friend, the late Mr. Cruttwell, of Bath, and that of Baron Larrey, have fully proved, that no assistance can be derived, in these circumstances from the use of any flexible tubes. (See *Mém. de Chir. Militaire, T.* 1, *p.* 247.) Sometimes however, the obstacle to the administration of medicines, arising from the closure of the jaw, is prevented by loss of some of the incisor teeth, and, in a few instances, Baron Larrey adopted the plan of extracting two of them. This would be useless, however, when deglutition is totally hindered, as happened in one instance recorded by the latter eminent surgeon. (*Op. cit. T.* 3, *p.* 301.) Glysters are the only resource, when the spasm of the fauces cannot be overcome. In this way, as much as a dram of the extract of opium has been introduced into the bowels at one dose. Opiate frictions upon the jaws, throat, and other parts of the body, have been practised. Opiate plasters have also been applied to the masseter muscles, and behind the ears. This external use of opium, however, can only be regarded as a feeble, and probably useless method.

A curious fact, noticed by Mr. Abernethy in his lectures, seems to offer some explanation of the little effect of some of the most powerful medicines on the constitution in tetanus: on opening the stomach of a patient, who had died of tetanus, after taking large doses of opium, thirty drachms of this substance were found undissolved in the stomach. Whether morphine will have more power over tetanus, than the common preparations of opium, must be decided by further experience; but, I confess, that my own expectations of so desirable a circumstance, are not very sanguine.

As the costiveness, always produced by tetanus, is rendered still more obstinate by opium, laxative medicines and glysters should constantly accompany its employment. The testimony of the army physicians, as we learn from the report of Sir James Macgrigor, is highly in favour of a rigid perseverance in the use of purgatives, given in adequate doses to produce daily a full effect. Dr. Forbes states, that a solution of sulphate of magnesia, in infusion of senna, was found to answer better than any other purgative; and it was daily given in a sufficient quantity to procure a copious evacuation, which was always dark-coloured and highly offensive; and to this practice he chiefly attributes, in one severe case, the removal of the disease. (*Med. Chir. Trans. Vol.* 6, *p.* 452.)

A spasmodic rigidity of the muscles being the most prominent symptom of tetanus, it was natural for practitioners to try the efficacy of some other anti-spasmodic medicines besides opium, and those which have been principally the subject of experiment, are castoreum, æther, the conium maculatum, musk, camphor, and latterly the digitalis. In many cases, opium and camphor have been exhibited together. Indeed, Larrey asserts that, of all the medicines hitherto proposed by skilful practitioners, the extract of opium combined with camphor, and the nitrate of potassa, dissolved in a small quantity of the almond emulsion, and given in doses, more or less strong, produces the most favourable effects, since patients, who have an aversion to other fluids, take with pleasure this mixture, the action of which must be promoted by bleeding, if necessary, and blisters, under the circumstances which have been specified. (See *Mém. de Chir. Militaire, T.* 1, *p.* 271.) In the same work, several cases are detailed, which were benefited by such treatment.

Although some practitioners have thought, that they saw good effects result from musk; yet the majority, who have made trial of both this and camphor, in cases of tetanus, have found no reason to recommend these medicines. One hundred and fifty grains of musk, however, have been given in the space of twelve hours, to a young girl, thirteen years old, affected with an incipient tetanus; but no salutary effect on the disorder was produced.

We learn also from Sir James Macgrigor, that æther, camphor, musk, and other anti-spasmodics, as likewise the alkalies, were tried by our military surgeons in Spain, and found unsuccessful. (*Medico-Chir. Trans. Vol.* 6, *p.* 458.)

From the same authority we find, that digitalis, in large doses, was tried in several cases in the Peninsula; and that it, with several other medicines enumerated, failed in almost every case of acute tetanus which occurred. (*P.* 454.) In one case recorded, the jaw remained fixed to the last, and the patient was never entirely free from spasms. (*P.* 458.) I am not acquainted with any cases in which belladonna has been given; but it is certainly a remedy well worthy of trial.

Analogy has also led to the employment of the warm bath, as a plan which seemed to promise great benefit, by producing a relaxation of the contracted muscles. But, notwithstanding this means has appeared, in a few instances, to occasion some little relief, particularly when the practitioner has been content with mere fomentations, it generally fails, and often has even done mischief. This may perhaps be, in some measure, ascribable to the disturbance and motion which the patient must necessarily undergo, in order to get into the bath; for it is very well known, that every exertion on the part of the patient is very apt to excite most violent paroxysms of spasm. The author of the article Tetanus, in the Encyclopédie Méthodique, mentions his having seen the warm bath do harm, in two or three cases in which it was expected to do good. Though numerous writers, have recommended the trial of the plan, it would be difficult to trace, in their accounts, any facts which decidedly show that its adoption has ever been followed by unequivocal benefit. The warm bath was tried in Spain, and found to produce only momentary relief. (*Medico Chir. Trans. Vol.* 6, *p.* 457.) Dr. Hillary, who practised a long while in the warm climate of America, where tetanus is very common, disapproves of this method of treatment. He observes, that although the use of the warm bath may appear to be very rational, and promise to be useful, he has always found it much less serviceable than emollient and anti-spasmodic fomentations; and he also mentions, that he has sometimes seen patients die the very moment when they came out of the bath, notwithstanding they had not been in it more than twenty minutes, the temperature of the water being likewise not higher than 29 or 30 of Reaumur's thermometer. (See *Hillary on the Air and Diseases of Barbadoes.*)

De Haen also relates a similar fact of a patient dying the instant he was taken out of the warm bath.

Hippocrates was an advocate for the application of cold water to tetanic patients. The advantages of the cold bath were first particularly explained by Dr. Cochrane, in the Edinb. Medical Commentaries; and the plan has subsequently received the praises of Dr. Wright, Dr. Currie of Liverpool, and others. Of all the remedies, which have been employed in cases of tetanus, the cold bath is perhaps that which has been attended with the greatest success. Dr. Wright published, in the *Med. Obs. and Inq. Vol.* 6, a paper, containing a narrative of the first trials of this method, which were all successful. The plan is said to be at present preferred throughout the West Indies. It consists in plunging the patient in cold water, and in that of the sea, when at hand, in preference to any other, or else in throwing from a certain height several pails of cold water over his body. After this has been done, he is to be very carefully dried with a towel, and put to bed, where he should only be lightly covered with clothes, and take twenty or thirty drops of laudanum. The symptoms usually seem to give way, in a certain degree, but the relief which the patient experiences is not of long duration, and it is necessary to repeat the same measures at the end of three or four hours. They are to be repeated in this manner; that is to say, at such intervals, until those of freedom from the attacks of the disorder increase in length. This desirable event generally soon follows, and ends in a perfect cure. Wine and bark were sometimes conjoined with the foregoing means, and seemed to co-operate in the production of the good effects. Dr. Wright concludes the account with the following remark, sent to him with a case, by Mr. Drummond, of Jamaica:—"I am of opinion, that opiates and the cold bath will answer every intention in the tetanus and such like diseases; for whilst the opium diminishes the irritability, and gives a truce from the violent symptoms, the cold bath produces that wonderful tonic effect, so observable in this and some other cases. Perhaps the bark, joined with these, would render the cure more certain. May we not then have failed in many cases, by using opiates alone in large doses, or, what probably is worse, with the warm bath, instead of the cold bath? And have we not reason to suspect that the increased doses of opium, which seemed requisite when the warm bathwas used, may have proved pernicious?" (*Vol.* 6, *p.* 161.)

Our army surgeons, who were in Spain, are said to have found the cold bath worse than useless (*Med. Chir. Trans. Vol.* 6, *p.* 254); and here I beg to remark particularly, that the plan seems to present no hope of benefit in cases of tetanus from wounds, however strong the evidence is of its utility in other examples of the disease. This was the opinion of Hippocrates, and, in modern times, that of Dr. Cullen, Callisen, &c. "Immersio subita iterata totius corporis in aquam frigidam in tetano a causa interna mire prodest, in tetano a causa externa minorem effectum præstat." (*Systema Chirurgiæ Hodiernæ, Part* 1, *p.* 169, 170, *Edit.* 1798.) On the subject of cold effusion and bathing, there are on record two cases, which are curious. One is related by Baron Larrey. It was an instance of tetanus from a gunshot wound. The cold bath was used. The two first trials gave the patient extreme pain, and no amendment followed. The sight of the bath the next time filled him with an invincible dread of the water, into which he refused to be put. He was covered, however, with a blanket, and immersed. The tetanic stiffness was immediately increased, and dreadful convulsions excited. It became necessary to remove him directly from the bath, and put him to bed. Deglutition was from this moment utterly impeded, and the contraction of the muscles carried to the most violent degree. A tumor, about as large as an egg, suddenly made its appearance near the linea alba, below the navel. After death, this was found to be caused by a rupture of one of the recti muscles, and a consequent extravasation of blood. (See *Mém. de Chir. Mil. T.* 3, *p.* 287—289.) This case is decidedly in support of the truth of the sentiment expressed on this subject by Hippocrates, Cullen, and Callisen. The next is not so: it is mentioned by Sir James Macgrigor, that, in the march of the Guards through Gallicia, one of them was attacked with tetanus, in consequence of a slight wound of the finger. As it was impossible to think of leaving the man in the wretched village where he was taken ill, he was carried on a bullock car, in the rear of the battalion. During the first part of the day he was drenched with rain, the thermometer standing at 52°; but, after ascending one of the highest mountains in Gallicia, the patient was in a cold of 30°; and he was exposed from six in the morning till ten at night, when he was found half starved to death, but free from every symptom of tetanus. (See *Med. Chir. Trans. Vol.* 6, *p.* 450.)

Mr. Abernethy in his lectures, expresses his conviction, that in tetanus, and all nervous affections, it is a most material point to operate on the brain, through the medium of the digestive organs, and that the production of secretions from the alimentary canal has a more beneficial effect, than any other means. He particularly commends the exhibition of calomel and jalap, mixed with treacle, as answering better than salts. Where much difficulty occurs in making the patient swallow common purgative medicines, I would strongly recommend to the recollection of practitioners, the oleum tiglii, a drop of which, blended with a little mucilage, and put on the root of the tongue, will operate powerfully on the bowels.

Another remedy, said to have frequently effected a cure in tetanus, is mercury. (See *Journ. de Med. p.* 45.) Mercurial frictions, practised so as to bring on a quick affection of the mouth, and in an early stage of the disorder, are preferred. Others contend, that it matters not, whether mercury be rubbed into the body, or given internally. It is generally allowed, that opium may be advantageously exhibited at the same time. This practice was first adopted in the West Indies (see *Edinb. Physical and Literary Essays, Vol.* 3), where it succeeded in many cases. Whatever benefit, however, may have been experienced from this plan in mild cases, it completely fails in the acute form of the disease. Mercurial frictions appeared to Baron Larrey to aggravate the symptoms, in the cases where the plan was tried in Egypt (*Mem. de Chir. Mil. T.* 1, *p.* 257); and Dr. Emery, Mr. Guthrie, and other medical officers, attached to our army in the Peninsula, tried inunction of the whole body, three times a day, with strong mercurial ointment, in unlimited quantity, with no degree of success. After the battle of Toulouse, a fatal case even occurred in a man strongly under the influence of mercury, which he had been previously using for the cure of the itch. (*Sir J. Macgrigor in Med. Chir. Trans. Vol.* 6, *p.* 454.) The submuriate of mercury, combined with ipecacuanha, also proved inefficacious in acute cases; but, in chronic ones, it proves serviceable by keeping open the bowels.

Another method of treating tetanus is that of administering the most powerful tonics and stimulants, such as wine, brandy, æther, preparations of ammonia, bark, cordials, &c. The introduction of this plan was chiefly owing to the eminent Dr. Rush, Professor of Medicine in Philadelphia, who published in the Trans. of the American Philos. Society, Vol. 2, a paper, entitled "*Obs. on the Cause and Cure of Tetanus.*"

Dr. Rush considers tetanus as a disease essentially connected with debility, and he recommends for it the exhibition of the preceding class of remedies. He particularly advises the liberal use of wine and Peruvian bark; and, as we have already stated, when tetanus arises from a wound, he directs the dilatation of it, and dressings with oil of turpentine. Considerable success is represented as having attended the practice. Several other instances of success are also recorded by Dr. Hosack. (*American Medical Repository, Vol.* 3.)

Nothing is a more certain proof of our not being acquainted with any very effectual method of treating a disease, than a multiplicity of remedies, which are as opposite as possible in their effects. We have seen that the celebrated Dr. Rush conceived, that tetanus was a disease connected with debility, and he has recorded examples, in which it was successfully treated by tonics and stimulants. Extraordinary, however, as it may appear, many practitioners are advocates for venesection, especially in the early stage of tetanus. Dr. Dickson thinks, that, in a full habit, where the wound is swelled, inflamed, and painful, venesection, with free purging, and such other means as are calculated to allay the general and local irritation, affords the fairest chance of averting the danger. (See *Med. Chir. Trans. Vol.* 7, *Part* 2.) Larrey has also published several cases, in which bleeding had a good effect. We are informed by Sir James Macgrigor, that, in our military hospitals in Spain, venesection had a fair trial. In three cases at St. Andero, detailed by Mr. Guthrie, this was the principal remedy. One patient with tetanus, from a wound of the back part of the hand, was bled nearly *ad deliquium* several times with good effect, calomel and diaphoretics being also given, and he recovered. Another patient was bled in the same manner with such amendment, that he suffered but little from spasm, and could open his mouth very well, when he was seized with diarrhœa, which, in his debilitated state, carried him off. In the third case, which was one of acute tetanus, venesection, pushed to the utmost, totally failed. (*Op. cit. Vol.* 6, *p.* 455, 456.)

The powerfully relaxing effects of tobacco clysters, in cases of hernia and enteritis, have suggested a trial of them in tetanus. In one very acute case, the plan was tried by Mr. Earle, but it only afforded a temporary alleviation of the spasms, and, as it caused severe agitation, it was discontinued. According to Sir James Macgrigor, tobacco clysters, tried in the advanced stage of the disease, seemed to have no effect. He considers, however, the tobacco fume as deserving further trial.

A remarkable case is recorded by Dr. Phillips, in which the jaw suddenly fell upon the exhibition of an enema with oil of turpentine. (See *Med. Chir. Trans. Vol.* 6, *p.* 65.)

According to Baron Larrey, frictions, with oily liniments, as recommended by some authors, were tried by the French surgeons at Cairo; but they produced no change in the state of the disease. We learn, from the same authority, that the application of blisters to the throat also failed in checking the symptoms.

The Barbadoes tar, mentioned by Cullen, electricity, the colchicum autumnale, or meadow saffron, recommended by Dufresnoy, and several other means formerly in repute for their virtues in cases of tetanus, have now been fully proved by experience to possess little or no claim to this character.

Consult *Hippocrates de Morbis Popularibus, Lib.* 5 *et* 7. *Cœlius Aurelianus de Morbis acutis. Med. Obs. and Inq. Vol.* 1, *p.* 1 *and* 87; *Vol.* 6, *p.* 143. *Hillary on the Air and Diseases of Barbadoes, 8vo.* 1765. *Edin. Physical and Literary Essays, Vol.* 3. *Dr. Carter in Medical Trans. Dr. Cochrane in Edin. Medical Commentaries. Cullen's First Lines of the Practice of Physic, Vol.* 3. *Rush's Observations on the Cause and Cure of Tetanus, in Vol.* 2 *of the Transactions of the American Philosophical Society. Sir Gilbert Blane's Observations on the Diseases of Seamen, Edit.* 3. *M. Ward, Facts establishing the Efficacy of the Opiate Friction in Spasmodic and Febrile Diseases, &c. 8vo. Manchester,* 1809. *Larrey, Mémoires de Chir. Militaire, T.* 1, *p.* 235, *&c.; T.* 3, *p.* 236, *&c. Callisen, Systema Chirurgiæ Hodiernæ, Pars* 1, *p.* 165, *&c. Sir James Macgrigor, in Med. Chir. Trans. Vol.* 6, *p.* 449, *&c. Dr. Phillips's Case in the same work and volume, p.* 65. *Dr. Dickson's Observations on Tetanus, and Dr. Macarthur's Letter in Vol.* 7, *p.* 448, *&c. of the same book. Trnka de Krzowitz, de Tetano Commentarius, Vindob.* 1777, *Richerand, Nosogr. Chir. T.* 2, *p.* 338, *&c. Edit.* 4. *Edinb. Med. and Surgical Journal, Vol.* 1, *p.* 67; *Vol.* 2, *p.* 255—430; *Vol.* 4, *p.* 45, *&c. &c. Boyer, Traité des Mal. Chir. T.* 1, *p.* 285, *&c. Paris,* 1814. *Rees's Cyclopædia, art. Tetanus. C. H. Parry, Cases of Tetanus, and Rabies Contagiosa, &c. 8vo. Lond.* 1814. *John Morrison, a Treatise on Tetanus, 8vo. Newry,* 1816. *Robert Reid, on the Nature and Treatment of Tetanus and Hydrophobia, 8vo. Dublin,* 1817. *Stewart, in Med. Chir. Journ.; Oil of Turpentine tried. Sir Astley Cooper, Surgical Essays, Part* 2, *p.* 190. *Burmester, in Med. Chir. Trans. Vol.* 11.

THORAX, WOUNDS OF. See *Wounds of the Thorax.*

THROAT, WOUNDS OF. Injuries of this kind are often attended with considerable danger, on account of the great number of important parts, which are interested; but, mere cuts of the integuments of the throat and neck are not (generally speaking) dangerous cases, and do not materially differ from common incised wounds of the skin in any other part of the body. They are not liable to be followed by any particular consequences, and require the same kind of treatment as cuts in general. (See *Wounds—Incised Wounds.*)

In wounds of the throat and neck, however, the larynx and trachea, pharynx and œsophagus, the trunk of the carotid artery, and all the principal branches of the external carotid, the large jugular vein, the eighth pair of nerves, and the recurrent nerve, are all exposed to injury; some much more so than others, but all of them being occasionally reached by the edge of the knife, or razor, or the point of the sword, or other instruments.

It would be absurdity to offer an account of what is to be done in cases, attended with some part of the mischief above pointed out; for no patient, thus wounded, would ever be found alive. Wounds of the eighth pair of nerves are generally considered fatal, though some doubts begin to be entertained on the point. Indeed, Klein positively states, that such an injury is not fatal. (See *Journ. der Chir. B.* 1, *p.* 123, 8*vo. Berlin*, 1820.) However, if such a wound is not absolutely fatal, there can be no doubt of its being highly perilous, and that it should be most cautiously avoided. These nerves, as is well known, proceed down the neck, in the same sheath of cellular substance, which includes the carotid artery, and lie on the outside of this vessel, between it and the internal jugular vein.

Wounds, either of the carotid artery, or internal jugular vein, must generally prove immediately fatal, in consequence of the great and sudden loss of blood. However, were any surgeon on the spot at the moment, he should instantly secure the wounded vessel. In tying the carotid, one caution is highly necessary, viz. always to be sure that the par vagum is excluded from the ligature: for were this nerve to be tied, the mistake, if not absolutely mortal, would leave but a slight possibility of recovery.

If the mouth of the vessel could not be at once secured, pressure should be instantly resorted to, for the purpose of producing a temporary suppression of the hemorrhage. The surgeon should then either make the necessary enlargement of the wound in the integuments, with a due and constant recollection of the important parts near the place, or else, in the case of the carotid being injured, he should cut down to this vessel in the manner explained in the article *Aneurism.*

In lacerated wounds, the carotid artery may be injured, and yet the patient not immediately bleed to death; for it is the nature of all wounds, attended with much laceration and contusion, not to bleed so freely as clean cuts. Mr. Abernethy has related a case, in which the carotid, and all the chief branches of it, were wounded in a man who was gored in the neck with a cow's horn; yet death did not directly follow, and there was time to have recourse to the ligature. Baron Larrey even reports one or two cases, in which the bleeding from the carotid, injured by a gunshot, was permanently stopped by pressure, (See *Mém. de Chir. Milit.*) Dr. Hennen also refers to another instance of a similar nature. (*On Military Surgery*, *p.* 106, *Ed.* 2.)

Punctured wounds might obviously injure either the carotid, or the internal jugular vein, without the patient expiring of hemorrhage at once; because the smallness of the wound in the skin might hinder the fatal effusion of blood.

However, frequently, when these vessels are wounded, the par vagum is also injured, and the case is mortal, either immediately, from the direct effects both of the injury of the nerve, and sudden loss of blood, or very soon afterwards, the bleeding being of a slower and more interrupted kind; which circumstance must depend on the lacerated nature of the wound, the small size of the opening in the vessel, or of that in the skin, &c.

Persons who attempt suicide, by cutting their throats, do not often divide the carotid artery, on account of their incision being made too high up. Where the carotid arteries emerge from the chest, they are situated by the side of the trachea, and even a little more forward than it. However, as these vessels proceed up the neck, they become more laterally situated with respect to the trachea; and when they have arrived at the upper part of the neck, where persons, who aim at suicide, almost always cut, they become situated more backward than the trachea, inclining towards the angle of the lower jaw.

The œsophagus is so deeply situated, lying close to the bodies of the vertebræ, and behind the trachea, that it is not often concerned in any incised wounds, which do not immediately prove fatal, in consequence of the division of other important parts. Yet numerous cases are recorded, in which the œsophagus is said to have been wounded; and what is usually set down as a criterion of the fact, is the passage of victuals through the wound. In many of these narrations the writers seem to have forgotten, that wounds, made above the os hyoides, as they frequently are, may enter the mouth, and the victuals escape through the cut, without the œsophagus, or pharynx, being at all concerned.

However, no doubt, the œsophagus has occasionally been wounded, together with the trachea, not only without the patient perishing so immediately as to be incapable of receiving any succour, but without every chance of recovery being destroyed. Stabs, and gun-shot wounds, may injure the œsophagus, and leave all other important parts untouched. Nay, when other parts of consequence are injured, the patient is sometimes saved. (See *Hennen's Military Surgery*, *p.* 363, *Ed.* 2.)

Even where the œsophagus is known to be wounded, its deep situation would prohibit us from doing any thing to the breach of continuity in the tube itself. The best plan would be to have recourse to antiphlogistic means, and to introduce a flexible elastic gum catheter, from one of the nostrils, down the œsophagus, for the purpose of conveying nourishment and medicines into the stomach, without any risk of their passing out at the wound. An instrument of this kind will lie in the above situation for any length of time, without occasioning much inconvenience; and, besides being advantageous for injecting nourishment and medicines down the passage, and keeping them from issuing at the wound, it prevents all necessity for the wounded œsophagus to act, and become disturbed, when there is occasion to take any kind of liquids, whether in the way of medicine or food. The outer wound should be brought together, and treated on common principles.

When persons cut their throats, as I have explained, they do not often divide the carotid artery, owing to their incision being usually made high up in the neck, where this vessel has attained a very backward situation. When any serious hemorrhage does arise, it is sometimes from the lower branches of the lingual artery, but most frequently from the superior thyroideal arteries. Such arteries may occasion a fatal bleeding, which, indeed, would more frequently be the event than it actually is, did not the patient often faint, in which state the bleeding spontaneously ceases, and gives time for the arrival of surgical assistance.

I need hardly tell the reader, that these arteries are to be tied, and that this important object is the first to which the surgeon should direct his attention. The danger of bleeding to death being obviated, as soon as possible, the other requisite measures may be more deliberately executed.

With respect to wounds of the trachea, the same plan of conveying food and medicines into the stomach, through an elastic gum catheter, introduced from one of the nostrils down the œsophagus, is highly proper, though too much neglected. For nothing creates such disturbance of the wound as the convulsive elevation and depression of the larynx and trachea, which are naturally attendant on the act of swallowing.

When the trachea is cut, the patient's power of forming the voice is more, or less, impaired, in consequence of the air passing into, and out of, the lungs, chiefly through the wound. Besides air, a considerable quantity of the natural mucus of the trachea is also continually coming out of the wound.

The grand means of accomplishing the union of wounds of the trachea, are a proper position of the head, and a rigorous observance of quietude. By raising the patient's head with pillows, and keeping his chin close to his breast, the edges of the wound, both in the skin and trachea, are placed in contact, even without any other assistance, unless the division of the trachea be exceedingly large. It is proper, however, to promote the effect of a suitable position with strips of sticking plaster, and sometimes with a suture or two. But the necessity for sutures must depend on the extent of the division of the trachea; for, unless most of the circle of this tube be cut, and position be neglected, the wound in it will not gape. The stitches should never be passed through the lining of the trachea, as this method would be likely to make it inflame, and occasion considerable coughing and irritation, attended with very pernicious effects.

Should there be much coughing, apparently arising from irritation and inflammation in the trachea, bleeding is proper, if other considerations do not forbid it. The spermaceti mixture, with opium, is also frequently of great service. I never saw a wound of the trachea unite by the first intention. (See *John Bell on Wounds, Ed.* 3. *Hennen's Military Surgery, p.* 356, *&c. Ed.* 2. *8vo. Edinb.* 1820. *Amongst other references made by Dr. Hennen, the following seem to me to merit particular notice:— An interesting case of wound of the neck, succeeded by hemiplegia, and another of gun shot wound of the throat, succeeded by paralysis and convulsions, says Dr. Hennen, is given by Forestus in his Surgical Observations. Another, with loss of motion in the arm, from a wound in the neck, is to be found in the Edinb. Med. Essays, Vol.* 1. *And in the Med. Commentaries, by Dr. Duncan, Vol.* 4, *p.* 434, *and Vol.* 8, *p.* 356, *are two interesting cases. Mursinna, in his Med. Chir. Beobachtungen, relates a case of removal of the thyroid gland by a cannon ball; the patient survived fourteen days, and died of dysentery. Wounds of the œsophagus often remain open for indeterminate periods, as is exemplified in a case reported by Trioen, in his Fasciculus Observationum, Lugd.* 1745, *p.* 40. *Mr. Bruce has recorded an interesting case of wound of the Œsophagus, in Med. Chir. Journ. Vol.* 1, *p.* 369. *I would also refer to various parts of Mém. de Chir. Milit. by Baron Larrey. And Thomson's Report of Obs. made in Mil. Hospitals in Belgium,* 8*vo. Edinb.* 1816.)

THROMBUS. (from ϑρομϐος, coagulated blood.) A clot of blood. The term is also applied to a tumor, formed by a collection of extravasated, coagulated blood, under the integuments after bleeding. When not considerable, it is usually called an *ecchymosis.* (See this word, and *Bleeding.*)

A thrombus after bleeding, generally arises from the opening in the vein not corresponding to that in the skin. The patient's altering the posture of his arm, while the blood is flowing into the basin, will often cause an interruption to the escape of the fluid from the external orifice of the puncture; and consequently, it insinuates itself into the cellular substance in the vicinity of the opening in the vein. In proportion as the blood issues from the vessel, it is effused, in the cellular membrane, between the skin and fascia, covering the muscles, and this, with more or less rapidity, and in a greater or lesser quantity, according as the edges of the skin more or less impede the outward escape of the fluid. Sometimes also, a thrombus forms after venesection, when the usual dressings, compress, and bandage, have been put over the puncture, and the patient imprudently makes use of the arm on which the operation has been done. This is more particularly liable to happen when the opening in the vein has been made large.

When the extravasation is not copious, it is of little importance, the tumor generally admits of being easily resolved, by applying linen dipped in any discutient lotion. If the swelling be more extensive, applying to it a compress, wet with a solution of common sea-salt, is deemed an efficacious plan of promoting the absorption of the extravasated blood. Brandy, and a solution of the muriate of ammonia in vinegar, are likewise eligible applications.

It sometimes happens, that a thrombus induces inflammation and suppuration of the edges of the puncture. The treatment is now like that of any little abscess: a common linseed poultice may be applied, and any considerable accumulation of matter should be prevented by making an opening with a lancet in proper time. As soon as the inflammatory symptoms have ceased, discutients should be employed again, for the purpose of dispersing the remaining clots of blood, and surrounding induration.

When the quantity of blood is large, many authors recommend opening the tumor at once; and, despairing of the power of the absorbents to remove the extravasation, they recommended as much of the blood as possible to be pressed out through the incision. I believe, however, that making an opening is seldom necessary, and often brings on inflammation, and suppuration, when they might be avoided. I have never seen any case, in which this practice seemed necessary, though such a case may be conceived.

THYROID GLAND DISEASED. (See *Bronchocele.)*

THYROID GLAND, EXTIRPATION

OF. That such an operation, though attended with great difficulties, is not impracticable, is proved by the following example:—

On the 20th of March, 1791, a woman presented herself for admission at the Hôtel Dieu, with a tumor of the right portion of the thyroid gland. The swelling was two inches in diameter, round, hard, and attached to the right and middle part of the trachea, and it pushed outwards the sterno-mastoideus muscle. Independently of its being sensibly raised by each pulsation of the arteries, it followed the motions of deglutition, and in a slight degree impeded the passage of solid aliment. Desault made an incision through the middle of the tumor, beginning one inch above, and finishing one inch below the swelling. By the first stroke, he cut down as far as the gland, dividing the integuments, the platysma-myoides, and some fibres of the sterno-hyoidcii and sterno-thyroidei muscles. An assistant, with the view of fixing the tumor, drew it towards the inner edge of the wound, whilst the operator detached the swelling from the sterno-mastoideus muscle. In dissecting the cellular substance, which united the parts, two small arteries were divided, which were secured with ligatures. The outer portion of the tumor being thus disengaged, the inner was detached in the same way. The tumor was then drawn outwards by means of a hook, that it might be separated with more ease from the trachea. In the course of this dissection, the branches of the thyroid arteries were successively tied, as fast as they were divided. The assistant who held the hook, pulled the gland from within and forwards, whilst the surgeon finished the dissection outwards and from above downwards. This part of the operation was the most difficult: it was necessary continually to wipe away the blood with a sponge, which necessarily prevented the parts from being easily distinguished, and obliged the surgeon to cut but a little at a time, and always to examine well with his finger those parts which he was about to cut. By this cautious dissection, the superior and inferior thyroid arteries were laid bare, and afterwards tied with the aid of a blunt crooked needle. They were then transversely divided, and the remaining part of the tumor detached from the trachea, to which it strongly adhered. The wound, resulting from this operation, was near three inches in depth; outwardly bounded by the sterno-mastoideus muscle, inwardly by the trachea and œsophagus; and posteriorly by the carotid artery, and par vagum, which were exposed at the bottom of the wound. The extirpated tumor was five inches in circumference; and on examination was found to differ in no particular from scirrhous glands, except that in the centre there was a cartilaginous nucleus. The patient left the hospital, perfectly well, the thirty-fourth day after the operation. (See *Desault's Parisina Chir. Journ. Vol.* 2, *p.* 292, 296.)

The extirpation of the thyroid gland is an operation extremely difficult, and certainly highly dangerous, when performed by an operator but moderately exercised in the practice of his profession. The number and size of the arteries divided, the proximity of the trachea, œsophagus, jugular vein, and carotid, near which the knife must necessarily pass, are the principal dangers, which have deterred the majority of practitioners from performing the operation. The first time that Gooch undertook the operation, he was deterred from finishing it by the hemorrhage, and his patient died on the eighth day. The second time he succeeded better, but was incapable of securing the vessels, and the hemorrhage which would have been mortal, was only stopped by the pressure of the hands of assistants for the space of eight days. (*Gooch's Med. and Chir. Obs. p.* 130. *Bell's System of Surgery, Vol.* 5, *p.* 525. *Richter's Bibl. T.* 2, *p.* 128.)

Vogel and Theden also did the operation with success; but, no surgeon, who has attempted this bold operation, has signalized himself so much by it as Dr. Hedenus, of Dresden, who has removed the diseased thyroid gland in six instances with success. His reasons for resorting so often to this difficult operation, he says, are: 1st, because he has seen a patient with enlarged thyroid gland, for which the seton had been employed, seized on the ninth day with violent tetanus, which proved fatal in 17 hours; 2dly, because he considers setons and other similar means unlikely to do good, as he has almost always found portions of cartilage or bone within the diseased part. In one of his cases the gland was as large as a skittle-ball; it covered the whole of the front of the neck, reaching from the os hyoides to the upper part of the sternum, and pushing back on each side the sterno-cleido-mastoideus and adjacent parts. The circumference of its base was 14 inches, and its transverse diameter seven. It had a firm, tense, heavy feel. The skin was full of enlarged veins; and the tumor communicated to the hand a throbbing motion, which might have been taken for that of an aneurismal swelling.

The patient was laid on a mattress. Dr. Hedenus then divided the skin in a longitudinal direction, from the os hyoides to the top of the sternum, and dissected and turned back the skin and platysma myoides, on each side, to the extent of two inches. The sterno-hyoid and sterno-thyroid muscles were then seen firmly adherent to the whole tumor. An attempt was made to separate them from the swelling; but, scarcely had the dissection extended a quarter of an inch, when a copious stream of blood proceeded from numerous small arteries, which could neither be tied, on account of their minuteness, nor stopped with styptics. Hedenus, therefore, determined immediately to cut through the above-named muscles at their points of attachment, above and below, and to remove the intervening portions with the tumour.

Respecting this part of the operation, it merits particular notice, that, after the cure, the motions of the os hyoides and larynx, and the functions of respiration, speech, and deglutition, all remained unimpaired, which was also the case in four other instances, in which Hedenus removed portions of the sterno-hyoidei and sterno thyroidei muscles.

Hedenus next separated the swelling, above and below, from the sterno-cleido-mastoid, and omo-hyoid muscles, and also from the jugular vein and carotid arteries, to which it was closely adherent, until he had freed them as far as the point, where the thyroid arteries originate. He then tied all the superior and inferior thyroideal arteries, close to the tumor, and, on account of the free anastomoses, applied to each vessel two ligatures, and divided it in the interspace. The more deeply the dissection now reached, the more hazardous did the operation appear, as, at every cut of four or five lines, he was obliged to tie two or three arteries, which was done with great difficulty. After most cautiously dissecting to the base of the tumor, which was firmly attached to the thyroid cartilage, and the three upper rings of the trachea, he met with so many arteries, for the most part as large as the radial, or digital, that, in order to prevent further loss of blood, he decided to tie the base of the swelling, and then cut away the tumor above the ligature. For this purpose, he used a blunt-pointed aneurismal needle, armed with two four-threaded ligatures. This was passed through the middle of the base, while the tumor was pulled upwards, and one ligature was then firmly tied over the lower, and the other over the upper half of the base. For the sake of being still more sure of commanding the hemorrhage, Hedenus also applied a third ligature all round the swelling, and he then extirpated the diseased gland, without any bleeding from the part included in the ligatures. These were now fastened at the sides of the wound with adhesive plaster. The whole surface of the wound was sprinkled with powdered gum arabic, over which was laid agaric wet with Theden's vulnerary lotion. These applications having been covered with charpie, the lips of the wound were drawn towards each other with adhesive plaster, which was also covered with compresses, wet with vinegar, and renewed every six or eight minutes.

It is quite unnecessary for me to follow the narrative of this case, in all its details. The patient between the period of the operation and that of his cure, suffered a great deal of indisposition, which at first, chiefly consisted of difficult deglutition, severe pain all over the right side of the head, imperfect use of the arm, frequent cough, and hoarseness. In the afternoon, blood began to flow through the bandage, and, as the bleeding had not abated, after an hour's pressure with the hand, the dressings were removed, and the blood found to proceed not from any particular artery, but from all the wounded surface. The wound was again sprinkled with gum arabic, which was covered with sponge and a bandage: two surgeons were also directed to keep up pressure with their hands. The day after the operation, the febrile symptoms ran high, but in two days subsided again. On the eighth day, all the ligatures came away, even that which had encircled the tumor, and a large quantity of fetid matter was discharged. Soon afterwards a considerable bleeding arose, which however was stopped with sponge and alum powder. On the 16th day, another serious hemorrhage was occasioned by a convulsive cough, and life was endangered by the loss of not less than two pounds of blood. The bleeding, which came from the upper angle of the wound, was stopped by means of a piece of sponge, dipped in rectified spirit, and covering the wound and indeed the whole neck with compresses, wet with vinegar, pressure being also kept up on the sponge with the hand. The dangerous state of the patient may be conceived, when it is known, that there was now a deadly paleness of his whole body, languid eyes, dimness of vision, loss of hearing and speech, and extreme prostration of the vital powers. With the aid of judicious treatment, however, he rallied, and in the end left the hospital quite cured.

In another case operated upon by Hedenus, the difficulties were even greater, owing to the extension of a portion of the right lobe of the thyroid gland, as far back as the transverse processes of the cervical vertebræ; but, after the third day from the operation, the progress to recovery was not interrupted by any bleedings. (See *Graefe's Journ. B.* 2, *p.* 237, *&c. or the Quarterly Journ. of Foreign Med. No.* 19.)

There can be no doubt, that the method adopted by Hedenus was well calculated to obviate the great source of immediate danger, viz. the bleeding. As long as it was practicable he took up every vessel, which he exposed or divided, and when this plan could not be continued, he tied the base of the tumor, ere he detached the enlarged gland from the larynx. This tying of the base of the swelling, though sometimes practised on other occasions, as in the removal of diseased axillary glands, constitutes the chief peculiarity of Hedenus's method in the extirpation of the thyroid gland.

A case, in which Klein removed a very large thyroid gland, has been recently published. The patient, a boy, eleven years of age, died, however, on the operating table. (See *Journ. der Chir. B.* 1, *p.* 120, *8vo. Berlin,* 1820; or *the Quarterly Journ. of Foreign Medicine, Vol.* 2, *p.* 380.) On the whole, I consider, that the practice of tying the thyroidal arteries is generally a safer experiment, than the removal of the enlarged gland with a knife. (See *Bronchocele, Med. Int.* 44. *p.* 363.) But now that the efficacy of the preparations of iodine, in many cases of bronchocele, is fully proved, it is to be hoped, that few cases will present themselves, in which either measure will be absolutely necessary.

TIC DOULOUREUX. This term is used to signify a disorder, the most prominent character of which consists in severe attacks of pain, affecting the nerves of the face; most frequently, the filaments of that branch of the fifth pair, which comes out of the infra-orbitary foramen; but sometimes the other branches of the fifth pair, and occasionally the numerous filaments of the portio dura of the auditory nerve, which are distributed upon the face. The complaint is not continual, but occurs in violent paroxysms, which vary in duration in different instances. It is the *trismus dolorificus* of Sauvage; the *Faciei Morbus Nervorum Crucians* of Dr. S. Fothergill; and of that order of diseases which Professor Chaussier has so aptly denominated *neuralgies* (from νευϑου, a nerve, and αλγος, pain); for it should be known, that many other parts of the body are subject to a similar affection.

The first excellent description of tic douloureux was published in the year 1776, by the late Dr. Fothergill. (See *Med. Obs. and Inq. Vol.* 5.) It is not true, however, as is generally stated, that he was the first author who noticed the complaint. This, indeed, is so far from being correct, that we even find an account of an operation done long ago by Louis, for the relief of the disease. (See *No.* 36 *de la Gazette Salu-*

taire, 1766;) and this identical case actually became a subject of hot dispute between the physicians and surgeons of the French metropolis. (See a Thesis, entitled "*Utrùm in pertinacibus capitis et faciei doloribus aliquid prodesse possit, sectio ramorum nervi quinti paris? Proponebat Viellart*, 1768, *conclusio negativa*.")

Tic douloureux conveniently admits of being divided into four species, called by the French *frontal*, *suborbitary*, *and maxillary neuralgia*, and the *neuralgia of the facial nerve*.

In the frontal neuralgia, the pain usually begins in the situation of the supra-orbitary foramen, extending at first along the branches and ramifications of the frontal nerve, distributed to the soft parts upon the cranium, and afterwards shooting in the direction of the trunk of the nerve towards the bottom of the orbit. In a more advanced stage, the conjunctiva and all the surface of the eye participate in the effects of the disorder, and become affected with chronic inflammation, which is described as a particular species of ophthalmy. At length, the pain passes beyond the distribution of the branches of the frontal nerve, and affects all the corresponding side of the face and head. It seems as if it extended itself to the facial, sub-orbitary, maxillary, and even to the temporal and occipital nerves, through the communications naturally existing between the filaments of all those organs of sensation. Each paroxysm produces a spasmodic contraction of the eyelids, and a copious effusion of tears.

The sub-orbitary neuralgia is first felt about the sub-orbitary foramen. The seat is probably in the nerve of this name, and the pain extends to the lower eyelid, the inner canthus of the eye, the muscles about the zygoma, the buccinator, cheek in general, ala of the nose, and the upper lip. At a later period, the pain appears to extend backward to, the trunk of the nerve, and those branches which are given off in its passage through the sub-orbitary canal. Hence, pains are then experienced in the upper teeth, the zygomatic fossa, the palate, tongue, and within the cavity of the nose. As the disorder advances, it may extend, like other neuralgiæ of the face, to all the same side of the head. During the paroxysms, when the disease is fully formed, an abundant salivation usually takes place. In general, the attendant toothach deceives the practitioner, who in the belief that the pain arises from another cause, uselessly extracts several of the teeth.

The tic douloureux of the lower jaw, or maxilliary neuralgia, is usually first felt about the situation of the anterior orifice of the canalis mentalis, and it extends to the lower lip, chin, neck, teeth, and temple. This form of the complaint is more uncommon than the preceding; but, after it has prevailed some time, is equally remarkable for its intensity.

With respect to the neuralgia of the facial nerve. or portio dura of the auditory nerve, it is a case, which very soon cannot easily be distinguished from the other species of tic douloureux. The pains at an early period are no longer confined to the passage of the principal branches of this nerve between the parotid gland and ramus of the jaw. The numerous communications of the portio dura with the rest of the nerves of the face seem to facilitate the extension of the disease, so that the agony is soon felt over the whole side of the head. The original source of the disorder can only be detected by attentively considering the progress of the complaint in all its stages. (See *Delpech*, *Traité des Maladies reputées Chirurgicales*, *T.* 3, *Sect.* 7, *p.* 214, *&c.*)

Tic douloureux may be known from rheumatism by the paroxysm being excited by the slightest touch, by the shortness of its duration, and the extreme violence of the pain. In acute rheumatism, also, there is fever, with redness, heat, and generally some degree of swelling; and, in chronic rheumatism, the pain is obtuse, long continued, and often increased at night; none of which symptoms characterize tic douloureux.

It may easily be distinguished from hemicrania by the pain exactly following the course of the branches of the affected nerve.

It is known from the toothach by the comparative shortness of the paroxysms; the quickness of their succession; the intervals of entire ease; the darting of the pain in the track of the particular nerve affected; the more superficial and lancinating kind of pain; and the convulsive twitchings, which sometimes accompany the complaint.

The causes of tic douloureux may be said to be in general unknown; but, there are a few instances recorded, which appear to be the consequence of external violence, wounds, contusions, &c. It is mentioned in one of the journals, that distant irritations, especially of the splanchnic nerves, often produce this disease, and that Sir H. Halford has met with cases, where the discharge of portions of diseased bone, even from a distant part, has cured the complaint. (*Med. Chir. Review*, *No.* 9, *Vol.* 3.) The difficulty of placing implicit reliance on such observations depends on the fact, that disorders frequently exist together in different parts, without having any kind of connexion with each other, and terminate quite as independently.

A modern writer has related a very curious instance of a resembling disease in the arm, where the affection proceeded from the lodgment of a small bit of bullet in the radial nerve. (*Denmark, in Med. Chir. Trans. Vol.* 4, *p.* 48.) Dr. Parry attributed the pain to increased vascularity, or determination of blood,(perhaps amounting to inflammation) to the neurilema, or vascular membranous envelope of the nerves affected. (*Elements of Pathology and Therapeutics.*)

Sir A. Cooper states, however, in his lectures, that the nerves in this disease are certainly not in an inflamed state; for they are found of their natural colour, and rather diminished, than enlarged. The latter fact was ascertained in a dissection made by Mr. Thomas. An occasional thickening of the nerve is mentioned by Larrey, Delpech, &c. but whether from conjecture, or actual observation, I am uncertain.

Stimulating embrocations, blisters, caustic issues, fomentations, leeches, frictions with mercurial ointment, (*Edinb. Med. and Surg. Journ. Vol.* 3,) electricity, opium in large doses, the arsenical solution, and a variety of antispasmodic medicines, are the principal means, which have been tried; but for the most part, they only afford partial and temporary relief. Lasserre has reported two cases, which were cured by bark, joined with opium and sulphuric ether; and two other examples, which yielded to pills, composed of the extract of hyoscyamus, valerian, and peroxide of zinc. (*Journ. Univ. des Sciences Med. No.* 64. *Art.*14.) Belladonna has often been tried, and often failed. Two cases in which it answered in doses of two grains, and two grains and a half, were lately published by Mr. Thompson of Whitehaven. (See *Lond. Med. Repository for July*, 1822.) M. Piedagnel, cured a neuralgia of the infra-orbitary nerve, with the sulphate of quinine, ten grains of which were blended with equal portions of orange flower water and syrup, and taken in four doses, the medicine being continued afterwards in weaker doses for a short time. M. Dupré has also published various observations, representing the sulphate of quinine as a very powerful remedy for neuralgia in its various forms. The testimony of Dr. Rabey is also in favour of its exhibition, and his opinion is backed by two cases in which he tried the medicine with success. (See *Magendie's Journ. de Physiol. April*, 1822, *&c.*) A violent example of frontal neuralgia yielded to pills, containing in each $\frac{1}{6}$ of a gr. of arsenious acid, made up with soap. This case was the consequence of an injury of the os frontis opsis. (*Journ. Complem. du Dict. des Sciences Med. No.* 48.) From some facts, published by Dr. Marcet, the extract of stramonium, in doses of $\frac{1}{8}$ and $\frac{1}{2}$ a grain thrice a day, seems to be sometimes capable of alleviating the distressing agony of the present disorder. (See *Med. Chir. Trans. Vol.* 7, *p.* 75, *&c. also Kirby's Cases*, 8*vo. Lond.* 1819.)

In 1820, Mr. B. Hutchinson published some cases tending to prove, that the carbonate of iron, in doses of ℈ij. or ʒj. two or three times a day, is often an excellent remedy for tic douloureux. In fact if the sulphate of quinine be excepted, this medicine at present possesses more reputation than any other, for its virtues in this complaint. It is also highly commended by Sir A. Cooper in his lectures. Yet, for the following reasons, a shrewd critic views all this praise with distrust: in all the cases, he says, the iron was taken in doses of ʒj. three times a day, for months. Two months, indeed, often elapsed before the pain, &c. were more than slightly relieved. This, he observes, is in itself almost a proof of the medicine being very inert; but, when we find, that Mr. Hutchinson conjoins other treatment; that he takes off inflammatory action; that he attends to the abdominal functions, and to the diet, and forbids mercurials, purgatives, and all medicines likely to debilitate the nervous system, we may be allowed to doubt the sole efficacy of the iron in curing these cases. Sure we are, that the majority of cases would yield in less time to the plans recommended by Mr. Abernethy for restoring the health, joined with local treatment, calculated to relieve the inflammation, which, in most cases, he says, probably affects the nerves themselves. (See *Med. Intelligencer for* 1822, *p.* 472.) The latter conjecture, however, is rather repugnant to what is now commonly believed.

The strongest fact, in proof of the real efficacy of the carbonate of iron, is mentioned by Dr. Crawford: a severe case was benefited soon after its exhibition; but by mistake, the carbonate of potass was then given for a few days, during which time, the spasms returned with their usual violence and frequency: but when the iron was given again, the good effects formerly experienced from it returned. (See *Med. and Phys. Journ. for Feb.* 1823.)

The operation of dividing the trunk of the affected nerve, and even of dissecting out a portion of it, so as to prevent all chance of a relapse from the re-union of the ends of the nerve, is a plan, which has sometimes been practised with permanent benefit. Thus, any one of the three branches of the fifth pair of nerves may be divided at the point, where it comes out upon the face. But, before having recourse to this means, the surgeon should be sure that the particular nerve, which he is about to expose and divide, is really the principal seat of the disease; for, when all the nerves of the face generally are affected, or when the branches of the portio dura are especially concerned, there is little hope of success. In fact, it must be confessed, that the operation has had many failures and relapses, either from the cases not having been duly discriminated, or from the neglect to remove a portion of the exposed nerve. Richerand, Delpech, and most of the leading surgeons in France express their preference to the application of the moxa, or cautery, which, they say, proves more frequently successful, than the knife. This should be done directly over the apertures, from which the nerves emerge on the forehead, cheek, or chin; and Richerand asserts, that by such treatment, the pains may always be cured, or at all events rendered supportable.—(*Nosogr. Chir. T.* 2, *p.* 218, *Edit.* 4.) Delpech also affirms that the section of the nerve very often fails, and that issues, and the repeated use of the cautery have been attended with the greatest success. (See *Précis des Mal. Chir. T.* 3, *p.* 213.) The disfigurement of the countenance by burning applications must, however, be very objectionable, and, as I think there is no positive evidence of the superiority of this method over the use of the knife, I consider what Richerand and Delpech have stated only as another instance of the extreme partiality of the French surgeons to the moxa and cauterization. Delpech confesses, however, that, when the pains seem to be the consequence of a ganglion, or thickening of a part of a nerve, the excision of such part is indispensable. There can be little doubt, that this would have been more proper, than amputation, in Mr. Denmark's case, to which I have already referred. The theories of Dr. Parry, senior, who was generally inclined to refer the effects of disease to increased determination of blood to the parts affected, led him to believe, that the operation of cutting the nerve, as performed by Dr. Haighton and others, did good rather by the division of the arterial branch supplying the affected ramification of the trigeminus nerve, than by the division of that ramification itself. (*Parry, Elements of Pathology, &c.*)

There have been many examples of tic douloureux, which, after resisting all attempts to cure them, have been left to themselves, and, after a long time spontaneously subsided. (*Delpech, Traité des Maladies Chir. T.* 3, *p.* 212, 215.)

This author has seen the operation of dividing the chief branches of the portio dura, in front of the parotid gland, undertaken, and even a portion of the soft parts cut away; but without any favourable consequences. (*P.* 218.)

When the infra-orbitary nerve is to be divided, Sir A. Cooper recommends it to be done a quarter of an inch below the orbit. The supra-orbitary nerve should be cut through just where it passes out of the supra-orbitary foramen. An instance, in which this measure produced an immediate alteration in the seat of the pain, may be read in the 8th No. of the Quarterly Journ. of Foreign Med. but the cure was not complete, till the integuments had been divided from the root of the nose to the temple. The method of dividing the inferior maxillary nerve, advised by the same surgeon, is to cut down to the foramen mentale on the inside of the lip, directly under the bicuspid tooth. By the division of this nerve, M. Bouillard effectually cured one very severe case. (See *Lond. Med. Repository, No.* 79.)

I have already stated, that the nerves of the extremities are subject to affections very analogous to tic douloureux. The following instance related by Mr. Abernethy will be found interesting:—

A lady became gradually affected with a painful state of the integuments under, and adjoining to, the inner edge of the nail of the ring-finger of the left hand. No injury to the part was remembered, which could have brought on this disease. The pain occurred at irregular intervals, and was extremely severe during the time of its continuance, which was for a day or two, when it usually abated. Accidental slight injuries always produced great pain, and frequently brought on the paroxysms, which however occasionally occurred spontaneously, or without any evident exciting cause. In all these particulars, the disease correctly resembled tic douloureux. As the pain increased, the disorder seemed to extend up the nerves of the arm. After the patient had endured this painful affliction for seven years, she submitted to have the skin, which was the original seat of the disorder, burnt with caustic. This application gave her intense pain, and, on the healing of the wound, she found her sufferings rather augmented, than diminished, by the experiment. After four more years of suffering, she consulted Mr. Abernethy, when the circumstances of the case were such as to render an operation indispensably necessary. The pain of the part was intolerable, and it extended all up the nerves of the arm; and this general pain was so constant during the night, as to deprive the patient of rest. The muscles of the back of the neck were occasionally affected with spasms. The integuments of the affected arm were much hotter than those of the opposite arm, and sometimes the temperature was so increased as to cause a burning sensation in them. Under these circumstances, Mr. Abernethy did not hesitate to divide the nerve of the finger, from which all this disorder seemed to originate. He laid it bare by a longitudinal incision of about three quarters of an inch in length, from the second joint of the finger, and divided it opposite to that joint, by a curved sharp-pointed bistoury, which was conveyed under it. He then took hold of the nerve with a pair of forceps, and reflecting it downwards, removed a portion of it, half an inch in length, so that the possibility of a quick reunion might be prevented. The wound was brought together with sticking plaster, and it united by adhesion; but the upper part of the wound, opposite to the upper end of the nerves became slightly inflamed, and was very painful. However, in the course of three weeks, the appearance of inflammation gradually went off. After the operation, Mr. Abernethy pinched the originally affected integuments sharply with his nails, without causing any sensation; but if, in so doing, he moved the finger, then pain was felt.

The result was, that nine months after the operation, the general pains in the nerves had become very trivial; but the sensation in the integuments at the end of the finger had gradually increased, and the skin had now its natural sensibility, so as accurately to distinguish the tangible properties of any body applied to it. If also the originally affected part was slightly compressed, painful sensations resembling those which formerly occurred took place. (*Abernethy's Surgical Works, Vol.* 2, *p.* 203.) In a case resembling the former, but the consequence of a wound of the finger, Mr. Lawrence also cut down to the nerve and removed a portion of it, with permanent success. In a case of severe pain in the thumb, extending up the arm to the neck, and causing a distortion of the neck, fits, &c., Sir A. Cooper cut down upon the radial nerve, by the side of the flexor carpi radialis longus, and cut out about five-eighths of an inch of it. The result was a complete cure. (*Lancet, Vol.* 3, *p.* 113.) *Fothergill's Paper in vol.* 5 *of the Medical Obs. and Inq. Dr. Haighton's Obs. in the Med. Records and Researches. Darwin's Zoonomia. Abernethy's Surg. Works, Vol.* 2, *p.* 203, *&c. Richerand, Nosogr. Chir. T.* 2, *p.* 216, *&c. Edit.* 4. *Delpech, Précis des Maladies Chir. T.* 3, *p.* 206, *&c. Dr. S. Fothergill's Systematic Account of Tic Douloureux*, 1804. *Med. Chir. Trans. Vol.* 4, *p.* 48, *Vol.* 7, *p.* 575, *&c. Kirby's Cases*, 8vo. *Lond.* 1819. *B. Hutchinson, Cases of Tic Douloureux*, 8vo. 1820. *Also 2d Edit.* 1822. *Richmond in Lond. Med. Phys. Journ. Sept.* 1821: *a case in favour of carbonate of iron. Wadell, in Edinb. Med. Journ. No.* 32: case to the same purport. *Lizars, in same work No.* 69, *Carter's Case in Med. Repository, No.* 89. *L. D. Yeate's Review of a severe case of Neuralgia*, &c. *with observations*; 1822. *Dr. Stewart Crawford, in Med. and Phys. Journ. Feb.* 1823. Also *A. T. Thomson in the same No. and additional cases by various other practitioners in the Nos. for April, June, and Sept.* 1823. *A. Wilson, in Ed. Med. Journ. No.* 75, *a case cured by purgatives, followed by bark, after the carbonate of iron and liq. arsenicalis had failed. H. Jeffries, Neuralgia of the Median Nerve*, after a burn on the thumb, cured by carbonate of iron. See *Med. and Phys. Jour. May*, 1823. *T. Taylor in Edinb. Med. Journ. No.* 76. *carbonate of soda, hemlock, and the prussic acid prescribed with success.*

TINCTURA FERRI MURIATIS has sometimes been exhibited in gleets; but a more important use has been assigned it by Mr. Cline, who orders it in dysuria from *stricture*, in the dose of ten drops, every twenty or thirty minutes, until nausea is excited. Where chalybeates are indicated, this preparation is one very much approved of.

"Mr. Justamond's liquid for external use in cancers, and which the original inventor called his *panacea anticancerosa*, partook considerably of the nature of this tincture, which, indeed, with an equal quantity of spirit of wine, was sometimes substituted for it.

"Lastly, it is remarkably efficacious in destroying venereal or other warts, either used alone, or diluted with a small proportion of water." (*Pharm. Chir.*)

Tinctura Iodinæ. Take of Alcohol 7 dr. 52 gr. troy: Iodine gr. 39. 36 troy; dose, 10 drops three times a day in a little sweetened water: used in bronchocele and cases of scrophula. (See also Iodine and *Magendie's Formulary, 2d Edit. translated, p.* 35.)

TINCTURA LYTTÆ, vel *Cantharidis.* Sometimes employed in cases of gleets, and incontinence of urine, arising from a want of proper action in the sphincter vesicæ muscle. The usual dose is from ten to forty drops, twice or thrice a day; but its effects should be carefully watched; for, it is apt to occasion dangerous inflammations of the urinary organs, violent stranguries and retention of urine. It is occasionally used in various liniments, when the object is to stimulate the skin considerably, and rouse the action of the nerves and absorbents, as in certain cases of ptosis, paralysis, &c. Mr. Anthony Todd Thomson has found it an useful application in the mortification of the extremities, sometimes happening without any apparent cause; and also to frost-bitten parts. (*London Dispensatory, p.* 658, *Ed.* 2.)

TINCTURA THEBAICA. (See *Vinum Opii.*)

TINEA CAPITIS. (See *Porrigo.*)

TOBACCO is used for promoting the reduction of strangulated hernia, either in the form of a fluid clyster, or of smoke, which latter is introduced up the rectum by means of an apparatus. Excepting the operation, the power of tobacco, particularly when assisted by the topical application of cold to the tumor, is most to be depended upon for bringing about the return of the protruded viscera. (See *Hernia,* and *Enema.*) Tobacco clysters have also been tried with advantage in traumatic tetanus. (*O'Beirne in Dublin Hospital Reports*); and Mr. Earle has found tobacco clysters very efficacious in certain cases of retention of urine. (See *Tetanus,* and *Urine, Retention of.*) Consult *T. Fowler, Medical Reports of the Effects of Tobacco,* 8*vo. Lond.* 1785. *A. P. Wilson, An Experimental Essay on the manner in which Opium and Tobacco act on the living animal Body,* 8*vo. Edinb.* 1795. *R. Hamilton, De Nicotianæ Viribus in Medicina, &c.* 8*vo. Edinb.* 1780.

TONGUE, DISEASES OF. This part is subject to various diseases, as ulcers, tumors, and such enlargements as sometimes cause imminent danger of suffocation.

It is correctly noticed by Mr. Earle, that, when any morbid action is set up in the tongue, many things contribute to maintain it. "The extreme mobility of that organ, the almost continual use of it in eating, drinking, and speaking, the contact of the teeth, which are often irregular and decayed, are quite sufficient to interrupt any efforts to restore a healthy action. It often happens, too, that the part is so very tender, that the patient cannot bear to cleanse the mouth and teeth, which soon become incrusted, and, from this source alone, the complaint will be greatly aggravated, and the discharge rendered fetid and irritating." (*Med. Chir. Trans. Vol.* 12, *p.* 283.) The matter, with which the teeth become incrusted in these cases, is composed of phosphate of lime and mucus, and in the case recorded by Paletta, to which I shall presently refer, the quantity of it was very considerable.

Carious teeth, with points and inequalities, producing continual irritation, are the most frequent cause of ulcerations of the tongue. The sores, thus arising, often resist every kind of remedy, and ignorance of the cause sometimes leads the practitioner to consider them as irremediable; whereas, a cure may easily be effected by extracting the carious tooth, or simply filing off its sharp irregularities, as was anciently directed by Celsus.

The glandular papillæ, situated on the dorsum of the tongue, have a narrow base, and a broad termination or head, like a mushroom. They are capable of becoming considerably enlarged, so as to form preternatural tumors, which may be mistaken for cancerous excrescences.

A young man, eighteen years of age, had on the middle of his tongue a circumscribed tumor, about as large as a middle-sized nutmeg. Louis, who was consulted, perceived that the swelling was only of a fungous nature, and he tied its base with a ligature, with the noose of which he contracted the diameter of the pedicle, while, with the ends, he kept down the tongue. Then, with one stroke of a pair of curved scissars, he cut off the tubercle. Caustic was afterwards applied to the base of the tumor, and the patient was perfectly well in five or six days. (*Sur les Maladies de la Langue, in Mém. de l'Acad. de Chir. T.* 5.) Similar tubercles are mentioned by Morgagni.

A peculiar disease of the tongue was met with in a boy by Mr. Earle. "Clusters of very minute semitransparent vesicles pervaded the whole thickness of the tongue, occupying nearly one half, and projecting considerably both above and below that organ. The slightest injury caused them to bleed profusely, and, in some places, the clusters were separated by deep clefts, which discharged a fetid irritating sanies. This disease, which had resisted various plans of treatment both local and constitutional, gradually yielded to a strict attention to perfect quiet, and cleanliness, combined with large doses of hyoscyamus, which was increased to ʒj of the extract daily." (*Med. Chir. Trans. Vol.* 12, *p.* 285.)

The same medicine, he says, he has employed with most unequivocal good effect in many cases of ragged, irritable ulcers of the tongue.

The tongue is occasionally affected with a true cancerous disease; one of the most afflicting cases, indeed, which can possibly happen, as may be conceived, when it is known, that, in the advanced stage of the disease, the patient can hardly take his food, which must be conveyed over the tongue by some means, or another, before it can be swallowed, while he is obliged to write whatever he wishes to say. (See

Home's Pract. Obs. on Cancer, p. 112.) Cancer of the tongue seems to differ from other carcinomatous affections in frequently occurring in youngish subjects. In the course of the disease, the glands behind the jaw and in the neck are sometimes affected. Louis saw a lady, who had an ulcerated cancerous tubercle on the left edge of the tongue. The little swelling was circumscribed; its size did not exceed that of a filbert; the pains were lancinating; the sore had penetrated deeply; and its tuberculated edges were affected with a scirrhous hardness. Extirpation of the disease seemed to present the only chance of cure; but the patient refused to accede to any thing but palliative plans, and she died in the course of a few months.

Forestus makes mention of four women, who were attacked with cancer of their tongues, and died from the ravages of the disease, and hemorrhage. In the writings of Hildanus, there is a description of the origin and progress of a cancerous tubercle on a young man's tongue, whose breath was intolerably fetid, and who died in the most excruciating pain. The same author informs us of another case, exhibiting the good effects of sedative remedies in palliating a cancerous ulcer of the tongue, and the fatal consequences of an opposite line of conduct. In authors, many other examples, of the same kind, are to be met with.

Surgery, however, is not destitute of resources against diseases of so formidable a nature. The following case exemplifies the benefit which may be effected by this useful profession, when not exercised by men of too timorous a character.

An elderly woman had an ulcerated hardness on her tongue. It had been several times cut away, and as repeatedly returned. Ruysch was called into consultation with one of the surgeons, who was attending the patient, and who had already extended his incisions very deeply for the removal of the disease. The result of their deliberations was another attempt to extirpate the tumor, and they also determined that after it had been cut away, the actual cautery should be freely applied, with a view of destroying the roots of the fungus. The patient consented to the plan, and bore the operations with great fortitude. The tongue was taken hold of with a cloth, and Pierre Le Memnonite, a surgeon of eminence, removed the disease with a curved bistoury. The inside of the mouth was then protected with wet cloths, and the actual cautery applied several times to the wound in the tongue. The pain was appeased, and the separation of the eschar promoted by emollient gargles. Under the use of a gargle of honey of roses, and the tincture of myrrh and aloes, the place soon healed.

It is much easier to cut off a portion of the tongue, through all its diameter, than to remove a cancerous ulceration, situated at one of its edges. In both cases, there is a good deal of difficulty in fixing the part, for it is so very moveable, that it is not easy to keep it in a steady position. For this purpose, Louis recommended the employment of forceps, with blades terminating in hook-like extremities. With this instrument, the part of the tongue to be amputated can be kept from slipping away.

However, very malignant ulcers on the tongue have sometimes been cured by milder means. Sores of this description are reported to have yielded to the repeated application of leeches under the tongue, after a vast number of other remedies had been tried in vain. In the *Encyclopédie Méthodique, art. Langue,* there is an account of a very alarming affection of the tongue, (reputed to be cancerous, though this may be doubted,) which got completely well under a very simple plan of treatment. A woman, thirty-five years of age, subject to cutaneous diseases, and ill-conditioned ulcers, complained, for seven or eight months, of little swellings, accompanied with heat and pain, which made their appearance on the edge, and towards the apex, of the tongue. At length, the part affected began to swell, grow hard, and cause lancinating pains. Its surface became irregular and rough; and all the side of the tongue was considerably swelled. The patient could not put her tongue out of her mouth, nor swallow any thing except liquids; and her breath was intolerably fetid. Various sedative remedies had been employed without success. Cicuta had been used as a topical application; it had been exhibited internally in large doses; the patient had taken for a long while, the oxymuriate of mercury; but nothing proved of any avail. At length, the patient was so tired of trying the effect of medicines and applications, that she gave them up entirely; and contented herself with trying the experiment of keeping some honey continually in her mouth. As this method seemed to give her some ease, she was prevailed upon to persist in it, and, in this way, the pains were gradually appeased; the swelling was diminished, and, at the end of two or three months, the woman was quite well, except that an indurated cicatrix remained on the part affected, and considerably obstructed the extension of the tongue on that side.

On this case, however, it might be remarked, the retardation of the cure seems also ascribable to the injury of the health produced by the hemlock, mercury, &c. and that the amendment, following their discontinuance, might rather arise from the consequent improvement of the patient's health, than from any effect of the honey.

Some inveterate diseases of the tongue may be cured by hemlock. In the work last cited, is mentioned an instance of a very unhealthy-looking ulcer, near the apex of the tongue, attended with a considerable thickening of the part, and of some duration, which was cured by giving large doses of cicuta. But, of all the medicines which have the greatest reputation for their beneficial effects upon malignant ulcers of the lip and tongue, none perhaps is deserving of so much confidence, as arsenic. (See *C. Lane's case of ill-conditioned Ulcer of the Tongue, successfully treated by arsenic; Med. Chir. Trans. Vol.* 8, *p.* 201.) Mr. Earle's report of the favourable effects of hyoscyamus, I have already noticed: he speaks also in praise of the pulp of carrots, retained on the ulcer, and frequently changed. (*Op. cit. Vol.* 12, *p.* 286.)

However, notwithstanding many facts of this kind on record, medicines should not be tried too long, that is to say, so as to let the disease attain a condition, in which it will no longer admit of being cut away. When the disease makes progress, the knife should be employed, before it is too late.

When any part of the tongue is to be amputated, authors very properly recommend the chief vessels to be tied, if possible; but when this cannot be accomplished, they advise the employment of astringent gargles, such as a strong solution of alum, distilled vinegar, or diluted sulphuric acid. When these methods fail, the continental surgeons recommend the actual cautery as the only resource. Where only a piece of the tongue is cut out, in the shape of the letter V, the best mode of stopping the bleeding is to bring the sides of the incision together with a suture, by which means, the deformity will also be lessened, and the union expedited, as is exemplified, in a case recorded by Langenbeck. (*Neue Bibl. B.* 2, *p.* 489.) Rather than suffer a patient to die of hemorrhage, if the cautery and other means fail, the lingual artery should be taken up where it passes over the cornu of the os hyoides. Diseased portions of the tongue admit of removal with the ligature. (*La Motte, Chirurgie, Obs.* 208; *Godart, in Journ. de Med. T.* 13, *p.* 66; *Sir E. Home, Pract. Obs. on Cancer, p.* 207; *Inglis, in Edinb. Med. and Surgical Journ.* 1803, *No.* 1, *p.* 34.) Sir E. Home generally passed a double ligature through the centre of the tongue, behind the diseased portion, and then tied the threads tightly over each half of the organ, so as to make all the part in front of the constriction slough away.

The whole of the tongue sometimes inflames, and becomes considerably enlarged, either spontaneously, and without any apparent cause, or in consequence of some other disease; or else from some particular irritation, such as that of mercury, or some poisonous substance. Slegel, who was at Paris about the middle of the 17th century, saw a patient in a salivation, whose tongue became so enormously enlarged, that the mouth could not contain it. Pimprenelle, an eminent surgeon of that time, was sent for, and finding that all trials to relieve the affection were in vain, amputated one half of the tongue, with the view of preventing its mortification. After the wound had healed, it is said, the patient could articulate very well. Louis, from whom this fact is quoted, justly remarks, that the measure resorted to by Pimprenelle was an exceedingly violent one; for he has often seen urgent symptoms occasioned, during a salivation, by a rapid and enormous swelling of the tongue, very quickly yield to bleedings, purgative glysters, change of air, and leaving off mercury. Two or three facts, confirming this statement, have fallen under my own notice.

Trincavellius mentions two women, who had considerable enlargements of their tongues. One of these patients, who was young, had been rubbed with mercurial ointment even on her head; and in the other, who was about fifty years old, the complaint arose from the small-pox. The excessive swelling of the tongue, in both these instances, terminated in resolution. Another case of ulceration, enlargement, and protrusion of the tongue, is recorded by Paletta, who recommended the reduction of the part into the mouth, keeping the jaw closed with a bandage, and the frequent use of vinegar and alum gargles. The result is not stated. (See *Journ. of Foreign Med. No.* 19, *p.* 457.)

When the urgency is such, that an immediate diminution of the swelling becomes necessary for the relief of the symptoms, the plan of making one or two deep incisions along the tongue is strongly recommended. See the cases inserted by De la Malle, in the 5th vol. 4to. of the *Mem. de l'Acad. Chirurgie*, and some others, related by Louis in the paper above cited.

A man, recovering from a bad fever, was suddenly attacked with a pain in his tongue, followed by a swelling equally large and rapid in its formation. In less than five hours, the part became thrice as large as it is in its natural state, and, in this space of time, De la Malle, who had been consulted, bled the patient successively in his arm, neck, and foot. The man felt very acute pain; his skin was excessively hot; his face was swelled; his pulse was hard and contracted; and his look wild. He could hardly breathe; the tongue filled all the cavity of the mouth, and protruded out between the lips. In this very urgent case, the mouth was kept a little more open than the swelling of the tongue actually caused it to be, and three parallel incisions were made along this organ, one along its middle, and the other two between the one in the centre and the edges of the part affected. The cuts extended through two-thirds of the preternatural swelling, and had all the good effect which could possibly be desired. There was a great deal of hemorrhage, and the enlargement of the tongue subsided so much, that, an hour after the operation, the patient was able to speak. The next day, the incisions had the appearance of being only superficial scarifications, and the tongue was in its natural state. In short, the incisions healed in a few days, with the use of a simple gargle.

De la Malle quotes several other cases, all of which exhibit the success, which he met with from this practice in other similar cases. He quotes also the testimony of authors, antecedent to him, who have recommended the method; and in particular, he cites Job à Meckren, who adopted this practice, in a case, where the tongue, together with the tonsils and palate, became spontaneously affected with a sudden and dangerous degree of swelling. This treatment is found to answer by modern practitioners. (See *Journ. Universel, &c. June*, 1823.)

From the preceding observations, it may be concluded that making incisions in the tongue would have saved numerous patients, who have been suffocated, in consequence of enormous enlargements of this organ. In the small-pox, the tongue sometimes becomes immensely swelled; and, it is more than probable, that, in many instances, the employment of the above method would have afforded great relief to patients, whom the disease has been known to have entirely bereaved of the power of swallowing. It is a curious fact, that after the loss of very considerable portions, or, even what may be called, the whole tongue, patients often recover the power of speech, mastication, and deglutition. (*Louis in Mém. de l'Acad. de Chir. T.* 5; also, *J. Rowland, Aglossostomographie, ou Déscription d'une Bouche sans langue, laquelle parle, et fait naturellement toutes ses autres fonctions.*

12mo. Saumur, 1630. *Louis, sur les Maladies de la Langue, Mémoires de l'Acad. de Chir. T.* 5; *also the memoir of De la Malle in the same volume. Encyclopédie Méthodique, Partie Chir. art. Langue. Sir Everard Home's Pract. Obs. on Cancer, 8vo. Lond.* 1805. *Langenbeck, Neue Bibl. B.* 2, *p.* 487, *8vo. Hanover*, 1820. *C. Lane and H. Earle, in Med. Chir. Trans. Vols.* 8 *and* 12.)

TONSILS. The tonsils, like all other parts at the back of the mouth, are subject to different kinds of swelling, which vary as much in their nature as their consequences. Some are rapid in their progress, and these are frequently observed to affect persons of, what is termed, a sanguineous temperament. They are also prone to attack young people, and such as labour hard, and they have all the essential characters of inflammation.

Other swellings of the tonsils are slower in their progress, occur in damp cold weather, and in indolent, and, what the old physicians used to call, phlegmatic constitutions.

Lastly, another kind of enlargement of the tonsils, which is usually contagious, readily falls into a sloughing, gangrenous state, sometimes extends to the neighbouring parts, and too often proves fatal. Hence, the various species of angina have been named by some writers inflammatory, catarrhal, and gangrenous. The two first kinds frequently terminate in resolution; but, sometimes, the affected tonsils afterwards assume a scirrhous hardness, obstruct respiration and deglutition, so that it becomes indispensably necessary, either to extirpate the diseased parts with the ligature or knife.

The cutting away of enlarged tonsils was performed by the ancients, and in different ways. Sometimes, they tore with their fingers the membrane covering the tonsil, and then pulled this part out of the situation, which it occupies between the pillars of the velum pendulum palati. In other instances, in which they experienced too much resistance, they seized the diseased tonsil with a kind of hook, and then cut it away with a bistoury, which, Paulus Ægineta informs us, was concave on the side towards the tongue.

The moderns, who, for a long while, were timid in the employment of both these methods, adopted plans of a more cruel description. The actual cautery was proposed, and some partial success, which followed its use, at once established its reputation. Caustics were afterwards employed, instead of actual fire; but, the inconvenience of not being able to limit their action, and the hazard of their falling down the œsophagus, soon caused them to be relinquished by all rational practitioners. Then the operation of cutting away the tonsils was revived, and it was performed, sometimes in the manner of the old surgeons, sometimes with various kinds of curved scissars, or knives. Instead of the simple tenaculum used by the ancients, a sort of double one came into fashion.

Bichat describes the following, as once the common plan: the surgeon is to open the mouth very wide, and depress the tongue with any flat instrument, which is to be held by an assistant. The operator is then to take hold of the diseased tonsil with a tenaculum, and with a common scalpel, having the back half of its blade covered with rag, he now removes as much of the tonsil, as ought to be taken away. In common cases, it is deemed sufficient to cut on a level with the pillars of the velum pendulum palati. Any other portion, needing removal, should next be taken away. The operation being finished, the patient is frequently to wash his mouth with proper gargles.

The preceding method was long adopted by Desault. However, one objection is urged against it, viz. that, when the end of the knife is conveyed far into the mouth, it may do mischief, not (as has been alleged) to the internal carotid artery, the backward situation of which completely keeps it out of all danger of being wounded, but to the membranous covering of the palate, in a place not corresponding to the tonsils. Desault thought this objection was the more forcible, as when the hook is introduced into the tonsil, the danger of the above mischief is considerably increased by a general spasm, which seems to affect every part of the mouth. Hence, this eminent surgeon used to employ, for the removal of diseased tonsils, an instrument, which was first invented for dividing cysts of the bladder. It consisted of a sharp-edged blade, which was included in a silver sheath. The latter had at its extremity a kind of notch, in which the gland, about to be extirpated, was received. The rest of the instruments were similar to those commonly used. Desault proceeded as follows:

1. The patient being seated on a high chair, with his head supported on an assistant's breast, he is to open his mouth very wide, and the lower jaw is to be kept thus depressed, by some solid body placed between the teeth, and held there by an assistant.

2. The tongue is to be kept down with a broad spatula.

3. The surgeon is next to take hold of the tonsil with a double hook, with which he is to raise and draw it a little towards him. He is then to take the above cystitome, and put the tonsil in the notch, on a level with the place, where the incision is intended to be made.

4. When the portion, which is to be cut off, is engaged in the notch, the operator is to draw the part towards him, so as to stretch it, and press the instrument against it from below upward. The blade being next pushed across the notch, the necessary section is accomplished. When the division is not complete, which is particularly liable to happen, when the diseased gland is of considerable magnitude, the blade is to be drawn back, and the section completed by applying the instrument to the wound, which it has already made. Sometimes, even a third application may possibly become requisite.

5. The patient is to be directed to wash his mouth. Bichat states, that this plan of operating, adopted by Desault, is as simple, and easy as the method above related, with the advantage of being safer. Such is the construction of the blade of the instrument, that when it slides across the notch, it presses against, and steadily fixes the parts, which are to be divided; an advantage which neither the knife nor scissars have, under the action of which the parts are quite moveable. Hence, there is difficulty in cutting them. When the introduction of the instrument from above

downward, is difficult, it is better to withdraw it; and, after turning the notch in the opposite direction, pass it from below upward. In general, however, the first of these methods is preferable, because the gland, when half cut through, cannot now fall back and obstruct the rima glottidis, so as to bring on danger of a sudden suffocation; a circumstance which Wiseman and Moscati saw happen. With the view of preventing this occurrence, Louis recommended the common scalpel to be used, with its edge directed upward, as has been advised for the above instrument; which latter contrivance, however, being, according to Bichat's account, more easy and safe, merits the preference. Besides the advantage of fixing the soft parts, which are to be cut, it has that of not contusing them, like most other instruments of this nature, as, for instance, scissors; and the oblique disposition of its blade enables it to divide parts, in the manner of a saw.

This invention, as Bichat allows, is certainly increasing the number of surgical instruments; a thing, which all the best modern surgeons endeavour to avoid. But, it is to be recollected, that this instrument is not exclusively applicable to any particular operation. It may be employed for cutting away the tonsils and uvula; dividing membranous fræna in the rectum, vagina, and bladder; amputating fungous excrescences, polypi of the nose, (if this mode of extirpating them were preferred) and various tumors in general, which are deeply situated in different cavities of the body, where instruments introduced unguardedly might injure parts which should be avoided, or where the base of the tumor should be steadily fixed, when its division is to be accomplished. The latter object cannot safely be effected by scissars. When the base of the tumor is too large to be received in the notch, one part is first to be divided, and then another, till its whole thickness is cut through.

In England, when a diseased tonsil is to be cut away, surgeons generally prefer a common scalpel.

As a general practice, I consider, that the excision of an enlarged tonsil, is a better practice, than the extirpation of it with a ligature, which also sometimes answers very well, and, perhaps, in children and timid patients may merit the preference. The chief objections to the ligature are, that its operation is rather tedious, sometimes productive of a great deal of irritation, and, on the whole, at least as painful, as the knife.

Moscati having once adopted this plan, very severe pain and inflammation ensued; the difficulty of swallowing and breathing compelled him to amputate the tumor at the place where the ligature was applied, and all the bad symptoms immediately ceased. Besides, when the ligature is used, there is no oozing of blood from the vessels, a circumstance, which tends so much to diminish the inflammation. The base of the swelling is also sometimes broader than its upper part, and does not admit of being properly surrounded with a ligature. And, when it has a narrow base, it can then be so easily removed with a scalpel, or with Desault's instrument, and with so little pain, that one of the last modes is generally preferable.

The ligature, however, has had its advocates. Heister recommends it, in certain cases; Sharp praises it; and others approve its use; while the plans of employing it have been as various as the inventive genius of the different partisans of the practice. Some make use of Levret's double cannula, which is furnished with a silver wire noose, in which the tumor is to be engaged. By twisting the instrument, the diseased part becomes constricted. Some, after putting the noose of a ligature over a kind of tenaculum, take hold of the tonsil, push the ligature over the enlarged gland, which they tie, without having any means of increasing the constriction afterwards. Others employ Belloque's instrument for putting the ligature over the tonsil. Sir A. Cooper, who prefers the ligature to excision, gives to an eye-probe the requisite curve, and then passes the ligature with it behind the enlarged tonsil. The probe being then removed, the knot is made with tonsil-irons, if the fingers are found not long enough for the purpose.

Desault employed an instrument, which the French call *un serre-nœud*, which is in fact, nothing more, than a long, narrow, round piece of silver, terminating at one end in a little ring, or hole, and, at the other, in a kind of groove, or notch.

1. The patient was seated on a high chair, with his head held back, on an assistant's breast; his mouth was opened very wide, his tongue depressed, and the diseased tonsil taken hold of with a double hook.

2. The surgeon took the *serre-nœud*, in which a ligature had been passed, so as to form a noose. The noose was put over the handle of the hook, which was committed to the charge of an assistant, and the noose then pushed over the tonsil, so as to embrace it completely.

3. The surgeon now drew the ligature strongly towards him, and pushed forward the *serre-nœud*, so as to produce the requisite constriction of the tumor. In general, the ligature was not made very tight the first day.

4. When the necessary constriction had been made, the double-hook was withdrawn, and the ligature twisted round the notch, at the outward end of the instrument.

5. The next day, the gland became unusually large, in consequence of the impediment to the return of the venous blood. The ligature was unfastened from the notched end of the instrument, and drawn more out, so as to increase the constriction, after which it was again twisted round the notch. This plan was followed up, till the tumor was detached, which usually happened on the fourth, or fifth day.

The late Mr. Chevalier described a particular mode of passing and securing the ligature. He passed a flat spear-pointed hook behind the diseased tonsil, and its point was then pushed forward, so as to perforate it, through the middle of its base. The needle was then withdrawn, and an eye-probe, very much curved, and, armed with a long double ligature, was then readily passed through the perforation, and brought out at the mouth, the ligature divided, and one portion tied round the upper half of the tonsil, and the other round the lower. "A single knot being first made upon one end of the thread, the end so knotted, is to be brought forward upon the other, and to make a single noose upon itself including the other, and to be drawn tight upon it, close to the first knot. The free end of the thread is then to be passed" through a ring at the end of an instrument for the purpose, and "being then held firm, and the ring pushed forward upon the knot, the loop, now formed, may be readily tightened, so as completely to strangulate the diseased part; and in the same manner, it may be tightened, from day to day, till the part is entirely detached." (See *Med. Chir. Trans. Vol.* 3, *p.* 80, *&c.)* The subject is more intelligible, with the plate.

Sometimes, in cases of angina, the tonsils are suddenly attacked with such a degree of swelling, that respiration is dangerously obstructed. This case is analogous to the occasional enormous inflammatory swelling of the tongue, and, if it resist venesection and leeches, the most prompt mode of relief is that of making several deep scarifications with a knife in the part. Many cases, confirming the good effects of this practice, have been seen by Langenbeck. (See *Neue Bibl. B.* 2, *p.* 492, *&c.*)

TOPHUS. A swelling, which particularly affects a bone, or the periosteum. See *Node.*

TORTICOLLIS. (from *torqueo*, to twist; and *collum*, the neck.) The wry-neck. See *Wry-neck.*

TOURNIQUET. (*French*, from *tourner*, to turn.) An instrument for stopping the flow of blood into a limb, until some requisite operation has been performed, or a more permanent plan of checking hemorrhage has been put in practice.

The old surgeons used to surround the limb with a band, with which they made such a degree of constriction, that the circulation was quite stopped. They also believed, that the pressure of the band was advantageous, in benumbing the limb, and moderating the pain of operations.

The violent pain and contusion, however, which such a tourniquet occasioned, being frequently followed by mortification and abscesses, surgeons found it necessary to devise some other method of checking hemorrhage. The application of the circular band was first improved, so that it caused less pain, and less mischief to the skin. The limb was surrounded with a very thick compress, over which the band was placed. Two small sticks were next put under the band; one on the inside, the other on the outside of the limb; and they were twisted till the band was rendered sufficiently tight. It is in this manner, says Dionis, in his *Traité d'Opérations*, that carriers tighten the cords which fasten the bales of goods in their carts. A French surgeon, named Morel, is said to have made this first improvement in the application of tourniquets.

J. L. Petit, in 1718, presented to the Academy of Sciences a tourniquet of his own invention, which was much more perfect, though certainly very complex, when compared with that which is used by the best modern practitioners; but, still it is the original of the latter, and both are constructed on the same principles. All the pieces of modern tourniquets are kept connected together, and instead of two pieces of wood, used by Petit, there is contrived a brass bridge, which is capable of being elevated, or depressed, by means of a screw made of the same metal. Over this bridge a very strong band proceeds, and by passing under two little rollers, at each end of the bridge, it always remains connected with the instrument. A convex firm pad is sewed to the band, and put immediately over the artery, where the instrument is applied. There are no cushions for the opposite side of the limb under the screw; but a thick piece of leather, through which the band proceeds in two places, is always situated under the lower surface of the brass, and serves to prevent any bad effects of its pressure. It is usual also for the surgeon to fold some rag, and to put it in this situation, at the time of applying the instrument. (See *Hemorrhage.)*

The following are the advantages of the modern tourniquet, formed on the principles of that first invented by Petit: 1. It compresses the lateral parts of the limb less, than the tourniquet previously in use. 2. It requires the aid of no assistant, either to hold, tighten, or loosen it. 3. The operator is able of himself to stop the flow of blood in the artery, by means of the screw. 4. When there is any danger of hemorrhage after an operation, it may be left on the limb, and, in case of bleeding, the patient, if no one be at hand, can tighten the instrument himself, as much as is necessary. 5. Its constriction produces less danger of mortification, because it does not altogether stop the flow of blood through the collateral arteries. The interruption of the circulation in parts of the body by the tourniquet, has been tried as a means of relieving diseases. (See *G. Kellie, Obs. on the Medical Effects of Compression by the Tourniquet*, 8*vo. Edinb.* 1797.)

TRACHEA, Wounds of. See *Throat.*

TRACHEOTOMY. (from τραχεια, the windpipe, and τεμνω, to cut.) The operation of cutting an opening into the windpipe for various surgical purposes. See *Bronchotomy.*

TREPAN. (from τρυπαω, to perforate.) *Trepanum; Terebellum; Modiolus.* A circular saw, by means of which the skull is perforated in the operation called *trepanning*, or a circular portion of any bone may be sawn out. It bears a considerable resemblance to the well-known instrument named a wimble, and is worked in the same manner. Formerly the saw was sometimes made of a conical shape; (see *Abaptiston*) but this construction rendered the action of the instrument difficult. In this country, the trepan is now superseded by the instrument, called a *trephine*, which has a different handle, and is not worked in the same way. On the Continent, however, the trepan still has the preference.

TREPHINE. The instrument now commonly preferred for perforating the cranium, for purposes which I shall presently explain. It consists of a simple cylindrical saw, with a handle placed transversely, like that of a gimlet; and, from the centre of the circle, which the teeth of the saw describe, a sharp little perforator projects, named the centre-pin. The upper part of the centre-pin is made to screw in a corresponding hole at the inside of the top of the saw, and is capable of being taken out, or put in, at the surgeon's option, by means of a little key for the purpose. Its use is to fix the trephine, when it is first applied, that is, before the teeth of the instrument have made a sufficient circular groove, in which they can steadily work. When this has been accomplished, the centre-pin must always be removed; because now it is not only unnecessary, but, if left, would retard the progress of the operation, and inevitably wound the dura mater and brain, when the teeth of the saw had cut to a certain depth through the cranium. My trephines have their centre-pins contrived to slide up, or down, and to be fixed in either position by turning a little screw. This method seems to me both ingenious and convenient.

The cylindrical part of the trephine is often termed the *crown* of the instrument. The surgeon should have at least two, or three cylindrical saws of various sizes; for, it is always a commendable rule, never to saw away any more of the cranium, than is absolutely requisite for the accomplishment of some rational object. There is no occasion, however, for having more than one handle, which may be made to screw on any of the saws.

Trephines are also occasionally applied to other bones, besides those of the cranium. In the articles *Antrum*, *Caries*, *Exostosis*, *Fractures of the Sternum*, *Necrosis*, *Spina Ventosa*, other cases are mentioned, in which the employment of these instruments sometimes becomes proper.

It is not always desirable to remove a complete circular portion of the cranium, the taking away a piece of smaller size, and of a different shape, being frequently much more advantageous. Some surgeons, who object to removing any unnecessary quantity of the cranium, occasionally employ a trephine, terminating only in a semicircular, instead of a circular saw, by which means they can often cut across the base of a depressed portion of the skull, and take it away, without any occasion for removing also a circular piece of bone. An instrument of the latter kind may certainly be sometimes useful.

The saws, however, which Mr. Hey has described, should constantly be kept in every case of trephining instruments. This practical writer remarks, that " the purposes, for which any portion of the cranium is removed, are, to enable the surgeon to extract broken fragments of bone, to elevate what is depressed, and to afford a proper issue to blood or matter that is, or may be, confined, &c.

" When a broken fragment of bone is driven beneath the sound contiguous part of the cranium, it frequently happens that the extraction cannot be executed without removing some of the unbroken part, under which the fragment is depressed. This might generally be effected with very little loss of sound bone, if a narrow portion of that, which lies over the broken fragment, could be removed. But such a portion cannot be removed with the trephine. This instrument can only saw out a circular piece. And as, in executing this, the central pin of the saw must be placed upon the uninjured bone, it is evident, that a portion of the sound bone, greater than half the area of the trephine, must be removed at every operation. When the broken and depressed fragment is large, a repeated application of the trephine is often necessary, and a great destruction of sound bone must be the consequence.

" When the injury consists merely of a fissure with depression, a small enlargement of the fissure would enable the surgeon to introduce the point of the elevator, so as to raise the depressed bone. But a small enlargement of the fissure cannot be made with the trephine. When it is necessary to apply the elevator to different parts of the depressed bone, a great deal of the sound cranium must be removed, where a very narrow aperture would have been sufficient.

" The same reasoning will apply to the case of openings, made for the purpose of giving a discharge to extravasated blood, or matter.

" If a saw could be contrived, which might be worked with safety in a straight, or gently curvilineal direction, it would be a great acquisition to the practical surgeon. Such a saw I can now with confidence recommend, after a trial of twenty years, during which time, I have rarely used the trephine in fractures of the skull. Its use has been adopted by my colleagues at the General Infirmary in Leeds; and will be adopted, I hope, by every surgeon, who has once made trial of it." Mr. Hey next informs us, that the instrument was first shown to him by Dr. Cockell, of Pontefract; but that there is a saw, formed on the same principle, in Scultetus's Armamentarium Chirurgicum. The saws alluded to are very short ones, fixed at the end of a longish straight handle; their edges are made either straight, or semicircular. The latter construction qualifies the instrument for cutting in a curvilineal direction, which is often proper. The edge of the saw should always be made a little thicker than the rest of the blade, by which means it will work in the groove, which is cut, with more facility.

Saws, made on the principle just described, are also of infinite use in cutting away diseased portions of other bones, besides the skull, exostoses, &c. In cases of necrosis, when a dead part of a bone is quite wedged in the substance of the surrounding new bony matter, Mr. Hey's saws may often be advantageously employed for cutting away the parts which mechanically prevent the detachment of the dead pieces. The saws, invented by Mr. Machell and Professor Graefe, are also highly ingenious, and particularly merit attention, when there is very little room for the working of the instrument, and the bone to be cut lies rather deep. They are wheel-like saws, turned by machinery.

Besides trephines of various sizes, and the saws just now noticed, the surgeon should also take care to have in his case of trephining instruments a little brush for occasionally cleansing away the particles of bone from the teeth of the saw, in the progress of the operation; a pair of forceps for extracting the round piece of bone after it has been detached by the saw; a lenticular for removing any inequalities, which may present themselves, round the sawn edge of the cranium, after the circular piece is taken out; a raspatory for the same purpose, and, also, for scraping the bone in order to see whether it will bleed, which is a circumstance in some cases very important to be attended to; (see *Head, Injuries of;*) a largish common scalpel for dividing the scalp, &c.; and some elevators for raising depressed pieces of bone.

The common elevator is now generally used by all the best English surgeons; but several others have been proposed, as, for instance, the tripod elevator; and another invented by J. L. Petit, and afterwards improved by M. Louis.

Before beginning the description of the operation, I think it highly proper to remind the reader, of what has been so forcibly dwelt upon in the article, *Head, Injuries of,*—that, generally, the removal of pressure off the brain, which pressure must also actually occasion dangerous symptoms, can form the only true and vindicable reason for employing the trephine, or sawing away any portion of the skull. There are very few exceptions to this remark: it may, indeed, be now and then proper, to saw away the bony edges, around some fungous excrescences, which grow from the dura mater, and make their way outward, by occasioning an absorption of the part of the skull immediately over them. (See *Dura Mater.*) It may also be sometimes proper to saw out diseased portions of the skull, though, it must be confessed, that in general their separation should be left to time and nature. Loose splinters should always be removed, and, perhaps, if the depressed portion of bone be denuded in a wound of the scalp, a trial to raise it with the elevator will be proper, even though urgent symptoms of pressure may not exist. In such a case, Sir A. Cooper sanctions the application of the trephine; (*Lectures, Vol.* 1, *p.* 343;) but, it is contrary to the principle, which I conceive ought generally here to be our guide.

In the records of surgery, innumerable facts may be consulted, where the prudent and judicious employment of the trepan has effected wonderful cures, and been the only thing by which the patients' lives could possibly have been saved. The benefit, which the operation brings about, is also sometimes so sudden and astonishing, that in no instance does the interposition of the surgical art display itself to greater advantage. The immediate restoration of sight by the depression, or extraction of an opaque substance from the eye, is not more beautiful and striking, than the instantaneous communication of the intellectual faculties, and of the powers of speech, of feeling, &c. together with voluntary motion, to a person lying in an apparently lifeless state from an injury of the head. The utility of the trepan is occasionally manifested even in this degree. In the valuable essay of Mr. Abernethy on injuries of the head, a case may be seen, in which the patient, who had been in a condition almost bereft of animation, rose up and spoke the instant the extravasated blood was removed from the surface of the brain. And amongst the wounded at the battle of Waterloo, there was a soldier of the 44th regiment, whose case is of equal interest. He had been struck by a musket-ball on the right parietal bone, which was exposed, but had no appearance of being fractured. As however the symptoms of compression were urgent, and the patient was in nearly a lifeless state, I conceived it right to apply the trephine to the part on which the violence had acted. I had not sawn long before the external table came away in the hollow of the trephine, leaving the inner table behind, which was not only splintered, but driven at one point more than half an inch into the membranes and substance of the brain. No sooner were the fragments taken out with a pair of forceps, than the man instantly sat up in his bed, looked round, and began to speak with the utmost rationality. It is a most extraordinary fact, that this patient got up and dressed himself the same day, without leave from the medical officers, and never had a bad symptom afterwards. Immediately the operation was finished, the temporal arteries were opened, and some purgative medicines exhibited.

In a case of fungus of the dura mater, with diseased bone, mentioned by Schmucker, the trepan was applied eleven times in less than a month, and the operation used to cause so little indisposition, that the patient hardly ever required to go to bed afterwards, and, on one occasion, actually went to market an hour after its performance. (*Wahrnehmungen, B.* 1, *p.* 456.)

Let not the young surgeon, however, draw from these dazzling cases of success an immoderate solicitude to perform the operation; for, it should never be undertaken but in the most pressing circumstances, and when the symptoms unequivocally show, that a dangerous degree of pressure on the brain exists. I recollect an unfortunate example, in which the late Mr. Ramsden, of St. Bartholomew's Hospital, ventured to saw out a portion of the frontal bone for a mere long continued pain in the part: the patient was attacked with inflammation of the dura mater, and perished in three or four days. We may therefore conclude, that the operation is not itself exempt from danger; and it is certain, that it ought never to be resolved on without deep consideration. "*Gravis tamen satis est operatio, ut nunquam, nisi indicationes sufficientes adsint, institui debet.*" (*Callisen, Syst. Chir. Hodiern. Tom.* 1, *p.* 658.)

In cases of injuries of the head, the trepan, or trephine, is never necessary, except for the purpose of relieving the brain from pressure. Such pressure may be caused by a depressed portion of the cranium, or it may be produced by an extravasation of blood, or the lodgment of matter, betwixt the skull and the dura mater. The chief danger of concussion, when the accident is not directly or soon fatal from the disorganization and mischief done to the brain, depends upon the consequent inflammation of this organ, and therefore can be little likely to be benefited by the use of the trepan. If the operation become proper in such a case, it is when an abscess has formed under the cranium, and when the confined matter itself creates bad symptoms by its pressure on the brain. This state of things, however, cannot come on till after the inflammation of the brain and its membranes has prevailed a certain time, and it is always accompanied with a detachment of the pericranium and a puffy tumor of the scalp; or, if there be a wound of the latter part immediately over the abscess, the lips of the injury suddenly acquire an unfavourable appearance, and lose their vermilion colour. The patient has also had much preceding febrile disorder, pain and tension over the whole head, redness and turgescence of the eyes, and generally more or less delirium. When the matter is forming, there are usually rigors, and, as soon as it is formed, the patient falls into a comatose state, and paralytic symptoms show themselves. Here the urgency for the prompt application of the trephine is very great, and the patient's chance of living is almost essentially connected with the immediate performance of the operation. This important case has been particularly dwelt upon in the writings of Mr. Pott.

In the article, *Head, Injuries of,* I have laid down the most remarkable symptoms of concussion, and compression of the brain, a subject, which every surgeon should study with earnest attention, before he ever presumes to employ the trepan. For, sometimes these accidents are extremely difficult to be discriminated; sometimes they exist together in the same individual; a complication which is peculiarly embarrassing; and, in every instance, where the symptoms are those of concussion, the operation, so far from being indicated, would be a step of all others the most likely to do harm, by increasing the irritation and inflammation of the brain and its membranes. A fall upon the back, or upon the head, occasions a direct concussion of the brain, and the shock, not being materially weakened by the intervention of any yielding elastic structure, is the more dangerous. When a person has fallen from a certain height, and pitched on his head, his back, the buttocks, the knees, or even the soles of the feet; when he has been instantly deprived of his senses, and then by degrees recovered them and come to himself again; the fact of his having suffered concussion of the brain is clear and indisputable. Concussion has likewise taken place, though in a slighter degree, when the patient has been only stunned by the fall, and experienced a sensation of sparks. But, a multitude of degrees separate this feeble concussion from that, in which the substance of the brain is instantaneously disorganized, so that there is not the possibility of recovery.

The symptoms of concussion of the brain are attended with coma, and the compression of this organ by an extravasation is also accompanied with lethargic heaviness. How then is the surgeon to ascertain, whether the comatose disorder arises from one or the other of these affections?

Here, in order to avoid repetitions, I beg leave to refer to the observations already made in the above-mentioned article. But there is one criterion of such importance, that it may prevent innumerable fatal mistakes, and, indeed, without the continual recollection of it no man ought to interfere with this dark and abstruse part of surgery. On this account, I shall mention it here, notwithstanding it has been already noticed elsewhere. If the patient is knocked down and stunned directly by the blow, and remains in a state of insensibility, these primary symptoms are ascribable to the concussion. On the contrary, when the coma and loss of sense do not take place till an hour or two after the blow, they are to be imputed to an extravasation.

The shock given to the brain by concussion must, like every other impulse communicated, continue to diminish, until it ceases altogether. If, at the very time of the blow, the shock has not been forcible enough to produce alarming symptoms, such symptoms will not afterwards come on when their cause is weakened. Hence, the reason why compression can be distinguished from concussion of the brain, when there has been an interval of sense between the receipt of the blow, and the occurrence of the bad symptoms. But, the distinction of the symptoms into primary and consecutive cannot be made when concussion and extravasation exist together.

Having made these few remarks on concussion and compression of the brain, remarks, which seemed necessary before I entered into a description of the operation of the trepan, I shall next premise some observations relative to contusions and fractures of the skull, cases on which the most erroneous opinions have been entertained. It is true, that I have in another place (see *Head, Injuries of,)* considered the subject; but, it may be better to recapitulate certain points here, because they have such immediate connexion with the application of the trephine.

Contusions of the head not unfrequently occasion a small kind of tumor, which is soft in the centre, but hard and resisting at the circumference, especially when the violence has been considerable. Now the ease, with which the centre or seat of the extravasated fluid admits of being depressed, while the circumference remains hard and elevated, is extremely apt to give rise to the belief, that a fracture with depression has happened. The true nature of this accident was first clearly explained by J. L. Petit, and since his time the proper cautions not to fall into a mistake concerning it, have been laid down by the generality of surgical writers.

Often nothing is more obscure, than the diagnosis of fractures of the cranium: their existence indeed can only be made out with certainty, when they can be felt, or seen. Thus a fracture of the skull, attended with a wound of the scalp, and exposure of the bone, shows itself in the form of a fissure more or less wide and extensive, and taking various directions. The accident may also be known by the touch even when the soft parts continue entire, particularly if the fracture is accompanied with splinters, or the edges of the fissure are materially separated. When there are many splinters, entirely detached, a crepitus will likewise serve to explain the nature of the accident; but, unassisted by these symptoms, imparted to him by the sight, the hearing, or the touch, the practitioner cannot at once offer a decided opinion as to whether a fracture exists, or not.

In order to procure more positive information, would it be right and judicious to make several incisions and uncover the bone? But, here the surgeon would be embarrassed in the very commencement of his proceedings; for, how would he be able to judge where the knife should be applied? Why also should he resort to an useless and painful operation, which (to say the best of it) would only render the patient's cure more distant?

The symptoms, indicating compression of the brain, can alone justify an examination of the fracture. These symptoms also must be urgent and alarming; for, when they prevail in a slight degree, bleeding and evacuations promise more benefit, than any operation on the skull, and consequently all examination of the part, supposed to be broken, must be unnecessary.

Even when the cranium has been denuded, so that the sight can convey due information respecting the solution of continuity in the bone, care must be taken not to be deceived by a suture, or by the groove of a vessel. In cases of doubt, a modern surgical author advises us to scrape the outside of the bone; and he tells us, that, if after the removal of the external scale, the fissure yet appear, and a thread of blood be seen at its outer part, no doubt exists of its being a real fissure. As however making this examination can answer no purpose, except with a view to determine the place where the trepan should be applied, I cannot recommend the plan, except where the symptoms are such as to render this information desirable. On the contrary, it appears to me, that all examinations of the bone, made seemingly from mere curiosity, and without any true surgical object, should be deprecated as rash and hurtful.

The danger of fractures of the skull does not depend upon the simple solution of continuity: it bears altogether a relation to the concussion and compression of the brain, with which the injury of the bone may be complicated. The pressure, caused by depressed splinters of bone, is less alarming, inasmuch as the cause of the compression is easy of removal. The pressure of extravasated fluid is far more serious, in consequence of the difficulty of ascertaining positively its existence, and precise situation.

Its seat is sometimes between the skull and the dura mater, which has been detached from the bone. More frequently, it occurs either between the dura mater and tunica arachnoides; in the substance of the brain; or else in the ventricles. The quantity of extravasated fluid is generally less in those extravasations, which are situated between the dura mater and the skull. The extravasations, which are formed in the substance of the brain itself, are not only more considerable, but also, as they mostly depend upon concussion, are more alarming, than effusions on the surface of the dura mater. It is indeed extremely difficult, if not impossible, to ascertain the situation of the extravasated fluid. In such cases, the trepan is likewise of no use; while concussion, when so violent as to produce internal extravasation, is invariably fatal. In extravasations between the dura mater and the skull, which are almost the only cases of the kind, to which surgery can administer relief, when the effused fluid lies under a part of the skull accessible to the trepan, the extravasated fluid is almost always small in quantity. The danger, however, is not the less: ten, or twelve drops of fluid are sometimes enough to produce a fatal compression. When the extravasation has happened in the substance of the brain, the compression is far more perilous: in short, it may be said to prove, with very few exceptions, certainly mortal. The danger is not so great, when the extravasation is situated between the skull and dura mater.

The lethargy, the degrees of which increase from mere drowsiness into the most perfect coma; and the paralysis of the opposite side of the body to the seat of the extravasation; are the most common symptoms of this accident. Having explained elsewhere (see *Head, Injuries of,*) some other symptoms, such as stertorous respiration, dilated pupils, &c. which usually indicate pressure on the brain, it is unnecessary here to dwell upon them. The subsequent increase of the coma, and paralytic affections, and the gradual augmentation of their intensity, serve to render these symptoms distinguishable from others, which are suddenly brought on by concussion. But there are instances, as every man of experience knows, in which concussion ruptures the blood-vessels, and produces an extravasation of blood. In this circumstance, it is obvious, that the symptoms of compression are blended with those of concussion. The symptoms proceeding from the latter cause always diminish in proportion to the time, which has elapsed from the moment of the injury; while those of compression succeed, and, on the contrary, increase in intensity, in proportion as the quantity of extravasated fluid becomes more considerable. Notwithstanding these distinctions, however, it must be acknowledged, that there are many cases, in which the surgeon is obliged to remain in doubt, with regard to the particular cause of the symptoms. This indecision is the more embarrassing, because the operation of the trepan is necessary in cases of extravasation, but useless in those of concussion. Even when extravasation is known to exist, the practitioner requires more information; for, he ought to know the precise situation of the effused fluid. It is true, indeed, that paralysis of one side of the body generally indicates the pressure to be upon the opposite hemisphere of the brain. But, what surgeon would venture to follow the practice advised by Van Swieten, and apply to the suspected side of the head three crowns of the trepan? Possibly, not one of them might fall on the situation of the extravasated fluid. When the skull is broken, the extravasation is almost always on the same side as the fracture. When it is the effect of concussion, or when the breach of continuity in the skull is what is termed, a counter-fissure; the effusion is generally on the side of the head most remote from the blow. If the pressure is caused by a detachment of the internal table of the skull, the nature of the case cannot be ascertained before the operation of the trepan has been performed on the part of the skull, upon which the violence has acted. When there are two extravasations; one depending upon a fracture, and situated immediately under it, between the dura mater and the skull; the other arising from concussion, and situated at some point directly opposite, either between the dura mater and tunica arachnoides, or within the substance of the brain itself; paralysis may occur on the same side as the fracture, and hence, it may be inferred, that the palsy does not always take place on the side opposite to the extravasation. But, says Richerand, an examination of the body quickly proves, that the case does not deviate from the common rule. The extravasation produced by concussion, being almost invariably more considerable, than that caused by a fracture, accounts for the extension of the palsy to the same side of the body. Sometimes, the side, which is not paralytic, is affected with convulsions; the pulse is full and hard; and the respiration stertorous; in short, the symptoms are analogous to those caused by apoplexy.

The evacuating plan, recommended for the treatment of concussion, (see *Head, Injuries of,*) is all that can be done, when every thing is uncertain relative to the situation of the extravasation. It is all that can be done in those frequent instances, where the effusion has taken place in the substance of the brain, so that it cannot possibly be voided. The trepan then is indicated only when there is an extravasation between the dura mater and the bone, the fracture being situated at a part of the skull accessible to instruments, and not at the base. We shall not here dwell upon the doubtful example, where the fluid lies between the dura mater and the arachnoides. I believe, that the operation should be limited to a small number of cases, in which not only the existence and situation of the pressure are known, but in which the symptoms, arising from this cause, are urgent and dangerous, and the pressure can be removed by no other means.

Desault in the last years of his practice abandoned the operation of the trepan altogether, its ill success at the Hôtel-Dieu, having become notorious.

When the case is a simple fissure, the trepan ought to be applied upon the solution of continuity, *if the symptoms indicate a dangerous degree of pressure on the brain.*

When the detached portions of bone are depressed, so as to compress the brain, the operation is still requisite, if they cannot be elevated by other means. But, Richerand maintains, that a positive indication for trepanning is not frequent, either because it is difficult to judge of the existence and situation of extravasations, or because extravasated fluids readily escape through the interspaces of the fragments, when there is a splintered fracture. Such facility is also increased, when one of the portions of broken bone is totally detached, so that it can be removed, leaving an aperture equivalent to what would be produced by the application of the trepan.

When the operation is determined on, it is more convenient to have the head shaved: indeed, this is often done immediately the surgeon is called, in order that he may have a better opportunity of seeing what parts of the scalp have been struck; for, it is in such situations, that he has most reason to apprehend fractures of the bone, or extravasations beneath it. If, however, the violence has occasioned a large wound, or laceration of the scalp, the practitioner, knowing where the force has been applied, is frequently content with having a little of the hair shaved off the parts surrounding the injury. All that need be said on this subject is, that it is always better to have enough of the hair taken away, to afford the surgeon an uninterrupted opportunity of examining the scalp freely, and doing whatever may be necessary. The loss of a little hair is of very little consequence, while the concealment of the seat of a depressed fracture, or extravasation, might lead to fatal consequences.

When the propriety and necessity of trephining are fully indicated, provided the wound, or laceration of the scalp, should not have exposed a sufficient surface of the bone for the application of the crown of the trephine, an adequate dilatation of such wound ought immediately to be made. If, in the situation of the blow, there should only be a contusion, or a lump, unattended with any wound, a division of this part of the scalp is to be made by carrying the knife quite down to the bone. In those cases, in which the swelling, occasioned by the violence, is considerable, and attended with the sensation of a crepitus; as well as in other instances, in which there is only a contusion, under which a fracture and displaced pieces of bone may be felt; the scalp must be divided in the same manner, only with greater caution, lest the point of the knife should insinuate itself through the fracture, and do mischief to the dura mater and brain.

Authors recommend the shape of the incision to be different according to the kind of fracture, and the parts of the head, on which the violence has operated. When the whole extent of the injury can be brought into view, by means of an incision, having the form of the letter T, the surgeon should be content with such a division; but, if this be not sufficient, he may give it a crucial shape. When the trephine is to be applied to the squamous part of the temporal bone, we are recommended to make the incision, as much as possible, in the shape of the letter V, the branches of which are to be upward, and the angle downward, in order that as little as possible of the temporal muscle may be cut, and that the division of its fibres may be avoided as far as it is in our power.

Having divided the scalp, the next object is to reflect it; but, no man would be warranted in cutting any part of it away, although such practice is advised by Pott. The purposes of the operation do not require any removal of this kind; and the method would leave a wound, which would be long in healing, and, when healed, never exempt from deformity. In short, the reflected flaps of the scalp are capable of adhering to the parts, on which they are laid, after the operation, and, consequently, ought never to be wantonly cut away.

The scalp being reflected, authors next advise us to scrape away the pericranium, either with the knife, or the raspatory. Perhaps this measure may be considered as one, which does neither much harm, nor much good. The design is to facilitate the application of the trephine to the bone. However, the teeth of a proper instrument, in good order, will not be impeded by the slender periosteum; and scraping this membrane away from parts of the skull, which are not to be removed, may conduce to exfoliations.

Sometimes, the bleeding from branches of the temporal, or occipital artery, is so copious, that the bone cannot be very conveniently perforated before the hemorrhage is suppressed. If it be prudent to wait a little, and the case (as it generally does) should be likely to be benefited by the evacuation of blood, it is as well to let the bleeding continue for a certain time. The surgeon may then just direct an assistant to put the end of one of his fingers on the mouth of the vessel, and proceed in the operation. In some cases, the bleeding might be so troublesome, that it would be better to tie the artery at once.

All parts of the cranium do not admit of being trephined with equal convenience and safety. It has usually been set down by surgical authors, that the trephine cannot be applied below the transverse ridge of the os occipitis. There are some cases, however, which prove that such an operation may be safely done, and that we ought not, in urgent circumstances, to be afraid of dividing the trapezius and complexus muscles, in order to be enabled to apply the trephine to the bone. (See *Hutchison's Case in Med. Chir. Trans. Vol.* 2, *p.* 104, *&c.*)

The majority of writers also forbid the application of the trephine to the frontal sinuses, in consequence of the indeterminate depth of these cavities, and the apprehension of incurable fistulæ. However, Larrey has deviated from this precept in several instances, and his practice confirms the statement of Mr. C. Bell, that, by opening the frontal sinus with a large trephine, and then using a small one, the internal parietes of this cavity may be trephined with perfect safety, and no risk of injuring the dura mater with the saw. (See *Larrey's Mém. de Chirurgie Militaire*, *T.* 2, *p.* 136—138, *T.* 4.)

Writers also caution us not to apply the trephine to the anterior inferior angle of the parietal bone, in consequence of the middle artery of the dura mater lying under it, generally in a groove of the bone, and occasionally in a canal in its very substance. In the latter circumstance, this portion of the parietal bone, could not possibly be taken away, without wounding the vessel. However, notwithstanding this advice, which has been unthinkingly handed down by one writer to another, from generation to generation, I very much question the soundness of the doctrine. We undoubtedly ought to avoid trephining this part of the cranium, when we can prudently do so. But the causes demanding this operation are always so urgent, that the patient's sole chance of existence depends on their quick removal. Hence, were there pressure on the brain, either from a depressed portion of bone, from blood, or matter, and such pressure could not be removed without trephining the anterior inferior angle of the parietal bone, what operator would be afraid of doing so? Besides, the fear of the hemorrhage has been very unfounded; for, the lodgment of the artery in a bony furrow, or canal, which authors have pointed out as rendering the suppression of the hemorrhage more difficult, is a mere visionary idea, as it is well known, that a little plug of lint, pushed into the orifice of a vessel, so situated, will always stop the bleeding, with as much certainty and ease as can possibly be imagined.

The foregoing suggestion was made in the early editions of my works, and I now see the safety of the practice has been confirmed. "I have also applied the trepan (says Larrey) over the track of the spheno-spinous artery, at the inferior anterior angle of the parietal bone. The artery was divided; but, I stopped the hemorrhage almost immediately, by applying an iron probe red hot." (*Mem. de Chir. Militaire, T.* 2, *p.* 138.)

Writers, until very lately, also prohibited us from trephining over any of the sutures, and, especially, over the sagittal suture, beneath which the longitudinal sinus is situated. The fear of the dura mater being injured, and of this vessel being wounded, was the reason for the advice. With regard to the sutures in general, the trephine may be applied to them, as well as to any other part; and, as for the sagittal suture, many facts confirm the propriety of not being deterred even by it, though situated immediately over the longitudinal sinus. It is to be remembered, also, that the dura mater, in cases of extravasated blood, and matter, beneath the cranium, is detached by the intervention of such fluids from the inner table.

By means of a perforation practised over the sagittal suture, Garengeot successfully elevated a portion of bone, which pressed upon the longitudinal sinus, and made the patient quite comatose. The depressed piece of the cranium could not have been so advantageously raised, had the trepan been applied in any other situation. But a still stronger argument, in favour of this practice, when the case at all requires it, is the fact, that wounds of the longitudinal sinus, and the hemorrhage resulting from them, are not attended with any serious danger. Sharp mentions his having twice seen a bleeding of this kind. Another instance is also recorded in Warner's Cases. A child received a wound on its forehead: the two parietal bones were fractured, and a portion of each was depressed on the dura mater. The child lived a month, without any operation being done; but, at the end of this time, Warner applied the trepan. He found a splinter of bone sticking in such a way into the longitudinal sinus, that it could not easily be got out; consequently, he enlarged with a lancet the opening, in which the splinter was entangled. The hemorrhage, which was copious, was easily suppressed by the application of a little dry lint, and the child was relieved, though it died at the end of two months, after suffering a variety of symptoms, which had no connexion with the wound of the sinus, the opening of which soon healed. The fourth case, related by Marchettis, also proves, that wounds of the longitudinal sinus are not fatal. Pott and Callisen have since recorded other facts, tending to the same conclusion. (See *Syst. Chir. Hodiernæ, Pars* 1, *p.* 659, *Edit.* 1798.)

Whenever a depressed fracture can be elevated to its proper level, without applying the trephine, and with the mere aid of a pair of forceps, or an elevator, trephining should never be performed, unless there be strong reason to apprehend, that blood, or matter, lodged on the surface of the dura mater, contributes to the production of the bad symptoms, and ought to be discharged.

The scalp having been divided, if necessary, and the pericranium scraped from the surface of the bone, according to the common precepts, and practice, the next thing is the application of the crown of the trephine.

The surgeon is first to make a little impression with the point of the centre pin, for the purpose of marking the place, where it will work, when the crown of the trephine is applied in the proper situation; for, where such impression is made, the operator must make a small hole with a perforator, in order to fix the point of the centre-pin, on which the crown of the instrument turns backward and forward, as on an axis, during the first stage of the operation. Mr. Savigny's centre-pins make a perforation, without need of any particular instrument for the purpose, and, in this respect, are advantageous.

The point of the centre-pin having been fixed, the trephine is to be turned by regular semicircular motions, alternately to the right and left, which object is effected by steady pronations and supinations of the operator's hand. The teeth of the saw having made a tolerable circular groove, in which they can steadily work, the centre-pin becomes useless, and, as it would, if not withdrawn, or removed, certainly injure the dura mater and brain, by reason of its projecting further, than any other part of the instrument, it would be an unpardonable blunder to let it remain, after a proper circular groove has been formed by the teeth of the saw.

The beginning of the sawing may be executed boldly and quickly; for, the operator runs no hazard of doing mischief. It is necessary occasionally, with a view of facilitating the action of the instrument, to clean away the particles of bony matter, with a little brush, usually kept for the purpose in every box of trephining instruments. Were this plan neglected, the action of the cylindrical saw would be very much clogged.

The operator, however, must increase his caution, when the sawing has made greater progress; for, were he to be too bold, he might sometimes lacerate the membranes of the brain with the teeth of the instrument, particularly, as the thickness of the cranium is subject to infinite variety, both in different parts of the same head, and in different subjects. Let the surgeon, therefore, never forget to examine frequently with the point of a quill, whether any part of the circular groove is cut through or nearly so; for, when this is the case, the instrument must only be worked in such a way, as to make pressure upon, and cut, the part of the circle, which yet remains to be divided. In some few cases, it is said, that the surgeon can distinctly feel, when the teeth of the saw reach the diploe, or medullary structure, between the two tables of the cranium, and some writers have rashly directed us to saw with boldness, till the sensation of this occurrence is communicated to our hand and fingers. However, I believe, this possibility of discriminating the arrival of the teeth of the saw at the diploe is so uncommon, and so fallacious, that it should never be expected, or relied on. Nor ought the surgeon to saw with incautious force and rapidity, till he sees the teeth of the trephine bloody, which appearance has been set down as another criterion of their having reached the diploe. I have already stated, that a great many skulls have hardly any space between several parts of the two tables. This is particularly often the case in old persons.

A prudent man will always prefer exerting a little force for the purpose of breaking some of the bony connexion, retaining the circular piece of bone, to running any hazard of injuring the dura mater, by sawing too deeply. After a certain time, therefore, it is better to lay down the trephine, and endeavour to elevate the portion of bone, with the aid of a pair of forceps, constructed for the purpose, and kept in most cases of trephining instruments, or else by means of an elevator, which is still more calculated for the purpose.

When the circular piece of bone has been taken out, and the edges of the perforation are unequal, and splintered, the irregularities are to be cut off with the lenticular knife. When there is extravasated blood underneath the opening which has been made, it sometimes spontaneously makes its escape, and, if it should not do so, the surgeon must remove it himself. If one perforation of the skull should not suffice for letting out the blood, as much more of the cranium ought to be removed with the trephine, as circumstances may require; there being no comparison between the danger of repeating the application of the instrument, and that of leaving a quantity of undischarged, compressing fluid, on the surface of the brain. Certainly, many facts on record evince, that the dura mater may be very extensively uncovered, without dangerous consequences. Sarrau saw a whole parietal bone exfoliate, in consequence of a blow on the head. Blegny relates a similar case; and Saviard makes mention of a woman, who had lost the upper part of the os frontis, both the parietal bones, and a large portion of the os occipitis, all of which had come away at the same time; yet she recovered. Vaugion, however, who also seems to relate this identical case, describes the exfoliation as not being quite so extensive.

I am of opinion, notwithstanding these facts, that exposing a large part of the dura mater with the trephine is, by no means, an operation exempt from serious danger. And, what I conceive confirms this statement, is my having known instances, in which persons, who had been rashly advised to submit to being trephined, for the cure of violent pains in the head, &c. died, in consequence of the operation. I make this observation, well aware of the successful instance of the practice recorded by Schmucker. (*Wahrnehm. B.* 1, *p.* 434.)

However, I perfectly coincide with writers, who direct the removal of as much bone, as is necessary in order to be able to remove the whole of the pressure from the surface of the dura mater.

The application of the trephine, in cases of large extravasations, must in particular be made several times, when the situation of the fluid does not favour its escape. However, in this circumstance, Sabatier says, that we should not make numerous perforations all along the extent of the extravasation; but, only a counter-opening, as is done on the soft parts. This author expresses his surprise at there not being on record many examples of counter-openings made in the cranium, since analogy demonstrates their utility. I cannot help remarking on this part of the subject, that one very obvious objection to making openings of this kind in the cranium, is the impossibility of knowing with certainty, whether blood lies under any particular part of the skull; whereas, in abscesses of the soft parts, the surgeon feels the fluctuation of the matter, and knows, that his counter-opening will be made in the cavity containing it. One might also have occasion to make more than one perforation, in order to discharge blood extravasated beneath the skull, when the blow has happened near a suture, to which the dura mater continues adherent; for, a single opening made only on one side of the suture, might only give vent to a part of the extravasation.

If we should not find blood lodged under the cranium; but the dura mater should seem elevated, tense, dark-coloured, forming a prominent fluctuating tumor, outward, it may be cautiously opened with a lancet, or bistoury, with a view of letting out any collection of blood underneath. In the article *Head*, *Injuries of*, I have stated the result of Mr. Abernethy's experience, in regard to the operation of opening the dura mater. This gentleman found, that the method never effectually discharged all the blood, but only the serous part of it. The evacuation of any of the compressing fluid must, however, be desirable; and, if the surgeon cannot do more, yet he has fulfilled his professional duty.

The utility of trephining is not limited to discharging extravasated blood, or matter, lodged underneath the skull. This operation frequently enables us to elevate depressed portions of bone. The latter object can often be accomplished by merely making one perforation. Sometimes, several perforations are requisite to be made near each other. Authors even state, that it may also become necessary to remove the intervening portions of bone with a pair of cutting forceps. The depressed part may then be easily raised by means of an elevator. Occasionally, indeed, I may say, very often, the best practice is to remove the depressed portion entirely, when its total separation from the rest of the skull can be accomplished by cutting across the base of the depressed piece. If any splinter stick in the dura mater, and should not admit of being withdrawn, without enlarging the wound in the membrane, the surgeon ought not to be afraid of doing this with a sharp instrument.

According to some writers, if, after dividing the dura mater, the surface of the brain appears smooth and flabby, with a fluctuation, we may conclude there is an abscess in its substance; and these authors, more enterprising with their pens, it is to be hoped, than with their scalpels, sanction the method of carrying the point of the bistoury to the depth of an inch, *if circumstances render so deep a puncture necessary.* "But," says Richerand, "prudence forbids us to go further. Cutting the surface of the brain causes no pain, and it produces less danger, than one might apprehend; experience and observation prove, that the essential parts of this organ are situated near its base, and that *its surface may be removed without danger, or pain.*" (*Nosogr. Chir. T.* 2, *p.* 301, *Edit.* 3.)

A case, in which Dupuytren plunged a bistoury to the depth of more than an inch into the brain, and thus let out an ounce and a half of pus, is recorded in a valuable periodical work. (*See Journ. of Foreign Med. No.* 18, *p.* 298.) Some temporary amendment followed; but, the case still had a fatal termination.

After the operation of trephining, the divided scalp is to be placed as nearly as possible in its natural situation, and lightly dressed with a simple pledget of any common unirritating ointment. In applying the dressings, the surgeon should invariably keep in view these objects; namely, to let whatever is put on the wound be as light as possible, not apt to make pressure on the brain, and of a nature, which cannot excite irritation. All stimulants are to be strictly avoided; nor will any bandage be better, than an ordinary night-cap of sufficient size to be put on with facility. It may be secured with bits of tape, which are to be tied under the jaw.

The practitioner should not now conceive, that he has done all that he ought to do. Let him remember the urgent necessity of keeping off, or diminishing, the inflammation of the dura mater and brain, which is still to be feared. Let him bleed the patient largely and repeatedly; exhibit saline purges, glysters, and antimonials; and if the symptoms continue, let him apply a blister to some part of the head. I shall avoid, however, any repetitions on this subject, by referring to *Head, Injuries of.*

The aperture in the skull usually becomes closed with soft granulations, which slowly acquire a hard consistence. While the cicatrix is soft, it should be protected from external injury with a thin piece of horn, or metal. Exfoliations from the margin of the perforation sometimes retard the healing of the wound; but, now that the practice of dressing with drying spirituous applications has been exploded, and the removal of any part of the scalp is condemned by all the best surgeons, these unpleasant consequences are rendered much less frequent, than in former days.

The reader may find an account of the operation of trepanning, or trephining, in every system of surgery; but, he should particularly consult the writings of Sharp, Le Dran, Dionis, Bertrandi, Pott, Sabatier, Schmucker, Abernethy, Desault, Callisen, Richerand, and several parts of the Mem. de l'Acad. de Chirurgie.

TRICHIASIS (derived from ϑριξ, the hair) denotes a faulty inclination of the eyelashes inwards against the globe of the eye. According to Scarpa, the disease presents itself under two distinct forms: the first is, where the cilia are turned inwards, without the natural position and direction of the tarsus being at all changed; the second consists in a morbid inclination of the tarsus inwards, (*Entropium*) and consequently of the eyelash towards the eyeball (*Trichiasis*).

The first form of this disease is said both by Beer and Scarpa to be uncommon, nor has it come under the observation of the latter writer more than once, and, in this instance, only some of the hairs had changed their direction. On this point, however, Mr. Travers is completely at variance with the foregoing authors, as he describes an inversion of the cilia as *frequently* existing independent of entropeon. (*Synopsis, p.* 232.) The second species, or form of trichiasis, or that which consists in a folding inwards of the tarsus and cilia at the same time, is the case which is commonly met with in practice. It may be either complete, affecting the whole of the tarsus; or incomplete, occupying only a certain portion of the edge of the eyelid, most frequently near the external angle of the eye. Sometimes, the disease is confined to one eyelid; at other times, it affects both; and occasionally the patient is afflicted with it in both eyes.

Some writers, amongst whom is Beer, (*Lehre von den Augenkr. B.* 2, *p.* 118,) admit a case, which they call *distichiasis,* and which they suppose to be produced by a double and unusual row of hairs. But, according to Scarpa, this third species is only imaginary, and the reason of this subdivision seems to have arisen from not recollecting, what was long ago remarked by Winslow and Albinus, that although the roots of the cilia appear to be disposed in one line only, they form two, three, and in the upper eyelid even four rows of hairs, unequally situated, and as it were confused. Whenever, therefore, in consequence of disease, a certain number of hairs are separated from each other in a contrary direction and disorderly manner, the eyelash will appear to be composed of a new and unusual row of them, while, in fact, there is no change, either with respect to their number, or natural implantation.

It is not an easy matter to determine precisely, says Scarpa, what are the causes, which sometimes make a few of the hairs deviate from their natural direction, while the tarsus continues in its right position. They are commonly referred to cicatrices in consequence of previous ulceration, whereby the cilia fall off, and those which are growing are hindered from taking their proper direction. There must, however, be other causes sometimes concerned; for, in the case seen by Scarpa, two or three hairs were turned inwards against the eyeball, although there had been no preceding ulceration, nor cicatrices, of any part of the tarsus. Indeed, Scarpa is inclined to believe, that the small ulcers and scars, which are sometimes formed upon the internal margin of the tarsus, are more likely to cause the second form of the disease, or the inversion of the edge of the eyelid, and, consequently, of the cilia towards the globe of the eye. As these ulcers, when neglected, destroy the internal membrane of the eyelids near the tarsus, it necessarily follows, that, in proportion as they heal and diminish, they draw along with them and turn inwards the tarsus, and hairs inserted into it. And since they do not always occupy the whole extent of the internal margin of the eyelid, but are sometimes confined to a few lines, in the middle, or extremity, near the external angle of the eyelid, so after the cicatrices are formed, the whole of the hairs are not invariably turned inwards, but only a certain number of them, which correspond to the extent of the ulcers previously situated along the internal edge of the tarsus. Indeed, in every case of imperfect trichiasis from a cicatrix of the inner margin of the eyelid, the tarsus and cilia are every where in their natural situation, except opposite the part, where the ulcers formerly existed. Also, if the eyelid be everted, its internal membrane, near that part of the margin corresponding to the seat of the trichiasis, will be found pale, rigid and hardened, the inversion of the cartilaginous border and of the cilia being plainly the effect of the contraction of the cicatrized point.

Chronic ophthalmies of long continuance sometimes bring on the complaint, in consequence of the skin of the eyelids being kept for a long time in a state of distention and œdema, terminating in a considerable relaxation of it. And, according to Beer, the too long continued use of emollient poultices may have the same effect. (*Lehre, &c. B.* 2, *p.* 113.) The cartilaginous margin of the eyelid then loses the proper support of the integuments, inclines towards the eyeball, and afterwards turns inwards, drawing the eyelashes along with it in the same improper direction. Long continued puriform discharges from the ciliary glands likewise spoil the shape and consistence of the cartilage of the eyelid, and therefore not unfrequently occasion trichiasis. Scarpa doubts, whether a spasmodic contraction of the orbicularis palpebrarum muscle can ever be a cause of the disease.

The annoyance, which must necessarily result from the hairs perpetually pressing upon the cornea and white of the eye, as Scarpa observes, may be easily imagined. The evil is rendered still greater by the hairs, which are turned inwards, becoming much longer and thicker, than those which retain their natural direction. And although the trichiasis be confined to one eye, both the eyes usually suffer from the effects of the disease. Indeed, generally, the eye on the sound side cannot be moved without occasioning pain in that which is exposed to the irritation and friction of the inflected hairs. In almost all cases, both the eyes are very irritable, and incapable of bearing the light. As, in cases of incomplete trichiasis, the patient retains some little power of opening the eyelids for the purpose of seeing, and that most frequently towards the internal angle of the eye, the head and neck are often inclined in an awkward manner, so that in children a distortion of the neck and shoulders is at last produced, which cannot be rectified without difficulty, even after the trichiasis is cured. Unfortunately, also, children are impatient of the uneasiness arising from the inflected hairs, and, therefore, are continually rubbing the eyelids, whereby all the ill effects of the complaint are much increased.

The cure of the second species of trichiasis, or that which is commonly met with in practice, is accomplished by artificially everting the eyelid, and fixing it permanently in its natural position, together with the eyelashes, which irritate the globe of the eye. According to Professor Scarpa, this indication is perfectly fulfilled by the excision of a piece of the skin close to the edge of the eyelid, of such a breadth and extent that, when the cicatrix is formed, the tarsus and margin of the eyelid may be turned outwards, and sufficiently separated from the eyeball, the cicatrix of the integuments affording a point of support fully adequate to keeping the parts in their natural position and direction. Scarpa believes, that there are now very few modern surgeons, who, with a view to the radical cure of this disease, place any confidence either in plucking out the inverted eyelashes, bending them outwards, and retaining them so by means of adhesive plaster; or in plucking them out, and destroying their roots with caustic: much less in extirpating the edge of the eyelid along with the hairs, or dividing the orbicularis muscle on the internal surface of the eyelid, under an idea that the disease is sometimes produced by a spasmodic contraction of it.

The following is the mode of proceeding recommended by Scarpa. The patient being seated in a chair, if an adult, or, if a child, laid upon a table, with the head raised, and firmly held by an assistant, who must stand behind the patient; the surgeon is to push outward, with the end of a probe, the hairs, which irritate the eye. Then, with a pair of dissecting forceps, or the ends of his fore-finger and thumb, he should lift up a fold of the skin of the eyelid, taking great care that the piece, which is taken hold of, corresponds exactly to the middle of the whole extent of the trichiasis; for, sometimes the whole, sometimes a half, and, in other instances, only a third of the extent of the tarsus is inverted. The surgeon, with his left hand, must raise the fold of the skin, more or less, according as the relaxation of the integuments, and the inversion of the tarsus, are more or less considerable. The reason of this is evident, viz. the greater the quantity of skin is, which is raised, the greater is the quantity which will be cut away. Supposing the patient to be an adult, as soon as the fold of skin has been raised in a certain degree, the surgeon must request him to open his eye, and if in this act the tarsus and eyelashes resume their natural place and direction, the portion of skin already raised will be sufficient for the purpose. When the integuments are elevated, by means of a pair of dissecting forceps, and care is taken to lay hold of the skin precisely at the middle point of the whole extent of the trichiasis, it necessarily follows, that the consequent section of the skin will form an oval, and that the greatest width of the wound will correspond exactly, or nearly so, to the middle of the eyelid, and its narrowest parts to the angles, or commissures of the same. This contributes very materially to make the cicatrix correspond to the natural fold of the eyelid, and hinder the origin of a disease of an opposite nature to the one about to be remedied, toward the angles of the eye, viz. a turning out of the commissures of the eyelids. See *Ectropium.*

Besides this caution, relative to the situation and figure of the fold of the integuments to be cut off, the surgeon must be careful, that the division of the skin be made very near the inverted tarsus. Were this circumstance neglected, the operator might have the mortification of finding, after the wound is healed, that although the eyelid is shortened, on the whole, from the eyebrow to the place of the recision, yet it is not equally so at the space, which is between the edge of the eyelid and the cicatrix of the skin. Hence the tarsus would not be turned outward sufficiently to keep the eyelashes from rubbing against the eye.

The surgeon, holding up the fold of skin by means of the forceps, in his left hand, is with a pair of probe-pointed, sharp-curved scissors, to cut off the whole of the duplicature, being first sure that one of the blades of the instrument is applied close to the edge of the eyelid. If the eyelids should be affected, the same operation must immediately be done upon both of them, with such cautions, and in such proportion, as the extent of the disease, and the degree of inversion of each eyelid, may require.

Scarpa next dissuades us from employing any suture to unite the wound, and represents that it will be sufficient to keep the eyebrow as much downward as possible, if the operation has been done on the upper eyelid, or, if on the lower, to support it against the inferior arch of the orbit, by pressing it from below upwards, so as to keep the edges of the wound from becoming separated. Then the lips of the wound are to be brought exactly together, by means of adhesive plaster, which should extend from the superior arch of the orbit to the zygoma, and the maintenance of this state of the wound will be still more securely effected, by placing two compresses, one on the eyebrow, and another on the zygoma, together with a bandage. On the other hand, Langenbeck disapproves of the omission of sutures, by which, he finds, that the wound may be both more accurately and expeditiously united. Indeed, he expresses himself generally in favour of sutures, where the wounded part is liable to be disturbed by the continual action of muscles. (*Neue Bibl. B.* 1, *p.* 415, *&c.* 12*mo. Hannover,* 1818.) Langenbeck, however, takes care to withdraw the ligatures in about twelve, or at most twenty-four hours, as their longer continuance would produce suppuration. Beer also particularly insists upon the utility of bringing the edges of the incision together with a suture; and both he and Langenbeck employ forceps, the ends of which have transverse pieces, calculated to take better hold of the slip of skin to be removed. (*Lehre, &c. B.* 2, *p.* 114.)

On taking off the first dressings, the third day after the operation, the surgeon will find, says Scarpa, that the patient can open his eye with ease, and that the inverted tarsus and eyelashes have resumed their natural position and direction. In the partial, or incomplete trichiasis, or that which only occupies a half, or a third of the whole length of the tarsus, and in subjects who have had the skin of the eyelids very loose, Scarpa has often found the wound perfectly united on removing the first dressing.

When, however, only a part of the incision has healed, while the rest seems disposed to heal by suppuration and granulation, the surgeon is to cover the wound with a small piece of lint, spread with the unguentum cerussæ; and if the sore should become flabby, it must be occasionally touched with the argentum nitratum, until the cure is finished.

With regard to the first form of this disease, or that, in which the eyelashes project against the eyeball, without the natural position of the tarsus being at all altered (a case which is fortunately rare), the accomplishment of a cure is very difficult, since neither the pulling out of the hairs, nor burning the situation of their roots, are means at all to be depended upon for producing a complete cure of the disorder; and turning the tarsus out of its natural position would make the patient liable to an irremediable dropping of the tears over the cheek, attended with a chronic thickening of the lining of the eyelid. It has only been in youngish individuals that Beer has ever seen the repeated and careful extraction of the cilia effect a radical cure. (See *Lehre von den Augenkr. B.* 2, *p.* 121.) In the instance of this form of the disease, which Scarpa met with, only two or three of the eyelashes inclined against the eye-ball. He found, on turning the eyelid a little out, opposite to the situation of the faulty hairs, that he could not, indeed, completely put them in their natural position; but he saw that he could thus remove them so far from the cornea, that they would not rub against it, without altering the position of the eyelids so much as to occasion a perpetual discharge of the tears over the cheek. And, as in the patient alluded to, the skin about the eyelid was very tense, Scarpa made an incision with the back of the lancet, near the tarsus, three lines long, and took away a small piece of skin of the same length, but very little more than one line broad. When the cut healed, the operation was found to answer as well as the nature of the case would allow, though the cure was not complete.

The trichiasis being cured, something more always remains to be done, for the purpose of correcting the cause of the disease, as well as curing the disorder of the eye, occasioned by the previous friction and irritation of the inverted hairs. The usual indications are to restore the tone of the vessels of the conjunctiva, to lessen the swelled Meibomian glands, and obviate opacity of the cornea.

According to Mr. Guthrie, when chronic inflammation prevails, and there is a commencing, but incomplete general inversion of the cilia, the cure of the inflammation will restore the conjunctiva to its natural state, and the cilia to their original direction, without any especial means being employed for the cure of the beginning inversion; but, when these changes proceed too slowly, the sulphuric acid, recommended by Helling, of Berlin, and Quadri, of Naples, should be applied, and will always be found effectual. Indeed, in cases where the incurvation of the cartilage is slight, and the contraction of the angles moderate, Mr. Guthrie says, that such treatment will render another operation unnecessary. Quadri applies the acid as follows: 1st. A small quantity of concentrated sulphuric acid is to be applied, by means of a piece of smooth solid wood to the centre of the affected part of the lid, and rubbed along on an oval space, a little exceeding in length the part on which the inverted hairs are situated, and from three to four or six lines in width, according to the inveteracy of the disease. The part ought to be wiped dry, after the acid has been applied about ten seconds, in order to prevent any of it from getting into the eye. 2nd. The application of the acid is now to be repeated, care being taken that it approach the edge of the eyelid, and touch the parts immediately over the inverted eyelashes; and it is to be continued, or repeated a third, or a fourth time, until the contraction of the parts draws the hair, from within outwards, or to their natural situation; when the operation is completed, and the part ought to be again perfectly dried. The attachment of the cilia to the forehead by means of pieces of silk and adhesive plaster, as practised by Quadri, Mr. Guthrie very properly rejects as inconvenient and unnecessary. (*Operative Surgery of the Eye*, *p*. 30.)

Some new methods of performing the operation, for the cure of trichiasis, have been proposed by Mr. Crampton, Mr. Saunders, Dr. Jaeger, Schreger, and Mr. Guthrie.

The following is the account which Mr. Crampton gives of his plan, which he tried in one instance with complete success. "Let the eyelid be well turned outwards by an assistant; let the operator then, with a lancet, divide the broad margin of the tarsus completely through, by two perpendicular incisions, one on each side of the inverted hair, or hairs; let him then, by a transverse section of the conjunctiva of the eyelid, unite the extremities of the perpendicular incisions. The portion of cartilage, contained within the incisions, can then, if inverted, with ease be restored to its original situation, and retained there by small strips of adhesive plaster, or, perhaps what is better, by a suspensorium palpebræ, adapted to the length of the portion of the tarsus, which it is intended to sustain, should one or two hairs be displaced without inversion of the tarsus." (*Essay on the Entropeon*, *p*. 55.)

Mr. Travers informs us, that, in cases of a circumscribed inversion, "produced by cicatrix from burn, or wound," he has found Mr. Crampton's method an effectual remedy. It is added, that the complete division of the conjunctiva and tarsal cartilage, including the inverted portion, and parallel to its border, with the aid of sticking plaster, sometimes proved sufficient. Mr. Travers also sees no objection to the entire removal of that portion of the tarsal edge, which is incorrigibly inverted from such a cause, especially when combined with a preternatural growth of cilia from the Meibomian border of the tarsus. (*Synopsis*, *&c. p.* 356.) In one inveterate case, which was not effectually relieved by the frequent extraction of the cilia, cauterizing the edge of the tarsus, the excision of a slip of skin, and smearing the eyelid with concentrated sulphuric acid, as proposed by Helling, (*Hufeland's Journ. St.* 4, *p*. 115,) Schreger, with a pair of curved scissors, cut out a triangular piece of the cartilage of the eyelid at the place where the cilia were most troublesome. The great benefit derived from the operation then led the same practitioner to suggest the removal of the whole of the inverted edge of the tarsus, towards the inner canthus, where some irritation was yet maintained. The plan, though followed by severe pain, appears to have succeeded. (*Chir. Versüche, B.* 2, *p*. 253.)

Mr. Saunders entertained a favourable opinion of Mr. Crampton's operation for the cure of the disease in its early stage; but, he contended, such a vicious bending of the tarsus inward was often the consequence of repeated ophthalmy, attended with ulceration of the conjunctiva and inside of the eyelid, so that every endeavour to rectify the wrong position of the tarsus, and restore its original direction, would be fruitless. Hence, he believed that its excision was decidedly indicated; an operation, which is said to be followed by no pain, nor uneasiness, and which is sure in its effect. No particular shortening of the eyelid ensues; the deformity is materially lessened; and, unless the cornea be already too opaque, perfect vision is re-established. Mr. Saunders directs a piece of thin horn, or a plate of silver, having a curvature corresponding to that of the eyelid, to be introduced under this part, with its concavity towards the eyeball. On this instrument, the eyelid is to be stretched. An incision is to be made through the integuments and orbicularis palpebrarum, down to the tarsus, immediately behind the roots of the cilia. The cut should extend from the punctum lachrymale to the external angle. The exterior surface of the tarsus is then to be dissected, until the orbital margin is exposed, when the conjunctiva is to be cut through directly by the side of the tarsus, which must now be disengaged at each extremity. The punctum lachrymale must be left uninjured. The operation is described as being simple, and if any embarrassment arises, it is from the hemorrhage of the ciliary artery, the blood sometimes obscuring the punctum lachrymale, just when the operator is about to divide the tarsus by the side of it. No dressings are required, it being merely necessary to keep the eye covered for a few days. The skin will continue to be elevated, just as the perfect eyelid was; and, though less completely, yet enough to leave the pupil clear, when the eye is moderately directed upward. In all the cases, in which Mr. Saunders operated, a fungus grew from the wound. He recommends the excrescence to be destroyed with caustic, or the knife.

Respecting this operation, I shall merely observe, that it is more severe, than that advised by Scarpa, and even than the method of Schreger, and must leave greater disfigurement. Unless, therefore, the latter methods prove ineffectual, I should consider the practice unjustifiable. Mr. Guthrie has seen three persons, on whom this operation had been performed, and on two of them by Mr. Saunders himself: in all the deformity was considerable, and the relief only partial. (*Operative Surgery of the Eye*, *p.* 25.) Nor is Schreger's method allowable, except in cases which resist the milder plan, sanctioned by Beer, Scarpa, and all the best practitioners in ophthalmic surgery.

Mr. Guthrie recommends the following operation, as adequate to the cure of the worst cases. A small narrow knife, or one blade of a blunt pointed scissors, is to be introduced close to the external angle, and a perpendicular incision made, from a quarter to half an inch in extent, or of sufficient length to render the eyelid quite free. Another incision is then to be made, in a similar way, at the inner angle, without including the punctum lachrymale. "The length, to which the perpendicular incisions at both angles ought to extend, must now be decided upon by the appearance of the part: they must be continued, if necessary, by repeated touches, with the scissors, until that part of the eyelid, containing the tarsal cartilage, is perfectly free, and is evidently not acted upon by the fibres of the orbicularis muscle." The part, included in the incisions is now to be completely everted, and retained by the forefinger of the operator's left hand against the patient's brow; when, if any lateral attachment be observed, confining the lid, it is to be divided. "On letting the eyelid fall on the eye, the edge of the tarsus and the hairs will frequently appear in the natural situation, in consequence of the relaxation of the angles, which bound them down; but, if the tarsal cartilage has become altered in its curvature, this will be immediately perceived; it will turn inwards at its ciliary edge, and be completely bent at its extremities, more especially at the inner one, where it is more powerfully acted upon by the ciliaris muscle. On desiring the patient to raise the lid, he readily attempts it, but the action of the levator, in such cases of vicious curvature, causes the cartilage to resume its situation; and, on examination, the curve will be observed to be so permanently vicious, for about an eighth of an inch at each extremity, and especially at the inner, that it cannot be induced to resume its actual situation. When this is the case, the cartilage is to be divided exactly at the place, where it is bent in its length, and in a direction at a right angle with the perpendicular incision: the portion thus slit, is only connected with the common integuments of the eyelid; and although this incision scarcely exceeds one, and never two eighths of an inch, at both extremities, and in general is only necessary at the inner, it enables the surgeon to remove the altered curvature of the part." The next proceeding in Mr. Guthrie's operation consists in cutting away a fold of skin from the part of the eyelid between the incisions. Three or four ligatures are then to be introduced, and the divided parts, from which the fold has been removed, are to be brought together by the ligatures, each of which is to be twisted and fastened to the forehead with several short strips of sticking plaster. The fold of skin should be raised regularly with the fingers, and as near as possible to the margin of the eyelid. It may then be taken hold of with Beer's forceps, the grasping pieces of which are transverse, slightly curved, and shut with a spring. The skin, thus taken hold of, which need not be large, may now be cut away with a large pair of curved, or straight scissors. The ligatures are first inserted at each angle, and, when the vicious curvature is considerable, Mr. Guthrie not only passes them through the skin, but takes care to make the *internal one* include at its lower part, the *outer edge* of the margin of the eyelid. The ligatures, thus placed, are to be equally drawn up on the forehead, until the eyelid is *completely everted*, when they are to be fastened in the manner above specified. In order to prevent union by the first intention, and make the granulating process necessary, the edges are slightly touched with the sulphate of copper. The eye and eyelids are now to be carefully cleansed; a piece of lint, spread with the ung. cetacei, is to be placed upon them; a small compress under the edge of the orbit; and a retaining bandage over the whole. The next morning the bandage and lint are to be removed, the eye fomented and cleansed, and the dressings replaced. On the 2nd day, great care must be taken, that the ligatures keep the lid sufficiently raised; and, if any union has taken place by adhesion at the angles of the incisions, it must be broken through with the probe. On the 3d day, the plasters on the forehead should generally be changed. The ligatures themselves must be supported by straps of plaster, placed vertically between them; and the edges of the incisions should be touched again with the sulphate of copper, or separated with a probe. In a few days more, the ligatures cut their way out, and by the time the parts are healed, the eyelid will have resumed its natural situation. (*Operative Surgery of the Eye*, *p.* 31, *&c.*) Operations on the same principle are also recommended by Mr. Guthrie for the lower eyelid.

When a surgeon chooses to try the foregoing operation, he ought to be certain, that the cartilage of the tarsus is so altered in its shape, as not to afford much chance of effectual relief from milder plans.

Inversion of the lower eyelid is much less common, than that of the upper one. The late Mr. Saunders never saw this disease arise from the same causes which induce it in the upper eyelid, though he acknowledges the possibility of such a case. However, he met with several instances of the affection, in consequence of encysted tumors, which, as they increased, carried the orbital edge of the tarsus outwards, and, in the same proportion, inclined the ciliary edge towards the globe of the eye.

An inversion of the inferior palpebra is sometimes produced by inflammation and swelling of that part of the conjunctiva, which connects the eyelid with the eyeball. In cases of ophthalmy, this membrane often forms between the latter parts a distinct fold, which is situated just on the inside of the orbital edge of the tarsus, and pushes it outward; while the contraction of the orbicularis muscle turns the ciliary edge inwards, and inclines it between the swelling of the conjunctiva and the eye. In this particular case, Mr. Saunders assures us, that replacing the eyelid in the early stage of the disease, and maintaining it so, until the ophthalmy has been lessened by proper means, will be found effectual. But, when the conjunctiva is much thickened and indurated, Mr. Saunders recommends cutting such diseased part of it away, and the application of compresses to keep the orbital margin of the tarsus inward. (See also *Travers's Synopsis, p.* 234 *and* 355.)

Albinus has recorded a species of trichiasis, which originated from the growth and inversion of one of the hairs upon the caruncula lachrymalis. The plan of relief consisted in plucking out the irritating hair; but it is not mentioned, whether the hair grew again.

J. Scultetus, Trichiasis Admiranda, sive Morbus Pilaris Mirabilis, 12*mo. Norib.* 1658. *Scarpa sulle principali Mulattie degli Occhi. R. Crampton, Essay on the Entropeon, Lond.* 1805. *Saunders's Obs. on several practical Points relative to the Diseases of the Eye, Edit.* 3. *Richter's Anfangsgründe der Wundarzneykunst, B.* 3. *G. J. Beer, Lehre von den Augenkraukeiten, B.* 2, *p.* 111—117, 8*vo. Wien.* 1817. *Schreger, Chirurgische Versüche, B.* 2. *Neue Methode die Trichia zu Operiren, p.* 253, 8*vo. Nürnberg.* 1818. *B. Travers, Synopsis of the Diseases of the Eye, p.* 232—354. *&c.* 8*vo. Lond.* 1820. *Jaeger, Diss. sistens Diagnosin et Curam radicalem Trichiasis, Distichiasis, necnon Entropii. Viennæ. This method is said by Mr. Guthrie to be similar to that proposed by Saunders. G. J. Guthrie, Operative Surgery of the Eye,* 8*vo. Lond.* 1823.

TRISMUS. (from τρίζω, to gnash the teeth.) The locked jaw. See *Tetanus.*

TROCHAR, or TROCAR. (from the French, *trois-quart*, three-fourths, from its point being of a triangular form.) An instrument used for discharging aqueous fluids, and, now and then, matter from different cavities in the body, particularly those of the peritoneum, and tunica vaginalis, in cases of ascites and hydrocele. Trocars are also employed for tapping the bladder, dropsical ovaries, &c.

A trocar consists of a perforator, or stilette, and of a cannula, which is so adapted to the first piece of the instrument, that, when the puncture is made, they both enter the wound together, with perfect ease, after which, the stilette being withdrawn, the cannula remains in the wound, and gives a ready passage for the fluid outward.

Such are the uses of a trocar, and the principles on which it should be constructed. It would be unnecessary in this work to detail every little particularity in the instrument. I shall merely observe, that the triangular-pointed trocars seem to retain the greatest share of approbation; for, although those of a flat, lancet-pointed shape enter parts with more ease, their cannulæ are not large enough for the ready escape of fluids, which are at all thick, gelatinous, or blended with hydatids, and flaky substances.

The trocar for puncturing the bladder from the rectum, should be longer than a common trocar, and of a curved form; but, as Mr. Carpue has explained, it should not be passed too high up the rectum, lest the peritonæum be wounded.

Surgeons ought always to have, at least, three trocars; one of full size, another of middling width, and a third of small dimensions. In cases of hydrocele, the latter is often preferable.

TRUSS. (*trousse*, French.) *Bracherium.* A bandage, or apparatus, for keeping a hernia reduced. A truss, which fulfils its intention properly, should compress the neck of the hernial sac, and the ring, or external opening of the hernia, in such a manner, that a protrusion of any of the contents of the abdomen will be prevented with complete security. Hence, it is the indispensable quality of a good truss, first, to make effectual and equal pressure on the parts indicated, without causing pain, or inconvenience to the patient; secondly, not easily to slip out of its right situation, in the varying motions and positions of the body.

Trusses are either of an elastic or non-elastic kind. The latter are composed of leather, fustian, dimity, or similar materials. These cannot be at all depended on, and, should, therefore, be entirely banished from surgery. Since, (as Mr. Lawrence has remarked) the size of the abdomen varies, according to the different states of the viscera, and to the motions of its parietes in respiration, a non-elastic bandage must vary constantly in its degree of tightness, and keep up either too great, or too little pressure. The omentum, or intestine, easily slips out when the opening is not exactly closed, and the patient, who wears such a bandage, must be in a state of constant insecurity. Those, who lead an active life, or are obliged to use laborious exertions, will be more particularly exposed to risk. If the patient, after experiencing these defects, endeavours to remedy them by drawing the bandage tighter, he may confine the viscera, but he produces other inconveniences. The increased pressure injures the spermatic chord, and may affect the testicle: the integuments become red, painful, and excoriated; and the bandage must be entirely laid aside, until the parts have recovered. Richter has often seen painful tumefaction of the testicle, hydrocele, and even cirsocele, produced from this cause, and entirely dissipated by the employment of a proper truss. (*Traité des Hernies, p.* 24.) He also saw the pad of a non-elastic bandage excite, in the region of the abdominal ring, a considerable inflammation, which terminated after a few days in suppuration. The hernia never appeared again after the cure of the abscess. The inflammation had extended to the neck of the sac, and obliterated that part.—(*On Ruptures, Ed.* 3, *p.* 69, 70.) The *spring* is a very essential part of every elastic truss, and it consists of a flat long piece of steel, which is adapted to the side of the body, on which the hernia is situated. It is not a great many years since the spring used to be made of common iron, and Arnaud and Richter express their preference to a mixture of malleable iron and steel, so that the instrument may be moulded by the hand to any particular shape; but, as Mr. Lawrence well observes, a truss, which admits of such management, must be more or less liable to the objections, which apply to inelastic bandages, and the only material, which possesses the requisite qualities of firmness and elasticity, is well tempered steel. The front part of the steel spring has an expanded form, and, when the truss is properly applied, ought to be situated over the mouth of the hernial sac. The spring of a truss has commonly been a semicircle, with the posterior end resting on the spine. Camper proposed to carry it round to the anterior superior spine of the ilium on the sound side; a plan, of which Scarpa highly approves. Trusses of this form fit with a degree of steadiness, which cannot be given to others, by tightening the strap. They keep up the rupture better than even a stronger spring of the common kind. Under the back surface of the anterior end of the spring is placed the pad, which should be adapted in shape and size to the passage, which is intended to be shut up. The steel spring is usually covered with leather, is lined with soft materials, and after being put on the patient, is fastened in its situation by means of a strap, which extends from the two ends of the spring, round that side of the body, on which the hernia is not situated. Hare-skin, with the fur outwards, is sometimes considered the best covering for preserving the spring from the ill-effects of perspiration.

When it is necessary to make strong compression, as in large old ruptures, and in persons who cannot avoid labour and exercise, the elastic spring should be made accordingly thicker and broader. But, an object of the first-rate importance is to make the spring press equally upon every point of the body, which it touches. This is what demands the earnest attention both of the surgeon and the instrument-maker, especially as the hips of some individuals are flat and narrow, while those of other persons are broad and prominent. A thick, flexible, metallic wire, accurately applied round the pelvis, will serve to take the measure and proper shape of the spring, which may afterwards be altered a little, if found necessary. The wire, however, should be somewhat longer, on account of the length of the spring.

The springs of trusses, intended for children, and persons, who do not undergo much labour and exertion, need not be made so strong, as those designed for hard working active people.

The idea, that children cannot wear steel trusses, is as erroneous, as it is dangerous in its practical consequences; a point, on which Mr. Pott has strongly insisted.

Trusses are sometimes fabricated with a pad moveable on the spring, instead of being riveted to it. This may be inclined upwards, or downwards, according to the form of the abdomen; and it is retained at the desired point by a spring fitting into the teeth of a rack. In others, the plate contains a screw, by which the cushion is pushed further inward, or allowed to recede at pleasure. Although there cannot be a doubt, that some of these inventions possess considerable merit, and are in certain instances superiorly useful, it must be confessed, that, in general, their utility is not so much greater, than that of common pads, as to make amends for the want of simplicity and the increase of expense. I should be sorry, however, to say any thing that would unfairly discourage all such ingenious endeavours to improve an instrument so difficult to bring to perfection as a truss; especially as I believe there are particular cases, in which pads, with racks, screws, springs, &c. may be employed with great advantage.

Notwithstanding every care, sometimes even elastic trusses cannot be hindered from slipping away from the part, which they are designed to compress. Sometimes they slip downwards, which in fat subjects is generally caused by the projection of the abdomen. Occasionally, the fault consists in the instrument becoming displaced in the direction upwards, which mostly happens in thin persons, and is produced by the flatness of the abdomen. In the first case, the displacement is to be prevented by the use of an elastic scapulary; in the second, the slipping of the pad upwards is to be prevented by the employment of a thigh strap.

When a patient is afflicted with a rupture on each side, the two protrusions may be very well kept up by means of a single truss, made with two pads, which are joined together, at the exact distance of the rings from each other, by a piece of steel, applied over the convexity of the symphysis of the pubes, and proportioned in length to the space between the two openings, through which the viscera descend. In such cases, however, it is absolutely necessary to have the spring stronger, than if there were only one rupture. The truss should also be put on that side of the body, upon which the hernia most difficult to retain is situated. There are some practitioners, however, who give the preference to the use of two single trusses, joined together in front and behind with suitable straps.

With respect to the application and use of trusses, the following instructions seem to merit attention.

1. A truss should never be first applied, or changed, except when the patient is in the horizontal posture, and it is known, with certainty, that all the contents of the rupture are completely reduced.

2. The first applications of a truss should always be made under the superintendence of the surgeon himself; and care should be taken to put on the instrument in such a manner, that the lower third of the pad will compress the neck of the hernial sac against the os pubis, while the upper portion will compress the abdominal ring. The surgeon should also make the patient acquainted with the right manner of applying the truss; the principles on which it keeps up the bowels, and affords a chance of a radical cure; the requisite cautions to be observed, &c. When a patient first begins to wear a truss, he should be particularly careful not to be guilty of any imprudent exertions, and it behoves him to observe most attentively, that the instrument does not slip from its proper situation. It will also be necessary for him to pay attention to the instrument being neither too tight, nor too loose.

3. The patient ought to be provided with at least two trusses, which should be changed every morning in bed. In order to save the truss,

especially in fat persons who perspire a great deal, it is a good plan to lay a soft piece of calico under the pad.

4. An uneasiness about the ring, which always gives rise to a suspicion that a portion of intestine, or omentum, is protruded, makes it proper to take off the truss, carefully examine the parts, and reduce them if they have descended.

5. When the skin is excoriated by the truss, the part may be cured by sprinkling upon it the powder of acetite of lead, fullers' earth, lapis calaminaris, &c. or bathing the part with an astringent lotion. It will also be right to protect the excoriated place with a piece of linen put under the truss.

6. When the pressure of the truss excites affections and swellings of the spermatic chord and testicle, either the thigh strap must be relaxed, or the lower part of the pad made less prominent. And when strong pressure is absolutely necessary to keep the hernia reduced, the pad should have an excavation in it over the spermatic chord. Whoever wears a truss should be careful to employ it day and night, without interruption, so that there may be no opportunity for the hernia to protrude again. If under the employment of a truss, the rupture once descends again, either a strangulation happens from the narrowness of the neck of the sac; or, at all events, the hope of a radical cure, which may have been entertained for years and months, is destroyed in a moment; for, experience has put it beyond all doubt, that, by the continual unremitted use of a truss, and the steady retention of the contents of the hernia, the neck of the hernial sac, and the ring, may be gradually lessened in diameter, until they are entirely closed, and a radical cure of the rupture effected. This is more frequently observed in young subjects, seldom in adults, and scarcely ever in persons of advanced years. But trusses must be worn a long while; nor should the patient venture to lay aside their use till after many cautious attempts; beginning the experiment at first only in the night time, and not making it in the day till after a considerable period from the time, when he first thinks himself safe. The longer and more attentively a truss is worn, the greater is the hope of a radical cure. (*Callisen, Syst. Chir. Hod. T.* 2.)

In the 2d vol. of the last edition of the First Lines of the Practice of Surgery, the truss for navel ruptures, which was devised by Mr. Eagland, and latterly preferred by Mr. Hey, is described; and in the article *Hernia*, an account is given of the truss for umbilical hernia, invented by Mr. Marrison, of Leeds, and described by Mr. Hey. In the same part of this Dictionary may also be found some observations, relative to the place, against which the pressure of the pads of trusses should be directed in cases of inguinal hernia, in conformity to Sir A. Cooper's description of the situation, at which the parts first protrude from the abdomen.

TUMOR. A swelling. In the present article, I intend only to treat of, what are usually called, sarcomatous and encysted tumors. Mr. Abernethy thinks, that the manner in which tumors are formed is best illustrated by those, which hang pendulous from the membranous lining of different cavities. This gentleman adverts to an example noticed by Mr. Hunter, in which, on the cavity of the abdomen being opened, there appeared lying upon the peritoneum, a small portion of red blood recently coagulated. This, on examination, was found to be connected with the surface, upon which it had been deposited, by means of an attachment, half an inch long, and this neck had been formed before the coagulum had lost its red colour. (See *Trans. for the Improvement of Med. and Chir. Knowledge, Vol.* 1, *p.* 231.) Mr. Abernethy observes, that if vessels had shot through the slender neck, and organized the clot of blood, this would then have become a living part: it might have grown to an indefinite magnitude, and its nature and progress would probably have depended on the organization, which it had assumed. He mentions his possession of a pendulous tumor, found growing from the surface of the peritoneum, and which was undoubtedly formed in the same manner as the tumor noticed by Mr. Hunter, viz. by vessels shooting into a piece of extravasated blood, or lymph, and rendering it a living organized substance. Tumors, in every situation, and of every description, are probably formed in the same way. The coagulating lymph being effused, either accidentally, or in consequence of disease, is afterwards converted into a living part, by the growth of the adjacent vessels and nerves into it. Mr. Abernethy remarks, that, when the deposited substance has its attachment by a single thread, all its vascular supply must proceed through that part; but, in other cases, the vessels shoot into it irregularly at various parts of its surface. Thus, an unorganized concrete becomes a living tumor, which has at first no perceptible peculiarity as to its nature. Although its supply of blood is furnished by the vessels of the surrounding parts, it seems to live and grow by its own independent powers, while its future structure seems to depend on the operation of its own vessels. Mr. Abernethy conceives, that the altered structure of an enlarged gland affords no contradiction to the above account, as, in this latter case, the substance of the gland is the matrix, in which the matter, forming the tumor, or enlargement, is deposited. The structure of a tumor, he observes, is, sometimes, like that of the parts, near which it grows. Such as are pendulous in joints, are cartilaginous, or osseous. Fatty tumors frequently form in the midst of the adipose substance, and he has seen some tumors growing from the palate, which had a slender attachment, and resembled the palate in structure.

However, this resemblance of the structure of a tumor, to that of the neighbouring parts, is not always observable. I have in my own possession a completely cartilaginous tumor, which I found in the midst of the fat near the kidneys. The pendulous portion of fat, growing from the peritoneum, and mentioned by Mr. Abernethy, serves as another instance of the fact; and, one might add, that every polypus, which we meet with, bears no resemblance in structure to the neighbouring parts. He has seen bony tumors, which were unconnected with bone, or the periosteum, and he observes, that the structure of a tumor is, in general, unlike that of the part, in which it is produced.

When the coagulable part of the blood is effused, and the absorbents do not take it away, the surrounding blood-vessels are supposed to grow into it, and convert it into a vascular tumor. The effusion of the coagulable part of the blood may be the effect of accident, or of a common inflammatory process, or it may be the consequence of some diseased action of the surrounding vessels, which (diseased action) may influence the organization, and growth of the tumor.

In the former cases, the parts surrounding the tumor may be considered simply as the sources, from which it derives its nutriment, whilst it grows apparently by its own inherent powers, and its organization depends upon actions begun and existing in itself. If such a tumor be removed, the surrounding parts being sound, soon heal, and a complete cure ensues. But if a tumor be removed, whose existence depends on the disease of the surrounding parts, which are still left, and this disease be not altered by the stimulus of the operation, no benefit is obtained. These parts again produce a diseased substance, which has generally the appearance of fungus, and, in consequence of being irritated by the injury of the operation, the disease is in general increased by the means, which were designed for its cure. It appears, therefore, that in some cases of tumors, the newly formed part alone requires removal, whilst in others, the surrounding substance must be taken away, or a radical cure cannot be effected. (*Abernethy's Surg. Obs.* 1804.) This gentleman conceives, that the irritation of the tumor itself, when once the swelling has been produced, keeps up an increased action in the surrounding vessels, so as to become a sufficient cause of the disease continuing to grow larger. As the tumor becomes of greater magnitude, it condenses the surrounding cellular substance, and thus makes for itself a sort of capsule. The close, or loose manner, in which tumors become connected with the surrounding parts, seems to depend very much on the degree of irritation and inflammation excited in the circumjacent parts. When a tumor has been at all tender, painful, and inflamed, it is generally found intimately adherent to all the neighbouring parts. Mr. Abernethy also believes, that the increased irritation, which a tumor creates, when it has exceeded a certain size, may explain, why some tumors, which are at first slow in their progress, afterwards begin to grow with great rapidity.

The process, by which tumors are formed, is commonly thought to be attended with an increased action of the vessels, which supply them with blood. It is supposed, in short, to be the same kind of process, which forms all the thickenings and indurations, which, under various circumstances, occur in different parts of the human body. It has sometimes been named *chronic* inflammation, to distinguish it from that which is more quick in the production of certain effects, and is often attended with a manifest throbbing in the part affected. This subject of chronic, or passive inflammation is one, about which very little certain is known; and even the name itself has commonly been admitted only on the supposition, that some kind of increased action exists in the vessels, though of a slower and less evident kind, than what prevails in acute inflammation. According to Dr. Wilson Philip, the difference between what is called active and passive, inflammation seems to depend upon "the degree, in which the arteries supplying the *vis à tergo* to the debilitated vessels are excited."—(*Laws of the Vital Functions, p.* 282, *Edit.* 2.) If this position be satisfactorily established, one important step will be made to a knowledge of the differences between acute and chronic inflammation; but, much would yet remain for explanation before our ideas of the later process would be at all complete.

In a work of considerable merit, Dr. Baron of Gloucester, offers many considerations against the correctness of the ordinary doctrines, respecting the formation of tubercles and tumors. By *tubercles,* he means disorganizations composed of one cyst, "whatever be its magnitude, or the nature of its contents," and by *tumors,* he would understand "morbid structures, that appear to be composed of more than one tubercle." (*On Tuberculated Accretions of Serous Membranes, &c. p.* 213.) From certain appearances, traced in dissections, Dr. Baron infers, that all tubercles, wherever situated, and of whatever substance composed, were at their commencement small vesicular bodies, with fluid contents; hydatids, as he endeavours to prove. "It is impossible to say, how minute they may have been at their origin, nor how large they may grow, before their transformations begin; nor are we acquainted with the circumstances, which occasion such transformations." To these *changes* in hydatids, (according to this writer,) certain tubercles owe their existence, and "on the *size, relative position,* and *structure of the tubercles, which are so formed, depend the characters of many of the most formidable disorganizations,* to which the human body is exposed." (*P.* 215.) A single hydatid, when it is transformed (says Dr. Baron) will give rise to one tubercle. "It may be pendulous, or embedded in any soft part, or it may be found between the layers of membranes, and wherever the textures are of such a nature, as to admit of its growth. It may be so small as to be scarcely visible, or, it may acquire a very great magnitude. Single tubercles are often seen in a viscus, while all the rest of the organ is free from disease, and its functions are performed in an uninterrupted manner. But, it is evident, that the same state of the system, (whatever that may be,) which calls one tubercle into existence, may generate an indefinite number. They may be diffused through the whole of a viscus, leaving nothing of its original texture, or they may occupy any proportion of it, or extend to the contiguous parts, and involve them in the same form of disease."—(*P.* 216.) When hydatids growing in clusters, and hanging within cavities, become changed into tubercles, Dr. Baron conceives, that the morbid appearances must of course correspond in some degree, with the original distribution of the parts. He has seen tubercles attached in this form to the choroid plexus, to the valves of the heart, to the fimbriated extremities of the Fallopian tubes, and to the omentum, and convolutions of the bowels. In the latter instance, they were very minute, the largest not being bigger than the head of a pin, and their number defied all calculation.

"Other varieties in the arrangement of the elementary parts of morbid growths, will of course cause corresponding varieties in their appearance. Thus, *when hydatids are enclosed, the one within the other, and are transmuted into solid substances, a section of these substances will exhibit a series of concentric laminæ.*"

Another variety pointed out by Dr. Baron, is "when an immense number of very small tubercles are generated in juxtaposition, and unite together. Wherever such an event occurs, the original texture of the part is entirely lost, and a mass of varying degrees of density and firmness formed. In the earlier stages of its growth, a granulated appearance may be distinctly traced; but, in process of time, this disappears, the consolidation becomes more complete, and substances of a gristly, or cartilaginous, or scirrhous texture may be found. I have traced (says Dr. Baron) the whole of these gradations in the liver, the lungs, the pleura, the omentum, the peritoneum, and in tumors in other parts." (*P.* 219.)

"Sometimes, small hydatids grow from the outer or inner surface of large ones, or float within them. I have seen, (says Dr. Baron,) from a source of this kind, the uterus and its appendages converted into an enormous misshapen mass, tubercles of the size of the fist growing from it, while these again were surmounted by smaller ones in many gradations. Some had glairy contents, others were in a state of scirrhosity, and others were but little changed, having thin delicate cysts, and containing a transparent fluid.

"But, perhaps, (remarks Dr. Baron) the most important variety of all, is, when tubercles, originally distinct from each other, approximate as they increase in size, ultimately unite, and form tumors, which have received different designations, according to the predominant character of their contents and internal structure. It was chiefly to elucidate this part of the subject, that I made the distinction between the words tumor and tubercle, &c." (*P.* 219.) By thus adverting to the primitive arrangement, number, size, &c. of hydatids, and their subsequent mutations, Dr. Baron tries to account for the varieties of encysted and sarcomatous tumors, fungus hæmatodes, tuberculated sarcoma, scirrhous swellings, &c. &c. The late Dr. Adams, as is well known, referred cancer to the living state, growth, and multiplication of the hydatid. (*On the Cancerous Breast, p.* 77.) In order to account for the various appearances of the disease, he has divided hydatids into a number of species, as *lymphatica*, *cruenta*, and *carcinomatosa*, and suspects, that there may be others. These, he affirms, are lodged in different cavities, or enclosed in a fungus, which is occasioned by any individual, or numbers, stimulating the surrounding parts to generate it, for the purpose of dividing the dead from the living. This fungus is a nidus, formed altogether for the protection of another generation; by means of it, the living families are separated from the dead, and their preservation is secured. They die, he says, without otherwise affecting the body, in which they existed, but, by their local stimulus, and he declares, that his object is to prove the *animalcular existence* of carcinoma. Now, according to Dr. Baron, this main position is the fundamental error of Dr. Adams's book; for, "in no rational, nor legitimate, point of view may cancer be said to have an *animalcular existence;* because admitting, for the sake of argument, that hydatids are animalcules, it has, I trust, been shown, (says Dr. Baron,) that *it is to the loss of the hydatical character altogether, and the transformations of these bodies, that the morbid appearances in this, and many other diseases, are to be referred.*" (*P.* 276.)

Although I consider the evidence and remarks, which Dr. Baron has adduced, in support of his opinions in many respects interesting, the facts brought forward do not appear to me to justify the conclusion, that the formation of tubercles and tumors originally depends upon hydatids, and their transformation. That hydatids are sometimes found within diseased structures, and that cells, cysts, granulated, and tuberculated appearances are often noticed in tumors of different kinds, are facts universally received. But, the presence of hydatids in the *unchanged* state is only an occasional circumstance, whereas, if they were generally a cause of tumors by undergoing some unexplained transformation, it is impossible to suppose, that some of them, at least, would not be more commonly found in a distinct, unaltered form within, or around all swellings, imagined to proceed from clusters of them. As the growth of tumors, formed on these principles, could not, I imagine, be accounted for, without supposing a continual multiplication and transformation of hydatids, either within, or around the swellings, one would expect, that some visible hydatids, previously to their transfiguration, would certainly be apparent on minutely examining the interior and the circumference of the diseased structure. Yet, I am not aware, that such fact has been proved to be generally the case, either by the aid of the scalpel, or the microscope. The observation of cavities, cells, and tuberculated appearances in some kinds of tumors, is no proof, that such modifications of structure are transformed hydatids. Besides, if my limits would allow me to consider this topic further, many reasons might be urged against the hydatid doctrine, arising from the consideration of the changes evident in the blood-vessels, supplying parts, in which a considerable tumor is situated. Thus, we often see the trunks of the arteries, running towards such parts, doubled in size, just as is noticed, with respect to the carotid in the natural growth of the stag's horn, and indicating, at least, that the formation and increase of swellings are effected through the medium of the blood-vessels. The sudden effect of tying the arteries, by which a tumor is supplied with blood, would also be difficult to explain, if the growth of the swelling really depended upon some undefined transformation of hydatids.

It seems to be generally admitted, that the growth of all tumors may be retarded, and that sometimes, they may even be diminished by means of topical bleeding with leeches, and keeping the parts in a continually cool state, by the incessant application of cold sedative washes. Afterwards, when the increased action of the vessels seems checked, and the tumor ceases to enlarge, discutients are indicated, such as frictions with mercurial ointment, pressure, electricity, rubefacient plasters, solutions of salts, blisters, and issues. Very few sarcomatous or encysted tumors, however, are ever completely removed by these local means. The swelling, on the contrary, generally increases, notwithstanding them, and the irritation of the disease by stimulants, is not altogether unattended with danger of the affection becoming changed by them into very malignant, and dangerous cases, sometimes to all appearances cancerous. The most advisable plan is to recommend the removal of sarcomatous tumors with the knife, while they are small, and in an incipient state. For thus they are got rid of by an operation, which is certainly trivial, compared with what might afterwards become requisite, if the disease were allowed to proceed, and attain an enormous magnitude.

Tumors, Sarcomatous. These have been so named, from their firm, fleshy feel. They are of many kinds, some of which are simple, while others are complicated with a malignant tendency. Mr. Abernethy has attempted to form a classification of sarcomatous tumors, for the different species of which he has proposed names, deduced from the structure, which they exhibit on dissection. This gentleman has named the kind of swellings, which he first considers, *Common Vascular*, or *Organized Sarcoma*. Under this title, Mr. Abernethy includes all those tumors, which appear to be composed of the gelatinous part of the blood, rendered more or less vascular by the growth of vessels through it. The vessels which pervade this substance are, in different instances, either larger, or smaller; and more or less numerous; being distributed in their usual arborescent manner, without any describable peculiarity of arrangement. Perhaps all the varieties of sarcomatous tumors are at first of this nature. The structure under consideration, is met with not only in distinct tumors, but also in the testis, mamma, and absorbent glands. When a common vascular, or organized sarcoma has attained a certain magnitude, the veins of the skin seem remarkably large, and their winding under the integuments excites notice. This kind of sarcoma is not at all tender, so that it may be freely handled, and also electrified, without giving pain. The tumor sometimes grows to such a size, that the skin bursts, the substance of the swelling sloughs out, and the disease is got rid of. However, this mode of cure is attended with such terrible local appearances, and so much fever, &c. that the removal of the disease with the knife is to be preferred. The enormous mass of 44½ pounds' weight, involving the penis, testes, and scrotum, and lately removed by Mr. Liston, together with those organs, (see *Edinb. Med. and Surg. Journ. No.* 77,) was probably the kind of tumor, which Mr. Abernethy would call a *common vascular sarcoma*. Other similar cases are noticed in another place. See *Scrotum.*

The second kind of sarcomatous tumor, noticed in Mr. Abernethy's classification, is the *Adipose Sarcoma*. Every one, at all in the habit of seeing surgical disease, must know, that fatty tumors are exceedingly common. Mr. Abernethy believes, that these swellings are formed in the same manner as others, viz. in the first instance, they were coagulable lymph, rendered vascular by the growth of vessels into it, and that their future structure depended on the particular power and action of the vessels. According to Sir Astley Cooper, "they are not composed of fatty matter only; but the adipose membrane is increased, and their structure is similar, only somewhat more compact, to that of the fatty membrane in other parts of the body." (*Med. Chir. Trans. Vol.* 11, *p.* 440.) This fact is very much against the doctrine, which ascribes the origin of tumors to hydatids and their transformation. Adipose sarcomatous tumors always have a thin capsule, formed by the simple condensation of the surrounding cellular substance. It adheres very slightly to the swellings, and, chiefly by means of vessels, which pass through this membranous covering in order to enter the tumor. As Mr. Abernethy has accurately described, the vessels are so small, and the connexion so slight, that, in removing the tumor, no dissection is requisite, as the operator may easily put his fingers between the swelling and its capsule, so as to break the little vascular connexions, and entirely detach the disease. Some individuals seem to have a disposition to the formation of fatty tumors upon various parts of their bodies, a memorable example of which is recorded in the Revue Medicale. The patient was a young woman, aged 18, whose constitution was not in any way remarkable. Although very lean, and of the middle stature, she weighed 169 French pounds. Between her shoulders were two tumours eight inches long and three broad. A third, of less size, was situated near the right armpit. A fourth arose from the inferior angle of the shoulder blade, and was 15 inches long, and six broad. A fifth, lower down, was six inches long, and five broad. The sixth which was larger than a man's head, was situated upon the right hip. The seventh, a small one, was below the right trochanter major. The eighth, a prodigious one, arose from the left hypochondrium, and hung down as low as the middle of the calf of the leg, being two feet long, and three feet one inch in circumference at its base. All these tumors were of a fatty nature, soft, uneven, and quite unconnected with internal organs, or the muscles. (See *Quarterly Journ. of Foreign Medicine, Vol.* 4, *p.* 618.)

The substance of adipose tumors is never furnished with very large blood-vessels, and the fear of hemorrhage, which frequently deters surgeons from operating, is quite unfounded. It is an undoubted fact, that there is no species of tumor, that can be removed with so much celerity, with such apparent dexterity, or with such complete security against future consequences, as those of an adipose nature. However, now and then, when the tumor has been sometimes in an inflammatory state, the capsule becomes thickened, and intimately adherent to the surface of the swelling, so that the separation of the disease is more difficult, and requires the knife to be more freely employed. The tumor also sometimes becomes, after inflammation, closely adherent to the contiguous parts. Adipose tumors often acquire an enormous magnitude. Indeed, there can be no doubt of the fact stated by Sir Astley Cooper, that they acquire a greater magnitude, than any other swelling ever reaches. Mr. Abernethy relates an example of one, removed by Mr. Cline, which weighed between 14 and 15lbs., and, which I saw myself previously to the operation. Sir Astley Cooper also mentions the successful extirpation of several adipose tumors of immense size: one weighing 14lb. 10oz. removed by himself; and another weighing 22lbs. removed from a lady's thigh by Mr. Copeland. But, a still more remarkable case is one, in which Sir Astley Cooper lately removed a fatty swelling, which weighed, independently of the blood in it, 37lbs. 10oz., and was situated on the abdomen of a man, aged 57. (See *Med. Chir. Trans. Vol.* 11, *p.* 440.) In the case above quoted from the *Revue Medicale*, and recorded by M. Dagorn, of Morlaix, the largest of the swellings weighed, after its removal, 46 French pounds. (See *Quarterly Journ. of Foreign Med. Vol.* 4, *p.* 618.) Although it is true, that when adipose swellings attain an enormous bulk, the immense size of the wound, requisite for their removal, must be dangerous, and is a strong argument in favour of having recourse to the operation at an earlier period, yet it is equally true, that large fatty swellings may be taken out, with a greater prospect of success, than any other kind of tumor, of equal size.

The next species of sarcoma, noticed in Mr. Abernethy's classification, is what he names *pancreatic*, from the resemblance of its structure to that of the pancreas. This kind of disease, it is remarked, is occasionally formed in the cellular substance; but, more frequently, in the female breast, on that side of the nipple, which is next to the arm. When a pancreatic sarcoma is indolent, and increases slowly, the surrounding parts, and the glands in the axilla, are not affected. But, some of these swellings deviate from their common character, and become of a very irritable nature, occasioning severe and lancinating pain, and producing an inflammatory state of the skin covering them, so that it becomes adherent to their surface. The absorbents leading to the axilla are also irritated, and the glands enlarged. Pancreatic sarcoma does not grow to a very large size; but, when its progress is unrestrained, the pain, attendant on the disease, becomes lancinating, and so severe, as to make the patients feverish, and lose their health and strength. Mr. Abernethy remarks, that, when the axillary glands become affected, one generally swells at first, and is extremely tender and painful; but, afterwards the pain abates, and the part remains indurated. Another is then affected, and runs through the same course.

To another species of sarcoma, Mr. Abernethy applies the epithet *mastoid*, or *mammary*, from the resemblance which this gentleman conceives its structure bears to that of the mammary gland. This kind of disease, Mr. Abernethy says, he has not often seen. In the example, which he met with, the tumor was about as large as an orange, and situated on a woman's thigh. The swelling was removed by an operation; but, the wound afterwards degenerated into a malignant ulcer, attended with considerable induration of the surrounding parts, and the woman died of the disease in two months. Mr. Abernethy conceives, that the whole of the morbid part had been cut away, but, that the contiguous parts had a disposition to disease, which was irritated by the operation, and, that if the nature of the case could have been known beforehand, it would have been right to have made a freer removal of the substance surrounding the tumor.

Mr. Abernethy places the mastoid sarcoma between such sarcomatous swellings as are attended with no malignity, and the following ones, which have this quality in a very destructive degree.

The *tuberculated* sarcoma is composed of a great many small, firm, roundish tumors of different sizes and colours, connected together by cellular substance. Some of the tubercles are as large as a pea; others equal a horsebean in size; most of them are of a brownish red colour; but some are yellowish. Mr. Abernethy mentions his having seen this species of sarcoma chiefly in the lymphatic glands of the neck. The disease proceeds to ulceration; becomes a painful and incurable sore; and ultimately occasions death.

Another kind of sarcoma, mentioned in Mr. Abernethy's classification of tumors, is distinguished by the epithet *medullary*, from its having the appearance of the medullary matter of the brain. It appears to be an exceedingly malignant disease; communicates to the lymphatic glands a similar distemper; ulcerates and sloughs, and at last proves fatal. It is particularly apt to make its attack on the testis, and is treated of in other parts of this book. (See *Fungus Hæmatodes* and *Testicle, Diseases of.*)

Mr. Abernethy includes also in his classification, *carcinomatous* sarcoma. (See *Cancer.*)

I must refer to another article, (*Mamma, Removal of,*) for an account of the plan of removing sarcomatous tumors.

Besides many operations, which have of late years been performed, and are remarkable, on account of the great size of the swellings removed, others, still more interesting, claim attention, on account of the nature and situation of the parts extirpated. On the excision of the thyroid gland, I need not here dwell, as it is elsewhere noticed (see *Thyroid Gland*); but, I feel called upon to mention some other very bold operations, executed within the last few years. The first is that, performed by Mr. Goodlad, of Bury, in Lancashire. The case was an immense tumor, situated on the left side of the face and neck, and the base of which was about twenty-eight inches in circumference. The disease extended from the external canthus of the eye above to within three quarters of an inch of the clavicle below, and some idea of the depth of its attachments may be conceived, when it is known, that the whole parotid gland was involved in it. For the purpose of obviating all danger of hemorrhage, Mr. Goodlad began with tying the carotid artery. The nature of the operation will be best understood by adverting to the appearances afterwards presented by the wound. "The whole sterno-mastoid muscle was exposed, and its fibres dissected clean, except about half an inch from its insertion into the clavicle. The wound extended backwards from behind the mastoid process to the trachea anteriorly, but became narrower in the direction of the muscle at the lower part of the neck. The submaxillary gland was exposed, and about one fifth of its substance, not appearing healthy, was removed. The digastric and the greater portion of the mylo-hyoideus were exposed. The ramus of the jaw was only covered by periosteum, except where covered by the masseter muscle, part of which, not appearing healthy, was dissected away. The whole of the condyloid process of that bone was laid bare in the same manner, and behind it the pterygoid muscles were also exposed. The membrane of the cheek was only covered by a cellular substance, which did not appear healthy; but, sufficient skin was saved to cover the zygoma. *The parotid gland was entirely removed.*" This enormous wound healed in ten weeks; but unfortunately the cure was not permanent; the disease returned, and fifteen months after the operation, the poor woman died. (See *Med. Chir. Trans. Vol.* 7, *p.* 112, *&c. Vol.* 8, *p.* 582.)

Respecting the foregoing severe operation, many surgeons may be inclined to doubt the propriety of tying the carotid artery, as a preparatory step, and, indeed, it is positively condemned in an anonymous note attached to the above case, simple temporary pressure on the exposed vessel being represented as preferable. It appears to me, however, that Mr. Goodlad's method was justifiable, and on the whole the best, because the application of the ligature to the carotid not only removed the dangers of hemorrhage during the operation, but obviated them afterwards, and no doubt lessened the necessity for a prodigious number of ligatures, for vessels, which would otherwise have poured out a profuse quantity of blood.

Nay, the hemorrhage is so profuse from the main branches of the external carotid, and mere pressure so uncertain of always commanding the flow of blood, that the patient may actually die from sudden loss of blood, as nearly happened in another very interesting case of removal of a large tumor involving also the parotid gland, and connected with the transverse process of the atlas, the basis of the skull, the meatus auditorius, mastoid process, and angle of the jaw. The operator, Mr. Carmichael, in order to complete the dissection, was obliged to divide the trunk of the facial artery: "instantly (says he) an alarming gush of blood, which evidently came from a large vessel, followed the division; *and the danger appeared the more imminent as the pressure, which Mr. Todd applied, with all the force he could exert upon the carotid trunk, was actually incapable of repressing the torrent.* There was not a moment to be lost. Mr. Colles plunged a dry sponge to the bottom of the wound, and firmly pressed on the bleeding vessel, while I made a horizontal section of the tumor, till I arrived at the cavities occupied by the sponge, with the view of exposing as quickly as possible the mouth of the bleeding vessel. This was accomplished in sufficient time to save the patient's life." Mr. Carmichael, at the conclusion of the history, remarks, that, if he were called upon to perform such an operation again, *he would, in the first instance, pass a ligature under the carotid trunk, which might be* tightened, or not, as occasion should require. The case, here spoken of, had a successful termination. One remarkable consequence was a paralysis of one side of the face, brought on by the division of the trunk of the portio dura in the operation. (See *Trans. of the King's and Queen's College of Physicians, Vol.* 2, *p.* 101, 8vo. *Dublin,* 1818.)

The next instance, which I shall notice, of the removal of an enormously enlarged parotid gland, is that recorded by Klein, the eminent operating surgeon at Stuttgardt. The patient was a woman of seventy, and the swelling extended from the ear to the shoulder. In the operation, all the branches of the facial nerve were divided; a piece of the masseter was left hanging; the external carotid artery and par vagum were left quite bare; the dissected sternomastoid lay on one side; and the temporal, external maxillary, and auricular arteries were of course divided, along with several arteries of the neck, yet, the largest of these being tied, the bleeding was very inconsiderable. The event was so successful, that, at the beginning of the third week, the wound was entirely healed.

The same distinguished surgeon also removed a fatty tumor, *extending from the buttock to the ham, and measuring three feet one inch in length, and two feet six inches in circumference.* Klein undertook its removal, on the supposition, that it was an encysted tumor lying above the fascia lata; but, it turned out to be a steatoma coming from beneath it, and reaching to the thigh-bone, and in every direction amongst the muscles, nerves, and blood-vessels of the thigh. At length, partly with the fingers, and partly with the knife, the fatty mass was separated from all its important connexions. Several vessels were tied, and amongst them the profunda femoris. However, not more than a pound of blood was lost. The tumor, after its removal, *weighed 27lb. and three quarters.* The patient, a woman 44 years of age, went on very well for eight days; but, on the ninth, she was constantly complaining of uneasiness in the foot of the affected limb; her pulse became weak and intermitting; and she sunk in the most unexpected manner. (See *Journ. für Chirurgie herausgegeben von D. L. Graefe und D. P. F. Walther, B.* 1, *p.* 106, *&c.* 8*vo. Berlin,* 1820*; or Quarterly Journal of Foreign Medicine, &c. Vol.* 2, *p.* 373, *&c.*)

In the autumn of 1823, M. Beclard removed the whole of the parotid gland, which is described as being in a truly scirrhous state: the disease, however, returned, and the patient ultimately died of it. Two curved incisions were made so as completely to encircle the tumour. The portion of it, situated on the masseter, was first detached. Then an endeavour was made to separate the tumor from below upwards; but a continuation of it was found reaching a great depth backwards, and under the pterygoideus internus. In order to avoid a hemorrhage, which it would have been difficult to stop in the operation, M. Beclard now determined to cut into the substance of the swelling, at the point, where the deep production went off from it, and, dissecting from below upwards, he removed the mass; and, together with it, the lower half of the cartilage of the meatus auditorius externus, which participated in the disease. Numerous arteries being now tied, Beclard proceeded to the extirpation of the remainder of the tumor. A part of the front and inner surface of the mastoid muscle, found diseased, was cut away. Nearly the whole of the elongation behind the jaw had been cautiously dissected out, when a large jet of arterial blood indicated, that either the external carotid, or one of its branches close to its origin was divided. M. Beclard placed his left forefinger on the point, from which the blood issued, and a double ligature was applied, one portion of it above, the other, below, the lateral opening in the carotid. The artery was now held forwards, and a little raised, while the rest of the parotid was dissected out. Only one small continuation of the tumor, situated just in front of the cervical vertebræ, was left, on account of its nearness to the internal jugular vein; and it was tied. In the wound, the masseter was seen cleanly dissected. The branches of the 7th pair of nerves had been removed with the tumor; the labial artery was denuded, but not wounded, was seen pulsating in front of the lower part of the masseter. The posterior part of the wound exhibited the mastoid process and the sterno-cleido-mastoid muscle. Internally, the styloid process, the external carotid tied with two ligatures, the stylo-hyoideus, digastricus, and rather lower down, the small part of the tumor that was tied, formed the bottom of the wound, which opened into the meatus auditorius externus. The following inferences are deduced from the case: 1st. The reality of scirrhus of the salivary glands is confirmed. 2dly. The possibility of removing the parotid demonstrated. 3dly. Hemorrhage from a wound of the carotid in the operation may be stopped by ligature; but, the attempt to remove by the first incisions that portion of the disease, which is wedged behind the jaw, is dangerous, as opening the carotid might then prove fatal; whereas, if the largest portion of the tumor be first removed, and then the rest cautiously and slowly, the carotid, if now wounded, may be more easily secured, because the mass, which lay over it, has been taken away. 4thly. The erysipelas and delirium, by which the patient was afterwards attacked, are common after operations on the face, and the return of cancerous disease but too frequent, even when completely extirpated. 5thly. The paralysis of the muscles of the face, which took place, is explained by the division of the branches of the 7th pair of nerves. (See *Archives Gen. de Med. Janvier* 1824.)

A question may be entertained, whether, in some morbid enlargements of the parotid gland, and parts extending deeply about the throat, it would not sometimes be better to be content with simply tying the carotid artery, and trying whether stopping this large supply of blood to the diseased parts, would not be followed by an absorption of the tumor? Some facts, appertaining to this question, are noticed in the article *Aneurism*, where the aneurism by anastomosis falls under consideration. It will there be seen, that the result of this experiment is not sure of permanently repressing the growth of a tumor of this last kind, even when it has this effect at first. This uncertainty will, no doubt, incline many practitioners to prefer the bold method of extirpation. Yet, others will perceive, that such an operation, notwithstanding its success in a few examples, is dreadfully severe, and must of itself in the generality of cases have fatal consequences. They will also be encouraged, in any similar instance, to try the effect of the ligature, by the cure, which Sir A. Cooper accomplished, of an enormous cutaneous enlargement of the lower extremity by tying the artery in the groin. Indeed, I am sure, that as the improvements in modern surgery advance, the plan of curing tumors by cutting off their main supply of blood, will be much more extensively adopted, than has hitherto been the case. In this way, the surgeon may attempt the dispersion of many tumors, which could not be meddled with in any other manner, and which, if left to themselves, must have a fatal termination.

TUMORS, ENCYSTED. These, which are commonly named wens, consist of a cyst, which is filled with different substances. When the contained matter is fatty, it is termed a *steatoma;* when somewhat like honey, *meliceris;* when like pap, *atheroma*. These are the three species, into which writers usually divide encysted tumors. However, some of these swellings do not conform to either of the above distinctions, as their contents are subject to very great variety indeed, and are occasionally of an earthy, bony, or horny nature. Some encysted tumors of the latter description occasionally burst, and assume the appearance of horns, by the gradual projection of the matter secreted within their cysts. (See *Sir Everard Home's Obs. on the Growth of Horny Excrescences, in Phil. Trans. for* 1791.) Last year (1824) I attended with Mr. Drew, of Gower Street, a medical gentleman, from whose hip I removed a swelling of this nature, which had become very troublesome, in consequence of its pressure making the parts around its base inflame. It had been cut off many years ago by another surgeon, but grew again. At present, there is no appearance of its reproduction, against which I guarded by carrying the incisions very deeply. I saw an excrescence of this kind removed some years ago from the scrotum of a man in St. Bartholomew's Hospital. Sir James Earle performed the operation, and, if I am not mistaken, the preparation of the disease is now in Mr. Abernethy's museum. But, still more remarkable specimens of such excrescences are preserved in the Anatomical Museum of St. Thomas's Hospital; one in particular, which resembles a ram's horn in shape, and was removed from a gardener's head at Kingston, by Dr. Roots. A further account of the case is given in Rees's Cyclopædia, article *Horny Excrescence.*

I suppose every body in London has now seen in the British Museum the horn deposited there as a curiosity, and which, with another of the same size, grew upon the head of a human subject. What is equally curious, hairs are not unfrequently found growing in the cavities of encysted tumors, (*Delpech, Précis des Mal. Chir. T.* 3, *p.* 412); and even teeth, more or less perfectly formed, have been strangely met with in the same situations. An interesting specimen of the latter occurrence, in a double encysted tumor in the orbit, was published some time ago by my friend Mr. Barnes, of Exeter. (See *Med. Chir. Trans. Vol.* 4, *p.* 316.)

It is observed by Sir Astley Cooper, that it is when encysted tumors are situated upon the temple, and near the eyebrows, and other hairy parts, that they sometimes contain hairs: these, "have no bulbs, nor canal, and differ therefore from those, which are produced on surfaces of the body, which naturally form hair." In sheep, the cysts sometimes contain wool. (*Surgical Essays, Part* 2, *p.* 233.) The manner, in which these horny excrescences are produced, is stated to be as follows: "The horn begins to grow from the open surface of the cyst; at first, it is soft, but soon acquires considerable hardness; at first, it is pliant, but, after a few weeks, it assumes the character of horn." (*Vol. cit. p.* 235; see *also Home, in Phil. Trans. for* 1791.)

Encysted tumors are generally of a roundish shape, and are more elastic than fleshy swellings. However, the latter circumstance depends very much upon the nature of their contents, and the thickness of their cysts. As far as my observation extends, encysted tumors form more frequently on the head, than any other part; but, they are very frequently met with in all situations under the integuments, and sometimes in deeper places. Encysted tumors are also very often seen on the eyelids.

According to Sir Astley Cooper, they are in general nearly globular, and, when seated on the head, feel very firm, but, upon the face, they are attended with a fluctuation, more or less obscure. The skin, covering them, is generally uninflamed; but, it is now and then streaked with blood-vessels, which are larger, than those of the surrounding integuments. "In the centre of the tumor on the skin, it often happens, that, in its early state, a black, or dark coloured spot may be seen, which sometimes continues through the whole course of the disease. In general, they are unattended with pain, are never in themselves dangerous, and only require removal from the parts in which they occur, and the unseemly appearance they produce. They move readily within the cellular membrane, if they are free from inflammation, but the skin in general does not easily move over them." (*Surgical Essays, Part* 2, *p.* 230.) The greatest number of encysted tumors, which this experienced surgeon has met with in the same individual, was sixteen, situated upon the head; and he has seen nine in another patient, as many as which number on one person I have seen myself. Four, five, and six, as Sir Astley remarks, are not uncommon. The largest, which he has ever seen, was equal in size to an ordinary cocoa nut, and grew upon the head; but, in general, they are not more than one or two inches in diameter. He considers them in some degree hereditary, as he has often heard a patient observe; "I have several swellings upon my head, and my father (or my mother) had several." They also frequently occur in several of the same family. (*P.* 231.)

According to Sir Astley Cooper, when encysted tumors are dissected, some part of their surface is found firmly adhering to the skin, while other parts are connected to it merely by the cellular membrane. The cyst itself is imbedded more or less deeply in the cellular membrane, and its thickness is different in different parts of the body. On the face, or near the outer canthus, the cyst is very thin; but, on the back, it is much thicker, and, on the head, it is so thick and firm, that it retains its form after the discharge of its contents, and is so elastic, that after being compressed, it readily expands again to its former size. Within the cyst, Sir Astley Cooper remarks, there is a lining of cuticle, which adheres to its interior, and several desquamations, of the same substance, are formed within the first lining. If the vessels of the cyst are injected, they are found to be numerous, but of small size. The cysts are occasionally met with in an ossified state. (*Surgical Essays, Part* 2, *p.* 232, 233.) It is the opinion of Sir Astley Cooper, that encysted tumors arise from the enlargement of the follicles, or glandular pores, in consequence of the obstruction of their orifice. (*P.* 236.) If this sentiment were correct, the fact would furnish another consideration against the view taken of the formation of tumors by Dr. Baron. There are some reasons, however, which render the adoption of Sir Astley's explanation difficult; for, if encysted tumors were only enlarged follicles, they would not be found, so far from the skin as they frequently are, as for instance within the orbit, between the peritonæum and abdominal muscles, and in other situations yet further from the surface of the body; and the collections of sebaceous matter, which are so often noticed, as this gentleman observes, in the follicles of the skin of the nose, and may be pressed from them in the form of worms, would, if the cause assigned were true, make encysted swellings on the nose itself exceedingly common; yet, this part is not so often the seat of such tumors, as other parts of the face. As far also as my observations extend, pressure cannot be said to have any share in giving rise to the formation of encysted tumors, because I have seen them chiefly in situations, where this kind of cause could not be suspected, as for instance, on the face and about the vertex, and not particularly round that part of the head, which is compressed by the hat. If also encysted swellings were owing to obstruction of the cutaneous pores with sebaceous matter, I apprehend, few persons would escape the disease. The cure in the early stage would also be as easily effected by the timely removal of the alleged obstruction, as the cure of the little tender points on the nose, really caused by the lodgment of the sebaceous matter in the cutaneous pores. This does not appear to me to be consonant to general experience. How the formation of steatomatous encysted swellings is to be thus accounted for, I cannot at all conceive. And, lastly, it is to be noticed, that the little swellings on the nose, arising in the way described, are, when they occur, frequently attended with soreness, from which true encysted tumors, at least, in the early stage, are completely free. These, and other, reflections lead me to believe, that the origin of encysted swellings cannot be satisfactorily explained upon the principles suggested by the above distinguished practitioner. At the same time, I ought to thank him for his kindness in showing me two cases. in which the fact of there being an opening in the skin, communicating with the cavity of the swelling, and giving occasional exit to its contents, was completely manifest; but, whether such opening actually were, or ever had been, the orifice of a sebaceous gland of the skin, is a point, which I cannot undertake to determine However, as all Sir A.

Cooper's opinions on surgical questions are deservedly valuable, I subjoin the advice, which he has given, founded upon the preceding doctrine. If the follicle can be seen only as a black spot, filled with hardened sebaceous matter, he recommends a probe to be passed into it, and the sebaceous matter to be pressed out of the tumor, which is done with little inconvenience. But, if the contents cannot be pressed out without such violence, as would create inflammation, he says, that the best plan is to make the opening larger. Other surgeons have tried to cure encysted tumors by pricking them with needles, and squeezing out their contents; or by applying stimulating and discutient applications to them. However, it is a practice, which mostly fails, and, sometimes, converts the case into a terrible disease, in which a frightful fungus shoots out from the inside of the cyst, attended with immense pain and irritation, and often proving fatal. (See *Abernethy's Surgical Observations*, 1804, *p.* 94.)

Similar dangerous fungous diseases may also arise, whenever the surgeon, in cutting out encysted tumors, leaves any part of the cyst behind.

The most advisable method, I believe, is to have recourse to the knife, before an encysted tumor has attained any considerable size. However, if it is large at the time of the operation being done, a portion of the skin must be taken away with the swelling, in the manner described in the article *Mamma, Removal of.* The chief piece of dexterity in the operation consists in detaching all the outside of the cyst from its surrounding connexions, without wounding it. Thus, the operator takes the part out in an entire state, and is sure, that none of the cyst remains behind. When the cyst is opened, some of the contents escape, it collapses, and the dissection is rendered more tedious and difficult.

Such is the common opinion, which has always appeared to me correct. However, Sir Astley Cooper states, that the best manner of doing the operation is to make an incision into the swelling, and then to press the sides of the skin together, by which means the cyst may be easily everted and removed. If the attempt be made to extract the tumor whole, "the dissection is most tedious, and, before it is completed, the cyst is either cut, or burst. So many incisions, and so much pain, may be readily prevented by opening it freely by one incision, raising its edge between the forceps," and dissecting it from its adhesions to the surrounding membrane. (*Surgical Essays, Part* 2, *p.* 240.) When the swelling is in the scalp, Sir Astley directs an incision to be made through its centre, from one side to the other, when its contents, which in this situation are very solid, are immediately discharged in a mass of the same shape as the tumor. The cyst being raised with a tenaculum, may then be easily separated.

When the foregoing difficulties are likely to be encountered, a late writer suggests the plan of first opening the cyst, washing out its contents, and then injecting into it a thin mixture of sulphate of lime, which will immediately harden, and facilitate the excision of the cyst. (*M'Ghie in Ed. Med. Jour. No.* 76.) This proposal, though ingenious, is perhaps not likely to be adopted, because the operation, which is generally easy enough without it, would thus be rendered long and complex.

With respect to encysted tumors of the eyelids, the atheroma and meliceris are said by Beer to form only upon the upper eyelid, on the side towards the temple, while he has always found the steatoma to be seated either in the vicinity of one of the eyelids, or sometimes over the lachrymal sac. The atheroma and meliceris, he says, usually lie in the loose cellular substance directly under the skin of the eyelid, though sometimes more deeply under the orbicularis muscle, or even quite underneath the levator palpebræ superioris, upon the convex surface of the tarsal cartilage, to which the swelling is then generally so firmly adherent, that it is impossible to remove this part of the cyst. Encysted tumors of the upper eyelid are commonly so moveable, that they can be pushed above the superciliary ridge of the os frontis; which is regarded by Beer as a very favourable circumstance in the operation. Though the atheroma and meliceris of the upper eyelid occasionally become as large as a pigeon's egg, Beer has never known a steatoma, in the vicinity of the eyelids, exceed the size of a hazel nut. Encysted tumors of the upper eyelid itself sometimes appear moveable, though they may be at the same time closely adherent to the cartilage. Hence, Beer recommends moving the tumor about for a few days before the operation, and trying to push it above the superciliary ridge; and, if this cannot be done, the circumstance will prove, that the swelling is connected with the cartilage, or, at least, is under the orbicular muscle, and the mode of operating regulated accordingly. With the yellow pappy substance, found in the cysts of atheromatous tumors of the eyelids, fine short hairs, scarcely one line in length, are frequently blended. Sometimes, as Beer remarks, the whole inside of the cyst is covered with these little short hairs, which may all be washed out, and are destitute of bulbs; a fact also noticed by Sir Astley Cooper. It merits attention, however, that in tumors of the meliceris kind, formed upon the eyelid, Beer never met with hairs. (*Lehre von den Augenkr. B.* 2, *p.* 607—609.) He remarks, that, when encysted swellings of the eyelid are let alone, he has never known them produce any injury to the eye itself, except in the hindrance to the opening of it, when they are large. On the other hand, if they be unskilfully removed, or rashly attacked with caustic, various ill consequences may ensue; as for instance, fistulæ of the lachrymal gland, entropium from a shrinking of the tarsal cartilage, ectropium from destruction of the skin, and the hare eye from an actual shortening of the upper eyelid. In consequence of the inflammation, caused by escharotics, Beer has more than once, found the integuments so adherent to the tumor, that in the operation, the removal of a considerable piece of them was unavoidable. But, says he, when swellings of this nature are properly treated, in good time, they may be removed, without leaving any vestige behind, excepting a trivial scar. Professor Beer joins all the best modern surgeons in considering the entire removal of the sac, and the reunion of the wound by the first intention, as the safest and most effectual method of curing encysted tumors of the eyelids. He admits, however, that the hinder portion of the cysts of some swellings of this nature upon the upper eyelid cannot be dissected out, because it may be so closely adherent to the cartilage, that its excision would injure the latter part too much, and produce either an incurable entropium, or an irremediable shortening of the eyelid. But, steatomatous tumors, near the eyelids, may almost always be completely dissected out, the only exceptions being cases in which the swellings happen to be situated between the lachrymal sac and the orbicular muscle, and so intimately connected with the first of these parts, that the back portion of the cyst could not be cut away, without permanently destroying the functions of the excreting parts of the lachrymal organs. However, when the swelling is not too strongly attached to the cartilage of the eyelid, Beer sanctions the removal of the whole of the cyst. He particularly insists upon the utility of moving the tumor a good deal about daily, for a few days before the operation, so as to loosen its connexions, and enable the surgeon to push it over the edge of the orbit, where it may be steadily fixed during its removal. (*B.* 2, *p.* 612.) Excepting a few instances, in which the skin was diseased, and firmly adherent to the cyst, Beer has never found it necessary, in the excision of encysted swellings of the eyelids, to remove any portion of the integuments, and he has cut away some tumors of this kind, which were as large as a pigeon's or hen's egg. The incision, through the skin, he says, should be longer, than the tumor, so as to facilitate the extraction of the distended cyst. (*B.* 2, *p.* 613.) When it is not advisable, for reasons above stated, to attempt to dissect out every particle of the cyst, Beer fills the cavity with lint, lets the wound suppurate, and, if this plan is not sufficient, he applies stimulants and caustic. It is noticed by Sir Astley Cooper, that encysted tumors, at the outer canthus, are often difficult of removal, on account of their extending into the orbit, and being adherent to the periosteum. (*Surgical Essays, Part* 2, *p.* 241.) Professor Scarpa has strongly recommended making the incision for the extraction of encysted swellings of the palpebræ, on the inside of these parts. But as Mr. Travers correctly remarks, the swellings are often situated superficially, and loosely connected with the tarsus, in which case, the operation should be done on the outside of the eyelid. The latter writer admits, however, that the cyst is often formed, betwixt the cartilage and the ligamentary membrane, which covers it, and, in his opinion, it is only when an intricate adhesion subsists, and the appearance of a white circumscribed indentation is seen upon the everted tarsus, that the excision should be performed on the inside of the eyelid, by dividing the cartilage. (*Synopsis of the Diseases of the Eye*, *p.* 357.)

I shall conclude the subject of tumors with a few observations, delivered by Sir Astley Cooper, and Professor Langenbeck. "The removal of encysted tumors, (the first gentleman observes,) is not entirely unattended with danger. I have seen three instances of severe erysipelatous inflammation succeed the operation of removing these swellings upon the head, and, I believe, it is owing to the tendon of the occipito-frontalis being wounded in the attempt to dissect them out whole." (*Surgical Essays, Part* 2, *p.* 241.)

In the extirpation of tumors about the neck, Langenbeck adopts the following rules: he makes a free division of the integuments, and dissects the muscles from the tumor, which lie over it, but he avoids cutting through, or injuring them: in this manner, the swelling is rendered more moveable. By the situation of the muscles, he is then enabled to know the place of the chief blood-vessels; and, on this account, he particularly advises young surgeons to study myology with the greatest care. As Langenbeck remarks, it is indeed an important advantage, after a muscle is exposed, to know what vessels lie at its edges, or underneath it. Thus, the sartorius is a sure guide to the crural artery, and the sterno-cleido-mastoideus to the carotid. A surgeon, who knows correctly the anatomy of the parts, will not be in danger of wounding unintentionally any large vessel. When the surface of the tumor has been cleared, but the base of it is yet firmly attached, Langenbeck commences the separation on the side, which presents the least risk, that is, where the least considerable blood-vessels are, and thence he proceeds by degrees, towards the most hazardous side. In favour of this method, he offers the following considerations: if, by chance, an artery, requiring a ligature, should be cut, it can now be more easily secured, as the base of the tumor is already partly detached. The loosened swelling may also be drawn away from the large vessels with the hand, or a tenaculum. Langenbeck never introduces the knife deeply, when there are large blood-vessels there, but pulls the swelling outward, and then divides the cellular substance, thus stretched, which is situated upon the already exposed portion of the tumor. In this manner, the swelling can always be drawn more and more away from the vessels, until, at last, there is no danger of wounding them. By attending to these principles, Langenbeck has succeeded in removing many very large tumors from the neck, where nearly all the muscles of that part were exposed by the dissection, and the carotid denuded. After one of these operations, not only the styloid process could be felt, but all the muscles, originating from it, could be distinctly seen. (*Bibl. für die chir. B.* 2, *p.* 312, *&c.* 12*mo. Gottingen*, 1808.) *C. G. Stentzel, De Steatomatibus in principio Aortæ repertis et Cysticis in genere excrescentibus. Wittersb.* 1723. *J. J. Plenck, Novum Systema Tumorum, quo hi morbi in sua genera et species rediguntur. Pars prior.* 12*mo. Viennæ*, 1767. *Wm. Ogle, Letter concerning the Cure of encysted and other kinds of Tumors without the Knife*, 8*vo. Lond.* 1754. *Abernethy's Surgical Works. Ph. Tr. Walther, über die angebohrnen Fetthautgeschwulsten und andere Bildungsfehler. fol. Landshut*, 1814. *J. P. Weidman, Annotatio de Steatomatibus*, 4*to. Maguntiaci*, 1817. *W. Hey, Practical Obs. in Surgery, p.* 517, *Ed.* 2, 8*vo. Lond.* 1810. *Allan Burns, Surgical Anatomy of the Head and Neck*, 8*vo. Edin.* 1811 *: this work contains much valuable information, respecting the extirpation of swellings about the neck. Schreger Chirurgische Versüche, B.* 1, *p.* 297 *; Ueber Lipoma und Extirpatio derselben.* 8*vo. Nürnberg*, 1811. *John Baron, An Inquiry, illustrating the Nature of Tuberculated Accretions of Serous Membranes, and the Origin of Tuber-*

cles and Tumors in different textures of the Body, 8vo. *Lond.* 1819. *Also Illustrations of the Inquiry, &c.* 8vo. *Lond.* 1822. *Sir Astley Cooper, Surgical Essays, Part* 2, *and Med. Chir. Trans. Vol. II. C. J. M. Langenbeck, Bibl. für die Chir. B.* 2, *p.* 312. *Gött.* 1808. *Also Geschichte einer grössen Speckgeschwulst welcher mit dem Unterkiefer so fest zusammenhing, dass die Trennung mit der Säge verrichtet werden muste: Neue Bibl. B.* 1, *p.* 295, 12*mo. Hannover*, 1817. *B. H. Jacobsen, de Tumoribus Cysticis*, 4*to. Jenæ*, 1792. *C. G. Ludwig, Monita de exscindendis Tumoribus tunica inclusis.* 4*to. Lips.* 1758. *R. Liston, Cases of Large Tumors in the Scrotum and Labium, removed by Operation: see Ed. Med. Journ. No.* 77.

TYMPANUM. For an account of its diseases, see *Ear.*

U.

ULCERATION, is the process, by which sores, or ulcers, are produced in animal bodies. In this operation, the lymphatics appear to be, at least as active as the blood-vessels. An ulcer is a chasm formed on the surface of the body by the removal of parts back into the system by the action of the absorbents. At first, it may be difficult to conceive how a part of the body can be removed by itself; but there is not more difficulty in conceiving this, than how the body can form itself. Both facts are equally well confirmed. When it becomes necessary, that some whole living parts should be removed, it is evident, says Mr. Hunter, that nature, in order to effect this object, must not only confer a new activity on the absorbents; but, must throw the part to be absorbed into a state, which yields to this operation. The absorption of whole parts in disease, arises from five causes; pressure; irritation of stimulating substances; weakness; inutility of parts; death of them. (*Hunter on Inflammation, &c. p.* 442—446.)

Ulceration takes place much more readily in the cellular, and adipose substance, than in muscles, tendons, ligaments, nerves, and blood-vessels. Hence, in the progress of pus to the surface of the body, ulceration often takes a circuitous course for the purpose of bringing the matter to the skin. The skin itself, also, being highly organized, considerably retards the bursting of abscesses. On the same account, when ulceration is spreading, the edges of the skin hang over the ulcerated surface. (*Hunter, p.* 447—449.) Parts at a considerable distance from the source of the circulation, are generally more disposed to ulcerate, than others situated nearer to the heart: hence, one reason of the greater number of ulcers on the lower extremities, than on the arms.

New formed parts, such as cicatrices, callus, and all adventitious new matter, like tumors, readily admit of being absorbed. Thus in lord Anson's voyage, when the crew of his ship began to suffer from great privations, fatigue, the scurvy, &c. it was remarked, that such men as had had ulcers and broken bones formerly, became again disabled by their old sores breaking out afresh, and the callus of their old fractures being removed. The adventitious matter is even more prone to be absorbed, than that which is a substitute for the old. Mr. Hunter explained this circumstance on the principle of weakness.

When ulceration takes place, in consequence of the death of an external part, it occurs first on the outer edge, between the dead and living substance.

A tumor, when it makes equal pressure in every direction around, will only make its way in an external course, because what Mr. Hunter termed interstitial absorption happens in no other direction. (*P.* 449.)

The parts situated between an abscess, or any extraneous substance, and the nearest surface, are those, which are most susceptible of ulceration. This is one of the most curious phenomena, connected with the process under consideration. It shows, that there is a principle in the human body, by which parts are always prone to free themselves from disease. Slight pressure from without will often produce a thickening of parts, and hence, Mr. Hunter remarks, there even appears to be a corresponding backwardness to admit disease. (*P.* 449.) Both these facts, he observes, are shown in the case of fistula lachrymalis; for, though the matter is nearest the cavity of the nose, still it makes its way externally, by means of ulceration, while the Schneiderian membrane even becomes thickened, so as to become a barrier against the progress of the disease inward. (*P.* 451.)

Not unfrequently, as Sir A. Cooper has remarked, matter forms behind the sternum close to the pleura and pericardium, which membranes are externally thin. From the proximity of these membranes it might be expected, that the matter would generally open into the pleura, and, by discharging itself into the cavity of the chest, destroy life. Instead of this result, however, the pleura undergoes no other alteration, than that of becoming thickened, and while it is acquiring this addition of substance, the process of absorption is going on in the inner part of the sternum, an aperture is formed through it, and the matter is voided externally. The same fact is exemplified in abscesses between the peritoneum and abdominal muscles. Abscesses of the liver, however, generally burst into the stomach or bowels, which are nearer to them than the skin, and afford also a passage for their evacuation. (*Lectures, Vol. I. p.* 132.)

There is one difference between the advancement of an encysted tumor to the surface of the body, and the progress of an abscess in the same direction, viz. that the former does not excite ulceration of the cyst; but, an interstitial absorption of the sound parts, between the cyst and skin, till the cyst and external skin come into contact, at which period, inflammation takes place, and absorption becomes accelerated into ulceration. In an abscess, the progressive ulceration begins in the cyst, at the same time, that the interstitial absorption in the sound part, covering the matter, is going on. (*P.* 452—457.)

The action of progressive absorption is to remove surfaces contiguous to irritating causes, which Mr. Hunter referred to pressure, irritation, and weakness. In cases of tumors, pressure becomes a cause. The buttocks and hips of persons, who lie long on their backs, often ulcerate. The heels of many patients, with fractures, who lie for a great while in the same position, are apt to ulcerate. In the latter instances, Mr. Hunter conceived, that ulceration is a substitute for mortification, and is, at the same time, a proof of a certain degree of strength; for, if the patient's constitution were very weak, the same parts would mortify. (*P.* 453.) That pressure is a frequent cause of ulceration, is also evinced by the occasional effects of chains on prisoners, and harness on horses.

That irritating substances produce ulceration, needs no illustration.

Progressive absorption may occur either with, or without suppuration. We have instances of the latter in cases of extraneous bodies, which travel about the body, without producing irritation enough to give rise to the secretion of pus. In the progress of aneurisms of the aorta, and of fungous tumors of the dura mater to the surface, the same fact is also illustrated. (P. 455.)

Absorption with suppuration, in other words, ulceration, either happens in consequence of suppuration already begun, in which event the pus acts as pressure; or else absorption attacks external surfaces from particular irritations, or weakness, in which case, suppuration must follow. (*P.* 456.)

The production of ulceration requires much greater pressure from without, than from within. The process is always disposed to take place more quickly, when near the surface of the body, and its progress becomes accelerated, in proportion as it arrives near the skin.

The adhesive inflammation precedes the suppurative, and prevents the pus from becoming diffused, as soon as it is secreted, and when the cyst afterwards ulcerates, in order to let the matter approach the skin, the adhesive inflammation still continues to go before the ulcerative process, and thus prevents the matter from insinuating itself into the interstices of the cellular substance. (*P.* 457.)

The pain of ulceration is, in some degree, proportioned to its quickness. When ulceration begins on a surface, or takes place for the purpose of bringing matter to the skin, the pain is always considerable. When ulceration takes place, in order to separate a dead part, as in sloughing, exfoliations, &c. there is seldom any particular pain. (*P.* 459.)

The ulcerating sore always exhibits little cavities, while the edge of the skin is scalloped, and thin, at the same time, turning a little out, and overhanging, more or less, the ulcerated surface. The face of the sore appears foul, and the discharge is very thin.

When ulceration stops, the edges of the skin become regular, smooth, a little rounded, or turned in, and of a purple colour, covered with a semi-transparent white. (*Hunter on Inflammation, &c. p.* 460.)

The reader, desirous of further information, should particularly consult this last publication, and *Thomson on Inflammation, p.* 349, *&c.*

ULCERS. Surgeons usually define an ulcer to be a solution of continuity in any of the soft parts of the body, attended with a secretion of pus, or some kind of discharge. "A granulating surface, secreting matter," has been proposed as a definition, (*A. Cooper, Lectures, &c. Vol.* 1, *p.* 182,) which is very applicable when ulcers have formed granulations, but cannot include cases, in which the effects of ulceration are extending, and the granulating process has not yet commenced.

In the present part of this Dictionary, there will not be occasion to speak of several kinds of sores, which have been treated of in other articles. (See *Cancer, Cancrum Oris, Fistula, Hospital Gangrene, Lupus, Ozæna, Scrophula, Sinus,* and *Venereal Disease.*)

Ulcers are divided into *local* and *constitutional.* As Professor Thomson has well observed, however, it is only within certain limits, that this distinction is well founded; for, an ulcer, which is at first completely local, may in time affect the system, so as to become constitutional; and ulcers, which derive their origin from some general affection of the system, may remain after the removal of the constitutional disorder, by which they were originally produced. (*Lectures on Inflammation, p.* 427.)

" Ulcers (says Dr. Thomson) have usually been distinguished from each other by the causes by which they are induced, by the symptoms which they exhibit, and by the parts of the body in which they occur. The want of a disposition to heal in a suppurating surface may depend upon some specific action in the cause from which it proceeds, upon something peculiar in the constitution of the patient in whom it exists, or merely upon an improper mode of management: and, hence, the distinction, that has long been made of ill-conditioned sores, or ulcers, into those which are *specific* in their nature, and into those which are *simple.*

" Specific sores, or ulcers, may be occasioned by specific poisons, or by particular diatheses. The sores, or ulcers, which arise from specific poisons, may be either *local,* that is, confined, like a primary syphilitic ulcer, to one spot; or *constitutional,* that is, liable to occur in any part, texture, or organ, such as secondary syphilitic ulcers. Of diatheses, predisposing to ulcers, we have examples in the scrophulous, scorbutic, and arthritic diatheses, and also in the syphiloid diatheses, or that which arises not unfrequently in those, who have had syphilis, from the too free and injudicious use of mercury.

" Every ulcer, strictly speaking, is of a local nature; but, there are ulcers, which, though necessarily local in their appearance, are connected with, or dependent upon, diseases, which affect the general system. These ulcers ought to be regarded as modifications of, or forms in which the diseases appear, with which they are connected. Considered in this light, it is obvious, that specific ulcers can be treated of with propriety, only under the head of the diseases, to which they respectively belong.

" We call those ulcers, *simple,* which do not appear to proceed from any specific disease, or morbid diathesis existing in the constitution of those, in whom they take place. They are usually solitary occurrences, and the consequences of accidental injuries, and improper modes of management. They may occur in every part of the body, but, they appear most frequently upon the lower extremities."

Professor Thomson afterwards remarks, that "the appearances, which different ulcers exhibit, seem, at first view, to afford an excellent foundation for distinctions among them, and so they undoubtedly do in many respects."

"But (says he) it is to be regretted, that the characters, upon which the distinctions of ulcers, as well as of many other local diseases, are founded, are neither very uniform in their appearance, nor very easily distinguishable from one another. Not only are the local appearances, which present themselves, in simple ulcers, liable to great variations in the different stages of the same individual affection, but, they are often apparently the same with, or at least not easily distinguishable from, those which occur in specific diseases, and which require, for their cure, peculiar modes of treatment. It is this circumstance, which renders it so necessary for us, in endeavouring to distinguish and to cure ulcers, to avail ourselves of all the information, which we can procure from the history of the ulcer, from the nature of the exciting cause. by which it has been induced, and from the effects of the remedies, which have been employed, as well as from the particular appearances, which the ulcer itself exhibits."

In noticing another ground of distinction among ulcers, or that derived from the parts in which they occur, Dr. Thomson observes, that "every texture and organ of the body possesses physical and vital qualities peculiar to itself; and these qualities must necessarily modify the appearances, which each texture and organ respectively exhibits in the state of disease. Specific diseases render some parts more liable, than others, to attacks of ulceration. Thus secondary syphilis appears most frequently in the throat; scurvy in the gums; cancer in the lower lip; and lupous and scrophulous ulcerations in the upper lip, or in the nose. Cancer seldom or never appears primarily in the upper lip; but syphilis, when it attacks this part, puts on many of the appearances of cancer;" a fact, which Dr. Thomson says, he first learned from Mr. Pearson. *(On Inflammation, p.* 427—430.)

In the valuable treatise on ulcers, published by Sir Everard Home, these complaints are divided into six principal kinds, viz.:

1. Ulcers in parts, which have sufficient strength to carry on the actions, necessary for their recovery.

2. Ulcers in parts, which are too weak for that purpose.

3. Ulcers in parts, whose actions are too violent to form healthy granulations, whether this arise from the state of the parts, or of the constitution.

4. Ulcers in parts, whose actions are too indolent, whether this arise from the state of the parts, or of the constitution.

5. Ulcers in parts, which have acquired some specific action, either from a diseased state of the parts, or of the constitution.

6. Ulcers in parts, which are prevented from healing by a varicose state of the superficial veins of the upper part of the limb.

Although I have chosen, in the subsequent columns, to adopt this nomenclature, I am perfectly aware of its being on some accounts objectionable, but, especially, because it assumes hypotheses the truth of which can never be established, nor proved. This is one of the considerations, which have induced Professor Thomson to prefer the old names. *(Op. cit. p.* 435—438.)

OF ULCERS IN PARTS, WHICH HAVE SUFFICIENT STRENGTH TO CARRY ON THE ACTIONS NECESSARY FOR THEIR RECOVERY, SIMPLE PURULENT, OR HEALTHY ULCERS.

In this species of ulcer, the pus is of a white colour, thick consistence, and readily separates from the surface of the sore, and when diluted, and examined in a microscope, is found to be made up of small globules, swimming in a transparent fluid. The granulations are small, florid, and pointed at the top. As soon as they have risen to the level of the surrounding skin, those, next to the old skin, become smooth, and are covered with a thin, semi-transparent film, which afterwards becomes opaque, and forms cuticle.

In the treatment, it is only necessary to keep the surface clean, and prevent the natural processes from being interrupted. Sir E. Home observes, that this is in general best done, by the application of dry lint, for the purpose of absorbing and retaining the matter, which serves as a soft covering for the granulations, and by putting over the lint, a pledget of any simple ointment, in order to hinder the matter from evaporating, by which means, the dressings will not become adherent, and may be easily taken off, as often as requisite.

Although healthy ulcers require no medicated application to be made to them, the dressings must be such as do not disagree with the granulations, or surrounding skin.

In some patients, a roller, applied with moderate tightness, with a view of retaining the dressings, will cause uneasiness, and make the ulcer lose its healthy appearance. Sir E. Home has seen several cases of this kind, in which the proper appearance of the sore returned as soon as the bandage was discontinued.

In some patients, ointment irritates and inflames the neighbouring skin; and certain superficial ulcers will not heal, while kept in a moist state, and unexposed to the air; but heal, when allowed to become dry and covered with a scab.

These particularities are referred by the preceding author to constitutional causes, and not disease; for, the ulcers heal as soon as the particular things, which disagree with them, are discontinued. These peculiarities in certain healthy sores may also attend others of a different description, and should always be discriminated from the effects of disease.

1. Applications in the form of vapour, and fomentations, should never be employed, as they render the texture of the granulations looser, and diminish the disposition to form skin.

2. With respect to fluid applications, Sir E. Home also very properly condemns poultices, as well as fomentations. He speaks of alcohol, as being an application, which promotes the for-

mation of a scab, when this mode of cure is chosen.

3. In regard to ointments, their only use, in cases of healthy ulcers, is to keep the matter from evaporating. The most simple ointments are the best for the purpose; particularly the one composed of white wax and olive oil.

Sir E. Home observes, that the great objections to the common simple ointments are, that they sometimes disagree with the skin, even when recent, and free from all rancidity. When they have acquired the latter quality, they still more frequently create a greater degree of irritation.

4. With respect to applications in the form of powder, Sir E. Home remarks, that when it is desirable to form a scab on the ulcer, any inert powder may be sprinkled on the sore; but, he prefers dry lint. Nothing should touch the powder, or lint; and, to prevent this circumstance, Sir E. Home recommends applying a little bolster on each side of the sore, and over them a roller, which will go from one bolster to the other, in the manner of a bridge.

For healthy ulcers, dry lint is to be regarded as being upon the whole, the most eligible application. When the sore does not secrete pus enough in twenty-four hours to moisten the lint, the dressings are to be changed only every other day.

When a moderately tight bandage is not forbidden by constitutional peculiarities, it is useful, both in supporting the muscles and skin, which are often in a flabby state from the unexercised state of the limb, and in defending the newly formed parts.

ULCERS IN PARTS WHICH ARE TOO WEAK TO CARRY ON THE ACTIONS NECESSARY FOR THEIR RECOVERY.

This is the second of the classes, into which Sir Everard Home has divided ulcers in general.

The granulations of these sores are larger, more round on their external surface, and of a less compact texture, than those formed on ulcers in healthy parts. Sir E. Home has also noticed their semi-transparent appearance. When they have filled up the cavity of an ulcer to a level with the surface of the body, they do not readily form skin, but, rising up in a still higher manner, often lose altogether the power of producing new cutis. When the parts are still weaker, the granulations sometimes continue gradually to fill up the hollow of the ulcer, and then, all on a sudden, are suddenly absorbed, so as to leave the sore as deep as it was before.

Ulcers may be weak from the first, or become so in the progress of the case. Even granulations of the most healthy kind, if they are not skinned over in a certain time, gradually lose their primitive strength.

Sores on the legs are greatly under the influence of all natural peculiarities of the constitution, and every thing which affects the health. When the constitution becomes in the least weaker or stronger, the appearance of the granulations becomes changed accordingly, and this effect of constitutional weakness, or strength, on ulcers, is greater in proportion as the sores are further from the source of the circulation.

While the constitution is undergoing any kind of disturbance, the healing of an ulcer is suspended. Mental anxiety is very apt to retard cicatrization.

Such effects of the constitutional kind on ulcers are greater in weak and delicate persons, than in the strong and robust. Change of weather has considerable influence over the healing of sores. Sir E. Home mentions, in proof of this fact, that when there were several hundreds of ulcers in the Naval Hospital at Plymouth, in 1778, every time the weather changed, from a dry to a moist state, the ulcers universally assumed an unhealthy appearance; but put on a better aspect when the weather became dry again.

In the treatment of this kind of ulcer, tonics are to be exhibited, particularly bark and steel, and every thing, which disagrees with the constitution, is to be avoided. Wine and cordial medicines are also usually prescribed. Porter, however, is deemed better than wine, for working people.

Sir E. Home observes, that the first object in the local part of the treatment, is to keep the granulations from rising above the edge of the surrounding skin. This gentleman (in my opinion) very judiciously represents the greater propriety of preventing the granulations from ever becoming too high by the employment of proper applications, than following the common plan of destroying the high granulations with escharotics, after they have risen to an improper height. There cannot be the smallest doubt, that if the granulations could always be prevented from rising up too much, the patient would suffer a great deal less pain.

Instead of applying to the surface of the ulcers, now under consideration, lunar caustic, blue vitriol, red precipitate, &c. Sir E. Home prefers mixing these escharotics with other substances, so as to render them only strong stimulants, and using them in this latter form. He conceives, that, when the high granulations are destroyed with escharotics, the disposition of the surface underneath to reproduce them is increased, but, that this is not the case, when the luxuriant parts are only stimulated, so as to become absorbed. He believes, that, when animal substances grow with great rapidity, they are, like vegetable ones, weaker, than when produced in a slower manner. Hence, he is of opinion, that the growth of granulations ought to be checked in the early stage of their formation, by some resistance, which they are just able to overcome. under which circumstances, they derive strength from the limited increase of action, which they are obliged to undergo.

On the same principle, according to Sir E. Home, the pressure of tight bandages is advantageous, and ulcers, which heal, while the patient is walking about, are not so apt to break out again as others, healed while the parts are in a state of perfect rest.

In the treatment of these ulcers, when the granulations have come to a proper height, and do not form a thin, semi-transparent pellicle upon their surface, they are to be considered as weak parts, and treated accordingly. In this circumstance, when no particularity of constitution forbids, Sir E. Home recommends pressure, made with a thin piece of lead over the dressings, and supported with a tight bandage.

Amongst the impediments to the healing process, Sir A. Cooper notices the *languid state of a sore*, denoted by the glassy, semi-transparent appearance of the granulations, already described. The dressings enumerated by him for the improvement of an ulcer in this condition, are, the ung. hydr. nitrico-oxydi, which, however, is said to produce a thickening of the cuticle at the edge of the sore, preventing the growth of the granulations at that part, and requiring the application of the ung. hydr. fort. for its correction; a lotion of the sulphate of zinc, two grains to one ounce of water; a solution of the sulphate of copper, one grain to an ounce of water; and a solution of one grain of oxymuriate of mercury in an ounce of lime water. A roller is to be applied, the diet is to be nutritious, and the patient to take exercise. (*Lectures, Vol.* 1, *p.* 187.)

OF APPLICATIONS TO ULCERS ATTENDED WITH WEAKNESS.

Although, strictly, we have no topical applications, which can directly communicate strength to granulations, there are certainly some which prevent the granulations from exhausting themselves by luxuriant growth, and stimulate them to draw more blood from the arteries; which effects, as Sir E. Home remarks, render such granulations stronger.

1. This gentleman very properly condemns, as applications to weak ulcers, all relaxing fomentations commonly employed; and recommends, instead of them, the use of spirits of wine, and the decoction of poppies, in equal proportions, not, however, to be applied hot.

2. With regard to moist applications, the same gentleman expresses his disapprobation of poultices, and mentions a weak solution of the argentum nitratum, as the most eligible application in an aqueous form.

3. On the subject of powdered substances, as applications to weak ulcers, Sir E. Home says, he has often tried bark, and the lapis calaminaris, without perceiving that the former had any power of strengthening granulations, or the latter any virtue in disposing them to form new skin; properties commonly imputed to these applications.

Sir E. Home entertains no better opinion of plaster of Paris or powdered chalk, employed with a view of promoting the formation of skin. Powdered carbon he speaks of as being more adapted to irritable, than weak ulcers. He praises powdered rhubarb, as particularly applicable to the latter kind of ulcer, because it represses the luxuriant growth of the granulations, renders them small and compact, and disposes them to form skin. When, however, the granulations have arisen above the level of the skin, it is not powerful enough to reduce them. When the rhubarb is too stimulating, it is to be mixed with a fourth part of crude opium in powder.

A piece of lint, a little less than the sore, is always to be put over the powder, and covered with a pledget of simple ointment.

4. Ointments, according to Sir E. Home, are particularly apt to disagree with weak ulcers. When other applications fail, however, greasy ones may be tried, and the above gentleman gives a preference to the ung. hydrarg. nitrat. mixed with hog's lard, in the proportion of one to five, or else to common cerate, blended with a small quantity of the hydrarg. nitrat. ruber.

OF ULCERS IN PARTS, WHOSE ACTIONS ARE TOO VIOLENT TO FORM HEALTHY GRANULATIONS, EITHER FROM THE STATE OF THE PARTS, OR THE CONSTITUTION: SIMPLE VITIATED ULCERS OF MR. B. BELL. IRRITABLE ULCERS, GANGRENOUS, OR SLOUGHING ULCERS.

There are three states of the constitution influencing the nature of ulcers; an irritable state, in which all the actions of the animal economy are more rapid than in health; an indolent state, in which they are unusually languid; and, lastly, a diseased state, by which they are affected.

An irritable and an indolent ulcer cannot in general be distinguished from each other by mere appearances, though they may be so in a few instances. Sir E. Home informs us, that the disposition of an ulcer, like the disposition of a constitution, can only be accurately ascertained by determining the actions which arise from the different impressions made upon it.

The following appearances, he says, at once show the ulcer to be of an irritable kind. The margin of the surrounding skin being jagged, and terminating in an edge, which is sharp and undermined. The bottom of the ulcer being made up of concavities of different sizes. There being no distinct appearance of granulations, but a whitish spongy substance, covered with a thin ichorous discharge. Every thing that touches the surface gives pain, and very commonly makes it bleed. The discharge is altered from common pus to a thin fluid, in proportion to the degree of irritability communicated to the sore by constitutional causes. In general, the pain of an irritable sore gradually becomes less. When it is not constant, but comes on in paroxysms chiefly in the evening, or night-time, with great violence, convulsive motions of the limb are apt to occur, and extend to various other parts. Sir E. Home refers this symptom to irritation, communicated along the course of the nerves, and producing an action in them, attended with a violent contraction of the muscles, which they supply.

When the above-mentioned signs of an irritable ulcer are not present, we must form a judgment of the nature of the sore from listening to the history of the case, the effects of various applications, &c. When this kind of information cannot be obtained, Sir E. Home recommends the treatment to begin on the supposition of the ulcer being of an irritable nature.

The *gangrenous*, or *sloughing* ulcer is frequently only one stage of the irritable one, and is therefore frequently met with in persons, whose constitutions have been hurt by intemperance. It occurs, also, as Sir A. Cooper has related, amongst persons emaciated and reduced by extreme want. The surface of the sore is dry, its edges have a livid appearance, with small vesicles on them, and the patient suffers much from irritative fever.

When an ulcer occurs just over the malleolus externus, it is generally of an irritable kind, in consequence of the nature of the part on which it is situated, quite independently of any constitutional or local disposition to irritability. Sir E. Home conceives, that the periosteum, which here lies immediately under the skin, becomes the seat of the ulcer, is the cause of its being very difficult to heal, and gives it the irritable appearance. The fact that sores, situated on the ligament of the patella, and over the periosteum of the anterior surface of the tibia, assume a similar appearance, and are equally difficult to heal, made him more confirmed in his sentiment.

As internal medicines, in these cases, Sir A. Cooper praises calomel and opium: one grain and a half of the former, and one of the latter, morning and evening. By some practitioners, the compound decoction of sarsaparilla seems also to be regarded as a good medicine for lessening constitutional irritability. (*Lectures, &c. Vol.* 1, *p.* 195.)

In treating ulcers in general, the surgeon will find it advantageous to be acquainted with the effects of a great many external applications; for very few cases will continue to heal beyond a certain time, without some alteration in the treatment. The necessity of changing the applications, after they have been continued for a certain time, is strikingly illustrated by the fact, that leaving off a powerful application, and employing one, which at first would have had no effect, often does a great deal of service. When the change is made to a medicine of powers equal to those of the previous one, the benefit will be more lasting, than in the preceding circumstance.

OF APPLICATIONS TO IRRITABLE ULCERS.

1. Sir E. Home recommends applications, in the form of vapour, as being particularly useful, by their quality of allaying irritation, and soothing pain.

The steam of warm water is productive of benefit in this way, though seldom used by itself. Its good effects are increased when it is mixed with spirits.

Sir E. Home speaks also in favour of the benefit derived from fomentations containing opium; such as the tincture of opium sprinkled on flannel, wrung out of warm water; or the application of flannels, wet with a warm solution of the extract of opium, or with a decoction of poppy-heads. A decoction of chamomile flowers, the tops of wormwood, or hemlock leaves, may also be employed for the same purpose.

Sir E. Home points out particular irritable ulcers, however, which are rendered more painful by warm applications; and he states, that the sores alluded to are generally attended with a mottled purple discoloration of the limb, for some way from them, and a coldness of the lower part of the leg, and that they are often disposed to mortify, which event is promoted by warmth.

2. As for moist applications, the poultice made of linseed meal, is the most simple, and most easily made; and, as it does not necessarily require any addition of oil, is to be preferred, when this disagrees with the sore.

Sir E. Home does not say much in favour of the use of the liquor plumbi acetatis, in poultices; for, though he allows, that it often answers very well, he adds, that it also frequently disagrees with the ulcer, and, if long used, is apt to bring on the lead-colic.

A decoction of poppy-heads is said to be a very good liquor for making poultices.

The carrot-poultice is also found to agree with a great many irritable sores.

The great objection to poultices, in these cases, being the weight of such applications, the limb should always, if possible, rest upon the poultice, and not the poultice upon the limb.

If poultices be employed, their use is to be continued as long as the granulations are small, and the ulcer is rapidly diminishing in size, and this even till the cicatrization is complete. When the granulations become large, and loose in their texture, poultices should be left off.

When the weight of poultices prohibits their use, Sir E. Home advises the trial of lint, dipped in one of the following lotions, and covered with a pledget of some simple ointment: a solution of the extract of opium; a decoction of poppies; the tincture of opium; a decoction of cicuta; the liquor plumbi acetatis dilutus; or a weak solution of the argentum nitratum.

3. Powdered applications are generally too stimulating for irritable ulcers. Carbon has been found useful; so has powdered extract of opium, mixed with an equal quantity of carbon, or linseed flour. However, opium occasionally affects the constitution, in consequence of absorption, and it has been known to excite violent inflammation ending in mortification.

4. Ointments are not often proper applications for irritable ulcers, as they are always, more or less, rancid, and generally disagree with the skin.

According to Sir A. Cooper, however, the following ointment agrees well with such cases: ℞. Ung. cetacei, ung. hydr. nit. ā ā ℥ss. Pulv. opii ʒj M. (*Lectures, Vol.* 1, *p.* 194.)

Sir E. Home mentions cream as being a very useful application, particularly in cases, in which warmth is found to do harm. As a substitute for it, he recommends an ointment composed of hog's lard, purified by being repeatedly washed in spring water, and then mixed with a small quantity of white wax, and rose water.

The observations, made respecting solutions of lead, apply to the unguentum cerussæ acetatæ.

5. The pressure of bandages is generally hurtful to irritable sores, though a slight degree of it proves serviceable to certain ulcers, which are somewhat less irritable, and arise from weakness.

When the ulcer is *gangrenous* or *sloughing*, the best application is the nitric acid lotion, (50 drops of the acid to a quart of water.) Lint is to be dipped in it, laid over the sore, and then covered with a piece of oiled silk, so as to keep it wet several hours. The recumbent posture is to be observed, (*Sir A. Cooper, Lectures, &c. Vol.* 1, *p.* 191.) This gentleman also gives internally, three times a day, twenty drops of the tincture of opium, and 10 gr. of carbonate of ammonia, with an ounce and a half of camphor mixture, and a little of the compound tinct. of cardamom seeds. Here, the preparation of morphine might be most eligible.

OF ULCERS IN PARTS, WHOSE ACTIONS ARE TOO INDOLENT TO FORM HEALTHY GRANULATIONS, WHETHER THIS INDOLENCE ARISES FROM THE STATE OF THE PARTS, OR OF THE CONSTITUTION: THE CALLOUS ULCERS OF SEVERAL WRITERS.

The indolent ulcer forms in its appearance a complete contrast to the irritable one. The edges of the surrounding skin are thick, prominent, smooth, and rounded. The surface of the granulations is smooth and glossy. The pus, instead of being of a perfect kind, is thin and watery, being composed of a mixture of pus, and coagulating lymph. The lymph consists of flakes, which cannot be easily separated from the surface of the sore. The bottom of the ulcer forms quite a level, or nearly so, and, as Sir E. Home very accurately remarks, the general aspect conveys an idea, that a portion of the skin and parts underneath has been removed, without the exposed surface having begun any new action to fill up the cavity.

When, however, the indolence of the ulcer is not so strongly marked, the sore does not correspond to the preceding description, but resembles in appearance the ulcer, which possesses an inferior degree of irritability, and can only be discriminated from it by receiving no benefit from soothing applications.

The odd circumstance of some indolent sores having the appearance of irritable ones, is, in some degree, explained by ulcers always being influenced by changes in the constitution, and accidental circumstances affecting the parts.

Most of the ulcers, which are to be seen in the London hospitals, are of the indolent kind. An indolent disposition in the ulcer may proceed altogether from the long existence of the disease; and hence, Sir E. Home very justly observes, it is immaterial whether at first it was healthy, weak, or irritable, for, if not cured within a certain time, it becomes indolent, with the exception of a few of the irritable kind, which never change their nature.

Indolent sores do form granulations; but these, every now and then, are all on a sudden absorbed, and, in the course of four and twenty hours, the sore becomes as much increased in size, as it had been diminished in as many days, or weeks. This absorption of the granulations arises principally from their not being of a healthy kind; but the event is promoted by changes in the weather, anxiety, fatigue, &c.

The object in the treatment of indolent ulcers is not simply to produce a cure, but to render such cure as permanent as possible. This can only be accomplished by altering the disposition of the granulations, and rendering them strong enough to stand their ground after the ulcer is filled up.

When an ulcer, which has existed six months, is dressed with poultices for a week, the granulations, at the end of this time, will partly have filled up the hollow of the sore, but they will present a large, loose, and glossy appearance. Should the poultice be now discontinued, and some proper stimulating application used for another week, the granulations will be found, at the expiration of this time, to have become smaller, more compact, redder, and free from the glossy appearance. The ulcer, when healed by the latter application, will not be so likely to break out again, as when healed with large, loose, flabby, glossy granulations.

Sir E. Home states, that the number of indolent sores, which heal under the use of stimulating applications, and do not break out again, compared with similar cases, treated with mild dressings, are as four to one.

APPLICATIONS TO INDOLENT ULCERS.

1. Medicines in the form of vapour cannot heal indolent sores, so as to accomplish a lasting cure. It is only when these ulcers assume a foul appearance, and are in a temporary state of irritation, that such applications can be advantageously employed.

In general, patients, on their first admission into hospitals with sore legs, have their ulcers in a temporary state of irritation from neglect, exercise, excesses, &c. Hence, it is generally found advantageous, for the first few days, or even a week, to have recourse to poultices and fomentations.

I believe, that any common fomentation, whether of chamomile, poppy-heads, or mere warm water, answers equally well. The time for using it is while a fresh poultice is preparing, and this latter application should be changed twice a day.

2. Moist applications, such as poultices, are to be employed when fomentations are proper, and they may be made of bread, oatmeal, or linseed.

Sir E. Home describes a species of indolent ulcers, which occur in patients of debilitated constitutions, which put on a sphacelated appearance, without any apparent cause, even after they have made some progress towards a cure, and in this way spread to a very large size. Some of these ulcers, if judged of from their appearances, would be ranked as irritable ones; but, as soothing applications do not agree with them, they are not to be classed with the latter kind of sores. They are said to occur particularly in seamen, and soldiers, who have been long at sea, and have been termed *scorbutic* ulcers. Sir E. Home represents them, however, as not being necessarily connected with the scurvy, and being often met with in patients, who have not been on the sea. He states that they are not of necessity joined with any specific disease; but are common to all kinds of patients, whose constitutions have been impaired, either by salt provisions, warm climates, or drinking.

From some trials, first made by Dr. Harness, and afterwards by Sir E. Home, it appears, that these particular ulcers, when in a sphacelated state, are benefited by employing the gastric juice of ruminating animals, as an external application. It makes the sloughs fall off, and the sore assume a better appearance. Some pain follows on its being first applied, and it is to be regarded as a stimulating application.

Sir E. Home mentions, that in the West Indies, such ulcers are advantageously dressed with the fresh root of the cassada, grated into a pulp. Lime-juice has also been found an useful application, and solutions of the sulphate of copper and alum have been recommended.

When indolent ulcers are not attended with certain peculiarities, a solution of the argentum nitratum is one of the best of the watery applications. It stimulates the granulations, and makes them put on a more healthy appearance, and its strength may be increased according to circumstances. An ulcer, which at first cannot bear this solution above a certain strength, without pain, and without the granulations being absorbed, becomes able, after the application has been used, about ten days, or a fortnight, to bear it twice as strong, without such effects being produced: a proof of the granulations having acquired strength.

The tincture of myrrh is often employed as an application to indolent ulcers. Hunezowsky has praised a decoction of the walnut-tree leaves, and soft covering of the walnut, for the same purpose. (*Acta Acad. Med. Chir. Vindob. T.* 1, 1788.) Sir E. Home gives his testimony in favour of both the latter dressings.

Diluted sulphuric acid, and the expressed juice of the pod of different species of pepper in a recent state, are mentioned by Sir E. Home as having been used as applications to indolent ulcers: the latter one in the West Indies.

This gentleman recommends also a scruple of nitrous acid, mixed with eight ounces of water, as a very useful medicine for external use. The strength must be increased or diminished, according to circumstances. Sir E. Home has found, that this application promotes, in a very uncommon manner, the progress of the cure.

The first application of diluted nitrous acid gives a good deal of pain, which lasts about half an hour, and then goes off.

When an indolent ulcer heals with the diluted nitrous acid, the process of skinning is accomplished with more rapidity, than when other applications are employed; and the new skin is said to be more completely formed. The acid coagulates the pus as soon as it is secreted.

Sir E. Home states, that several patients, who had ulcers dressed with the diluted nitrous acid, were allowed to walk about, without finding the progress of the cure retarded, although no bandage to support the limb was made use of. The same surgeon informs us, also, that, in ulcers of the leg, attended with an exposure of a piece of bone, which retards the cure, because it does not exfoliate, and come away, the application of diluted nitrous acid to the bone removes the earthy part, and excites the absorbents to act upon the remaining animal portion.

3. The only application, in the form of powder, adapted to indolent ulcers, is, according to Sir E. Home, the hydrargyrus nitratus ruber. It may be occasionally used for ulcers of the most indolent kind.

4. Ointments are represented as being particularly good applications for indolent sores.

The idea of the air having bad effects on sores, which are exposed to it, is now disbelieved. That air has no irritating property of this kind, is proved by the fact, that, when the abdomen of an animal is filled with it, no inflammation is excited. When the cellular membrane is loaded with it, in cases of emphysema, the parts do not afterwards inflame. Nor do ulcers in the throat, as Sir E. Home justly remarks, heal less favourably than others, although they are of necessity always exposed to the air.

Whatever ill effects arise, may probably be explained by the consequences of evaporation, which converts the soft pus into a scab. The granulations are, in all probability, most favourably circumstanced, when they are covered with their own matter, which should only be now and then removed, in order that such applications may be made, as will stimulate them to secrete a more perfect pus. From what has been just stated, it must be obvious, that indolent ulcers should not be frequently dressed, and, that if they are so, and the dressings are stimulating, the practice will do harm. Changing the dressings once in twenty-four hours is deemed quite sufficient, unless the quantity of matter be very great, which seldom happens.

One part of the unguentum hydrargyri nitrati, mixed with three of hog's lard, is one of the best applications. Its strength, however, must be increased after being used, for some time, as a dressing for the same ulcer.

The unguentum hydrargyri nitrati has the effect of quickly removing the thickness of the edges of indolent ulcers, and the surrounding dark red colour of the skin. It seems also to have particularly great power in making the granulations become small and healthy, and, of course, the ulcer less likely to break out again.

With some ulcers, however, this ointment is found to disagree.

The ceratum resinæ and the unguentum elemi, mixed with the balsam of turpentine, or that of copaiba, are other common applications to indolent sores. Sir E. Home states, that the resins and turpentines are not so powerful, as the acids and metallic salts, in giving the granulations a healthy appearance, and a disposition to resist absorption.

Cases, attended with a degree of indolent thickening, are most likely to be improved, by camphorated ointments.

In numerous cases, the applications, whatever they are, soon lose their effect, and others should then be substituted for them. The past and present states of the sore are always to be considered. Although the ulcer may be in its nature indolent, it is liable to temporary changes, from constitutional causes, and hence, a temporary alteration in the treatment becomes proper.

5. Bandages are undoubtedly of essential service in healing many kinds of ulcers; but, their efficacy is so great in curing numerous indolent sores, that they are sometimes considered the principal means of cure. But among modern advocates for rollers, Mr. Whately is one of the most zealous. While this gentleman acknowledges, that the efficacy of *pressure* in counteracting the effects of the dependent posture, was known to Wiseman, who recommended the use of the laced stocking for this purpose, he conceives, that the effects of pressure, in the cure of ulcers on the extremities, previously to the appearance of Dr. Underwood's treatise, were not duly insisted upon by surgical writers. However, he confesses, that there always have been practitioners, who were acquainted with the importance of this mode of treatment, and adopted

it in their practice. He then criticises the work of Sir Everard Home, in which, it is remarked, that the effect of pressure is not much relied upon for the cure of these complaints. Indeed, says Mr. Whately, it is stated in that book, not only that no benefit is derived from compression in several species of these ulcers, but that many ulcers are rendered worse, more painful, and more unhealthy in their appearance by its use; truths which it would be impossible for Mr. Whately to refute. They are, I conceive, admitted by himself, when he observes, that there are certain conditions of an ulcer, which will not bear compression. Whether Sir Everard Home has not given a sufficiently favourable account of the effects of pressure in the cure of ulcers of the leg, I will not presume to determine; perhaps, he may not have insisted so much upon this treatment as it deserves; but I can find no fault with him for speaking of it as *frequently* injurious, because the fact is notorious.

In the cases published in Mr. Whately's essay, *very little variety of dressing was used;* pressure being the principal means of cure, with some exceptions particularly specified in the work.

"I cannot doubt (says Mr. Whately) that the practice here recommended must, in the end, prevail, notwithstanding it has this great obstacle to contend with, that surgeons must condescend, for the most part, to apply the bandages with their own hands. The clumsy and ineffectual manner, in which this business is too frequently done, can never be expected to produce the desired effect. I am certain, that if the necessary pains be taken, according to the directions here laid down, such effects will uniformly follow, as must convince the unprejudiced mind, that to have recourse to the operation of tying varicose veins, and the application of a great variety of remedies, can be *very rarely*, most probably *never* necessary."

With respect to Mr. Baynton's mode of treatment, while Mr. Whately regards it as a confirmation of the principles insisted upon in his own tract, he considers the plan of making the pressure with adhesive plaster inconvenient, and on several accounts objectionable. In every case related by Mr. Baynton, he is sure, that the proper application of compresses and flannel rollers, would have produced similar good effects. The instances of success by this method, after the supposed failure by the roller, he attributes to the pressure made by the plasters, having been applied with Mr. Baynton's own hands, whereas that with the roller, was probably so made, that the effect intended by it, could not possibly be obtained. No surgeon, he observes, who will not be at the trouble of applying the roller and compresses himself, can be a judge of what may be effected, by the proper management of them.

The following is the calamine cerate, which Mr. Whately has usually employed:

℞. Axung. Porcin. depur. lib. iij.
Empl. Plumbi. lib. iss.
Lap. Calam. præp. ap. lib. j. M.

"To this formula, (says Mr. Whately,) I shall add another for making a cerate, which nearly resembles the unguentum tripharmicum of the old Dispensatory, but being less oily, it makes a much more adhesive plaster. It should be spread on rag, or silk, as an external covering to the dressing on lint, where a tow plaster cannot be conveniently used; as in wounds of the face or hands, a bubo, or any other sore, where an external plaster cannot be readily retained in its situation by a bandage. This plaster is likewise so mild, that it never irritates the skin. I have found it also a very useful plaster in fractures. The following is the formula:

℞. Empl. Plumbi. lib. j.
Axung. Porcin. depur. unc. vj.
Aceti unc. iv. M."

With respect to the proper method of applying the roller and compresses, Mr. Whately offers the following remarks:

"The best width for a flannel roller, designed for those who have slender legs, is three inches; but for those whose legs are of a large size, they should always be three inches and a half in width. They must therefore be at first torn a little wider, that they may be of their proper width when repeatedly washed. It will likewise be found, that rollers made of fine, soft, and open flannel, will answer much better, than those made of coarse hard flannel.

"For those who have full sized legs, the length of six yards is but just sufficient to answer all the purposes intended by a roller; but in those who have very small legs, five yards is a sufficient length. Care should be taken that the rollers be washed in very hot water, and they should be hung up to dry immediately on being washed. If these precautions be not attended to, repeated washing of them will, in some kinds of flannel, make them as narrow as tape, by which they will be rendered almost useless. They should be often washed, as they are much softer, and of course sit easier, when quite clean than when they are soiled.

"In applying a roller, (says this gentleman,) the first circle should be made *round* the *lowest* part of the ankle, as near as possible to the heel; the second should be formed from thence round the foot; the third should be passed again round the foot quite to the toes. The roller should then be passed from the foot round the ankle and instep a second time to make the fourth circle. In doing this, it should be brought nearer (but not over) the point of the heel, than it was at the *first time* of going round this part. The fifth circle should pass over the ankle again, and not more than half an inch higher up the leg than the fourth circle. The sixth, seventh, eighth, and ninth circles should ascend spirally along the small of the leg, at the *exact distance* of three-fourths of an inch from each other. Having proceeded thus far up the leg, we may begin to increase the distances of the circles from each other: they may succeed each other upward to the knee at the distance of from one to two inches, according to the size and shape of the leg. At that part where the calf of the leg commences, it is generally necessary to let the upper edge of the roller be once, twice, or thrice, turned downwards for about half the circumference of the leg, in order to make the roller lie smooth between the middle of the calf, and the small of the leg. When the roller has been thus applied as far as the knee, there will be a portion of it to spare, of perhaps a yard in length; this remainder should be brought down by spiral windings, at greater distances from each other than those which were made on the ascent of the roller. The windings should in general be completed in the small of the leg, where the roller should be pinned.

"In *many* cases, it is necessary to apply the roller *over* the *heel*. It should be brought as low as possible round the ankle; as in the former description. From thence, the second circle of the roller should pass from the instep over one side of the heel, and be brought over the other side of the heel to the instep again. The third circle should be passed round the ankle a second time, but still nearer to the heel than the first circle was. The roller should after this be brought back to the foot, and passed round it to make the fourth circle. A fifth circle should be again made (though it is not in all cases absolutely necessary) round the foot, to the toes. To make the sixth circle, the roller should be brought back, and passed round the ankle again. The seventh, eighth, ninth, tenth and eleventh circles should ascend spirally at the *exact distance* of three fourths of an inch from each other; these distances commencing at the sixth circle. The roller should then be carried to the knee, and be brought down again to the small of the leg, as described in the former instruction.

"In applying the compresses, it is necessary in every instance to put them on one by one, and not all in a mass, though they be of a proper size and number. They should be crossed in different directions; the largest of them should in no case be longer than just to meet on the opposite side of the leg, to which they are applied. I have in many instances seen the compresses applied by the patients of such a length as to go round the leg like a roller, and be fastened together with pins. This method generally wrinkles and blisters the skin, and by no means answers the purpose of making a compression on the part where it is most wanted. I never suffer a pin to be used in the compresses. If the same compresses in any case be applied two days together, they should always be turned on the contrary side at each re-application, in order to prevent wrinkles on the skin." (See *Practical Obs. on the Cure of Wounds and Ulcers on the Legs, without rest; by T. Whately*; 1799.)

6. I shall next introduce an account of Mr. Baynton's plan of curing old ulcers of the leg, by means of adhesive plaster. Were I to say, that any particular method of dressing such sores is entitled to superior praise, I should certainly decide in favour of this gentleman's practice. I have seen it most successful myself, and I hear it highly spoken of by numerous professional friends, in whose unprejudiced judgment I place much reliance.

Mr. Baynton acquaints us, that the means proposed by him will be found, in most instances, sufficient to accomplish cures in the worst cases, without pain or confinement. After having been repeatedly disappointed in the cure of old ulcers, Mr. Baynton determined on *bringing their edges nearer together by means of slips of adhesive plaster*. To this he was chiefly led, from having frequently observed, that the probability of an ulcer continuing sound, depended much on the size of the cicatrix, which remained after the cure appeared to be accomplished; and from well knowing, that the true skin was a much more substantial support and defence, as well as a better covering, than the frail one, which is obtained by the assistance of art. But, when he had recourse to the adhesive plaster, with a view to lessen the probability of those ulcers breaking out again, he little expected, that an application so simple would prove the easiest, most efficacious, and most agreeable means of treating ulcers.

Although the first cases, in which Mr. Baynton tried this practice, were of an unfavourable nature, yet he had soon the satisfaction to perceive, that it occasioned very little pain, and materially accelerated the cure, while the size of the cicatrices were much less than they would have been, had the cures been obtained by any of the common methods.

At first, however, the success was not quite perfect; as, in many instances, he was not able to remove the slips of plaster, without removing some portion of the adjacent skin, which, by occasioning a new wound, proved a disagreeable circumstance, in a part so disposed to inflame and ulcerate, as that in the vicinity of an old sore. He therefore endeavoured to obviate that inconvenience by keeping the plasters and bandages well moistened with spring-water, for some time, before they were removed from the limb. He had soon the satisfaction to observe, that the inconvenience was not only prevented, but that every succeeding case justified the confidence he now began to place in the remedy. He also discovered, that moistening the bandages was attended with advantages which he did not expect: while the parts were wet and cool, the patients were much more comfortable, and the surrounding inflammation was sooner removed, than he had before observed it to be.

By the mode of treatment here recommended, Mr. Baynton found, that the discharge was lessened, the offensive smell removed, and the pain abated in a very short time. But, besides these advantages, he also found, that the callous edges were in a few days level with the surface of the sore; that the growth of fungus was prevented, and the necessity of applying painful escharotics much lessened, if not entirely done away. Mr. Baynton gives the following description of his method.

"The parts should be first cleared of the hair, sometimes found in considerable quantities upon the legs, by means of a razor, that none of the discharges, by being retained, may become acrid, and inflame the skin, and that the dressings may be removed with ease at each time of their renewal, which, in some cases, where the discharges are very profuse, and the ulcers very irritable, may, perhaps, be necessary, twice in the twenty-four hours, but which I have, in every instance, been only under the necessity of performing once in that space of time.

"The plaster should be prepared by slowly melting, in an iron ladle, a sufficient quantity of litharge plaster, or diachylon, which, if too brittle, when cold, to adhere, may be rendered adhesive by melting half a drachm of resin with every ounce of the plaster: when melted, it should be stirred till it begins to cool, and then spread thinly upon slips of smooth porous calico, of a convenient length and breadth, by sweeping it quickly from the end, held by the left hand of the person who spreads it, to the other, held firmly by another person, with the common elastic spatula used by apothecaries; the uneven edges must be taken off, and the pieces cut into slips, about two inches in breadth, and of a length that will, after being passed round the limb, leave an end of about four or five inches. The middle of the piece so prepared, is to be applied to the sound part of the limb, opposite to the inferior part of the ulcer, so that the lower edge of the plaster may be placed about an inch below the lower edge of the sore, and the ends drawn over the ulcer with as much gradual extension as the patient can well bear; other slips are to be secured in the same way, each above and in contact with the other, until the whole surface of the sore and the limb are completely covered, at least one inch below, and two or three above, the diseased part.

"The whole of the leg should then be equally defended with pieces of soft calico, three or four times doubled, and a bandage of the same, about three inches in breadth, and four or five yards in length, or rather as much as will be sufficient to support the limb from the toes to the knee, should be applied as smoothly as can be possibly performed by the surgeon, and with as much firmness as can be borne by the patient, being first passed round the leg, at the ankle joint, then as many times round the foot as will cover and support every part of it, except the toes, and afterwards up the limb till it reaches the knee, observing that each turn of the bandage should have its lower edge so placed as to be about an inch above the lower edge of the fold next below.

"If the parts be much inflamed, or the discharge very profuse, they should be well moistened, and kept cool with cold spring-water, poured upon them as often as the heat may indicate to be necessary, or, perhaps, at least, once every hour. The patient may take what exercise he pleases, and it will be always found, that an alleviation of his pain and the promotion of his cure will follow as its consequence, though, under other modes of treating the disease, it aggravates the pain, and prevents the cure.

"These means, when it can be made convenient, should be applied soon after rising in the morning, as the legs of persons affected with this disease are then found most free from tumefaction, and the advantages will be greater than when they are applied to limbs, in a swollen state. But at whatever time the applications be made, or in whatever condition the parts be found, I believe it will always happen, that cures may be obtained by these means alone, except in one species of the disease, which seldom occurs, but that will hereafter be described. The first application will sometimes occasion pain, which, however, subsides in a short time, and is felt less sensibly at every succeeding dressing. The force, with which the ends are drawn over the limb, must then be gradually increased, and when the parts are restored to their natural state of ease and sensibility, which will soon happen, as much may be applied as the calico will bear, or the surgeon can exert; especially if the limb be in that enlarged and compressible state, which has been denominated the scorbutic, or if the edges of the wound be widely separated from each other."

Mr. Baynton afterwards takes notice of the breaking of the skin, near the ulcers; a circumstance, which sometimes proved troublesome, and arose partly from the mechanical effect of the adhesive plasters, and partly from the irritating quality of the plaster. Mr. Baynton, however, only considers such sores of serious consequence, when they are situated over the tendon of Achilles, in which situation they are sometimes several weeks in getting well. This gentleman recommends, with a view of preventing these ulcers, a small shred of soft leather to be put under the adhesive plaster.

Mr. Baynton next adds, "that cures will be generally obtained without difficulty, by the mere application of the slips and bandage; but, when the parts are much inflamed, and the secretions great, or the season hot, the frequent application of cold water will be found a valuable auxiliary, and may be always safely had recourse to, where the heat of the part is greater than is natural, and the body free from perspiration." (See *A Descriptive Account of a new Method of treating old Ulcers of the Legs, Edit.* 2, 1799.)

One circumstance, strongly in favour of the advantages of the foregoing mode of treatment, deserves particular notice: when M. Roux visited the London hospitals a few years ago, he had for the first time an opportunity of seeing this practice, which had never been tried in France. The plan appeared to him so different from every thing which he had been accustomed to see in his own country, where ulcers were almost always treated by rest in a horizontal posture, and emollient applications, that he left London somewhat prejudiced against the new method. Subsequently to his return to Paris, however, he has given it a fair trial, and experience has now entirely changed his opinion, as he has had the candour to acknowledge. (See *Rélation d'un Voyage fait à Londres en* 1814; *ou Parallèle de la Chirurgie Angloise avec la Chirurgie Françoise, par P. J. Roux, p.* 150.)

OF ULCERS ATTENDED WITH SOME SPECIFIC DISEASED ACTION, EITHER CONSTITUTIONAL, OR LOCAL.

1. *Ulcers which yield to Mercury.*

Here we shall exclude from consideration venereal ulcers, as this subject is treated of in the article *Venereal Disease.* At present, we shall only notice such sores, as are produced by other diseases of the general system, or of the parts, and are capable of being cured by mercury.

Perhaps there is no greater source of error in the whole practice of surgery, than the supposition, that a sore, when it yields to mercury, must be of a syphilitic nature. Surgeons, however, who run into this absurdity, can hardly be imagined to be unaware, that so potent a medicine must have effects on numerous diseases of very different descriptions. Sir E. Home accurately remarks, that many ulcers, unconnected with the venereal disease, which receive no benefit from other medicines, heal under a mercurial course, or yield to mercurial applications. In some cases, the ulcer remains in the same state, while mercury is used; but, begins to look better, as soon as the medicine is discontinued, in consequence of the beneficial change produced in the system by the mercurial course. In these cases, mercurial frictions are the best, because they occasion least impairment of the constitution, in consequence of the stomach continuing undisturbed, and capable of digesting well.

Another description of ulcers, noticed by Sir E. Home, as deriving benefit from mercury, occur on the instep and foot, have a very thickened edge, and are attended with a diseased state of the surrounding skin, so as to bear some resemblance to elephantiasis. They are frequently observed affecting servants, who live in opulent families, in an indolent and luxurious way. Sir E. Home states, that fumigations with hydrargyrus sulphuratus ruber heal these ulcers, and resolve in a great degree the swelling of the surrounding parts. In some instances, an ointment of calomel and hog's-lard; in others, the camphorated weak mercurial ointment, is the best application.

Many diseased ulcers, particularly those of a superficial kind, with a thickened edge, may be healed, when they are dressed with a solution of one grain of the hydrargyrus muriatus, in an ounce of water, containing a little spirit.

2. *Ulcers curable by Hemlock.*

Sir E. Home places more reliance on hemlock, as an external, than an internal remedy, for ulcers. The ulcers, which usually receive benefit from hemlock applications, look like those of an irritable sort; but, the surrounding parts are thickened, in consequence of some diseased action. Such sores occur near the ankle; which joint is at the same time enlarged. Sometimes, but not so often, they take place over the ligaments of the knee. On account of their situation, and the swelling of the joint, they may be suspected to be scrophulous, though they are more sensible than strumous ulcers usually are. The sores just described, are rendered less painful, their diseased disposition is checked, and the swelling of the joint diminished, by hemlock. Several irritable scrophulous ulcers are also particularly benefited by this medicine.

Sir E. Home gives the preference to hemlock poultices, unless their weight should be objectionable, in which case, he advises lint to be dipped in a decoction of the herb, and put on the sore.

Of the ointment, made with the inspissated juice, Sir E. Home says but little, in regard to its efficacy.

3. *Ulcers curable by Salt Water.*

Sir E. Home takes notice of other specific ulcers, which yield to this application, after resisting other remedies. Poultices, made with sea-water, are often employed; but, this gentleman seems to prefer keeping the part immersed in the water in a tepid state, about a quarter of an hour, twice a day.

When sea-water poultices bring out pimples, in cases of scrophulous ulcers on the legs and feet, Sir E. Home informs us, that this disagreeable circumstance may be obviated by diluting such water with an equal quantity of a decoction of poppies. After a time, the salt-water may be tried by itself again. While each fresh poultice is preparing, the part should also be immersed in such water warmed.

When there is a tendency to anasarca, or when there is an unusual coldness in the limb, unattended with any propensity to mortification, tepid salt-water may be used with infinite advantage.

4. *Ulcers, curable by the Argentum Nitratum.*

Sir E. Home notices, under this head, an ulcer, which does not penetrate more deeply, than the cutis; but, spreads in all directions, producing ulceration on the surface of the skin, and often extending nearly through its whole thickness. The part, first affected, heals, while the skin beyond is in a state of ulceration.

Of this description are, a leprous eruption, mostly seen in men impressed in Ireland; a disease of the skin induced by buboes, which have continued a great while after the venereal virus has been destroyed; and the ring-worm.

All these diseases are most easily cured by applying to them a solution of the argentum nitratum.

The leprous eruption is communicated by contact, and makes its appearance in the form of a boil. This is converted into an ulcer, which discharges a fetid fluid, by which the surrounding skin is excoriated, and the ulceration is extended over a large surface. The pain is most severe, and the discharge greatest, in hot weather. The parts first diseased heal, while others are becoming ulcerated, and the disease is always rendered worse, by spirituous liquors, salt provisions, and catching cold.

Sir E. Home remarks, that the disease in the skin, produced by the effects of very irritable buboes, in constitutions broken down by mercury, is attended with ulceration of a more violent, deep, and painful kind, than the foregoing distemper. The progress of this disorder is, in other respects, very similar to that of the leprous eruption.

Although the ringworm only occurs in the form of an ulcer in warm climates, a mild species of the affection takes place in summer-time in this country. It seems to be infectious; though it often occurs without infection. It commences with an efflorescence, which is attended with very trivial swelling, and spreads from a central point. The circumference of the efflorescence becomes raised into a welt, while the rest assumes a scurfy appearance. The welt becomes covered with a scab, which falls off, and leaves an ulcerated ring, in general, not more than a quarter of an inch wide. The outer margin of this ring continues to ulcerate, while the inner one heals, so that the circle becomes larger and larger. The discharge consists of a thin, acrid fluid, which seems to have a great share in making the disease spread.

For all the three preceding diseases, a solution of the argentum nitratum is strongly recommended by Sir E. Home.

5. *Ulcers, which yield to Arsenic.*

The sores, which come under the definition of *noli me tangere*, or *lupus*, derive great benefit from this powerful remedy. Sir E. Home observes, that they are nearly allied to cancer, differing from it in not contaminating the neighbouring parts by absorption, and only spreading by immediate contact.

From some cases, which fell under Sir E.

Home's observation, he discovered, that arsenic was not only efficacious as an external, but also as an internal remedy. I shall not unnecessarily enlarge upon this subject in the present place, as the reader may refer to the articles *Arsenic*, *Cancer*, *Lupus*, *Hospital Gangrene*, &c. for additional information, relative to the uses of this mineral in the practice of surgery.

Sir E. Home is an advocate for its employment, both internally and externally, for ulcers of untoward appearance on the legs. The *fungated* ulcer is particularly pointed out by this gentleman as being benefited by arsenic. This ulcer occurs on the calf of the leg, and on the sole of the foot. From its surface, a fungus shoots out, which is entirely different from common granulations. The new formed substance is radiated in its structure, the bottom of the ulcer being the central point, and the external surface, which is continually increasing, the circumference. The substance of this fungus is very tender, and readily bleeds. The first stage of the disease sometimes has the appearance of a scrophulous affection of the metatarsal bones; but, the parts seem more enlarged, and, when the skin ulcerates, a fungus shoots out, and betrays the nature of the case.

One species of the fungated ulcer is capable of contaminating the lymphatic glands; the other is not so. The first is represented by Sir E. Home as being incurable by arsenic, or any other known medicine.

The second yields to this remedy. Sir E. Home uses a saturated solution, made by boiling white arsenic in water, for several hours, in a sand heat. He gives from three to ten drops internally; and, for outward use, dilutes a dram with two pints of water, making it afterwards gradually stronger and stronger, till it is of double strength. The application may either be made in the form of a poultice, or of lint dipped in the lotion.

The best and safest preparation of arsenic, both for internal and external use, is the kali arsenicatum. The mode of employing it may be learnt by turning to the articles *Arsenic*, *Cancer*, *Potassa*, *Lupus*, &c.

6. *Ulcers attended with Varicose Veins.*

A certain kind of ulcer is very apt to occur on the inside of the leg, and is equally difficult to cure, and liable to break out again. It has the look of a mild, indolent sore; but, the branches and trunk of the vena saphena are enlarged, and this varix of the veins keeps the ulcer from healing. The sore is seldom deep, usually spreads along the surface, and has an oval shape, the ends of which are vertically situated. There is a pain affecting the limb rather deeply, extending up in the course of the veins, and exasperated by keeping the leg a long while in an erect posture.

This is a kind of ulcer, which derives immense benefit from a tight roller, applied from the toes to the knee, although the direct operation of the pressure of the bandage on the sore is itself productive of no particular good.

Sir E. Home found, however, that many patients could not bear laced stockings, or tight bandages, and that others received no relief from them. He represents, that, in consequence of the size of the vena saphena, and its numberless convolutions, the return of blood from the smaller branches is so impeded, as to retard the circulation in the smaller arteries, and to interfere with their action in forming healthy granulations. The coats, and valves of the veins also become thickened, so that the latter parts (the valves) do not do their office of supporting the weight of the column of blood.

These reflections induced him to think, that some benefit might be obtained from applying a ligature round the vena saphena, where this vessel passes over the knee-joint, so as to take off a part of the pressure of the column of blood. The following way of performing the operation was recommended: "As the veins are only turgid in the erect posture, the operation should be performed while the patient is standing; and if placed upon a table, on which there is a chair, the back of the chair will serve him to rest upon; and he will have the knee-joint at a very convenient height for the surgeon. The leg to be operated upon must stand with the inner ankle facing the light, which will expose very advantageously the enlarged vena saphena passing over the knee-joint. While the patient is in this posture, if a fold of the skin, which is very loose at this part, is pinched up transversely, and kept in that position by the finger and thumb of the surgeon, on one side, and of an assistant on the other, this fold may be divided by a pointed scalpel, pushed through with the back of the knife towards the limb to prevent the vein being wounded; much in the same way, as the skin is divided in making an issue. This will expose the vein sufficiently; but, there is commonly a thin membranous fascia confining it in its situation; and, when that is met with, the vein had better be laterally disengaged by the point of the knife. This is most expeditiously done by laying hold of the fascia with a pair of dissecting forceps, and dividing it; for it is difficult to cut upon parts, which give little resistance, and there is a risk of wounding the vein. After this a silver crooked needle, with the point rounded off, will readily force its way through the cellular membrane connected with the vein, without any danger of wounding the vessel, and carry a ligature round it. This part, or, indeed, what may be considered as the whole of the operation, being finished, the patient had better be put to bed, so as to allow the vein to be in its easiest state, before the ligature is tied, and then a knot is to be made upon the vein: this gives some pain; but it is by no means severe. The edges of the wound in the skin are now to be brought together by sticking-plaster, except where the ligature passes out, and a compress and bandage applied, so as to keep up a moderate degree of pressure on the veins, both above and below the part included in the ligature." (*Home on Ulcers, p.* 296, *edit.* 2.)

As a general practice, I never entertained any doubt about the preference, which ought to be given to bandages. Indeed, the risk, attending the plan of tying and dividing large veins, has now been displayed in so many fatal examples, that I begin to think, that, in a few years more, such operations will only be mentioned as things which ought not to be done. Sir A. Cooper, indeed, has already entered his protest against them, and mentions several cases, in which the experiment had a fatal result. (*Lectures, &c. Vol.* 1, *p.* 205.)

It appears that A. Paré proposed and performed an operation, similar to that described by Sir E. Home. (The *Works of A. Paré, translated by Johnson; folio, p.* 319.) An account of Mr. Brodie's operation for the cure of varicose veins, and some additional remarks on the treatment of ulcers accompanied with varices, will be found in a subsequent article. See *Varicose Veins.* A description of what has sometimes been called the *hospital sore,* is given under the head of *Hospital Gangrene.*

Ulcers from irritation of the Nails are the cases, with which I shall conclude. Sometimes portions of the nails grow against, or even into the flesh of the fingers, or toes, a fungus arises there, and, notwithstanding the repeated application of caustic, the disease returns, and the patient continues in a state of considerable pain and seriously disabled. The treatment, recommended by Sir A. Cooper, consists in paring the nail, till it is as thin as it can be made, without the production of bleeding: its edge is then to be raised, and a small bit of lint placed between it and the sore. When, however, the irritation is so great, that even the application of lint cannot be endured, he slits up the nail, and turns it back with forceps, or even removes it. (*Lectures, &c. p.* 200, *Vol.* 1.) A common plan is to apply Plunket's caustic, a strong solution of nitrate of silver, the liquor arsenicalis, or a blister, so as to produce a separation of the offending part of the nail; but, such treatment is sometimes tedious. According to Mr. Wardrop, the shape of the nail is not really altered, and the chief point in the treatment, is not to cut away any of it, but to reduce the swelling of the soft parts which press against the nail, and he has generally found, that the application of lunar caustic destroys the painful and irritable ulcerated surface, whilst it promotes the absorption of the thickened parts. (See *Med. Chir. Trans. Vol. 5, p.* 131, *&c.*)

For information on the subject of ulcers, consult *Michael Underwood's Treatise on Ulcers of the Legs, &c.* 8*vo. Lond.* 1783, *and Surgical Tracts: 3d. edit.* 1799. *B. Bell, A Treatise on the Theory and Management of Ulcers, &c. New edit.* 8*vo.* 1791 ; *and his System of Surgery. J. Merk, De Curationibus Ulcerum difficilium præsertim in cruribus obviorum.* 4*to. Goett.* 1776. *Baynton's Descriptive Account of a new Method of Treating Old Ulcers of the Legs,* 1799, *ed.* 2. 8*vo. Bristol,* 1799. *Whately's Practical Observations on the Cure of Wounds and Ulcers on the Legs, without rest,* 8*vo. Lond.* 1799. *Practical Obs. on the Treatment of Ulcers on the Legs, to which are added, some Observations on Varicose Veins and Piles, by Sir Everard Home,* 1801, *edit.* 2. *Principles of Surgery, by John Bell, Vol.* 1. 1801. *Hunter on the Blood, Inflammation, &c. C. Curtis, An Account of the Diseases of India, &c. with Observations on Ulcers and the Hospital Sores of that country, &c.* 8*vo. Edinb.* 1807. *B. Brodie on the Treatment of Varicose Veins of the Legs, in Med. Chir. Trans. Vol.* 7, *P.* 195, *&c. Roux, Voyage fait à Londres en* 1814, *ou Parallèle de la Chirurgie Angloise avec la Chirurgie Francoise, p.* 142, *&c. Paris,* 1815. *Dr. John Thomson's Lectures* on *Inflammation, p.* 423, *&c. Edinb.* 1813. *Dr. Dewar on the Treatment of Sinuous Ulcers, in Med. Chir. Trans. Vol. 7, p.* 482, *&c. Sir A. Cooper's Lectures, Vol.* 1, 1824. *Gibson's Institutes of Surgery, Vol.* 1, *Philadelphia,* 1824. *The stages of several cutaneous affections, attended with ulceration, have been excellently described by Dr. Bateman in his valuable Synopsis of Cutaneous Diseases.*

UNGUENTUM ACIDI SULPHURICI.—℞. Acidi Sulphurici ʒj. Adipis Suillæ præparatæ ℥j.—These are to be well mixed together in a glass mortar.

This ointment has been used by Dr. Duncan, of Edinburgh, for curing the itch. It has the character also of being efficacious in the reduction of some chronic swellings of the joints; and when mixed with a good deal of camphor it was rubbed upon the tumor, in cases of bronchocele, by Mr. Naylor, of Gloucester, with considerable effect.

As the sulphuric acid is particularly destructive of vegetable substances, the parts, to which this ointment is applied, should always be covered with flannel, instead of linen.

UNGUENTUM ANTIMONII TARTARIZATI.—℞. Antim. Tart. ʒj. Ung. Cetacei ℥j. Misce. The antimonial ointment, frequently used for exciting irritation of the skin, with the view of relieving diseases in the vicinity of the irritated part, as is exemplified in the treatment of some diseases of the eyes, and joints, and a variety of indolent swellings.

UNGUENTUM CETACEI.—℞. Cetacei ʒvj. Ceræ Albæ ʒij. Olivæ Olei. fluid uncias tres. These are to be melted upon a slow fire, and then briskly stirred till cold.—This ointment, spread on lint, serves as a simple dressing for wounds, ulcers, &c.

UNGUENTUM CERÆ CUM ACETO.—℞. Ceræ Albæ ℥iv. Olei Olivæ ℔j. Aceti Distillati ℥ij. The vinegar is to be gradually mixed with the two first ingredients, after these have been melted together. Dr. Cheston recommends this ointment for superficial excoriations, cutaneous eruptions, &c.

UNGUENTUM CONII.—℞. Foliorum Conii recentium. Adipis Suillæ præparatæ, sing. ℥iv. The hemlock is to be bruised in a marble mortar, after which, the lard is to be added, and the two ingredients thoroughly incorporated by beating. They are then to be gently melted over the fire, and after being strained through a cloth, and the fibrous part of the hemlock well pressed, the ointment is to be stirred till quite cold. To cancerous or scrophulous sores, this ointment may be applied with a prospect of advantage. (*Pharm. Chirurg.*)

The Pharmacopœia of St. Bartholomew's Hospital directs the unguentum conii, vel cicutæ, to be made as follows:—℞. Foliorum Cicutæ ℔j. Adipis Suillæ ℔iss. Boil the leaves in the melted hog's-lard, until they become crisp. Then strain the ointment. A similar ointment might be more conveniently made, by mixing the extractum conii with any common salve.

UNGUENTUM DIGITALIS.—℞. Foliorum Digitalis Purpureæ recentium. Adipis Suillæ præparatæ, sing. ℥iv. This ointment may be made in the same manner as the unguentum conii, and tried in the same cases.

UNGUENTUM ELEMI COMPOSI-

TUM.—℞. Elemi ℔j. Terebinthinæ ℥x. Sevi Ovilli præparati ℔ij. Olei Olivæ ℥ij. Melt the elemi with the suet; remove them from the fire, and mix them immediately with the turpentine and oil. Then strain the mixture.—Sometimes employed for dressing ulcers, which stand in need of stimulating applications.

UNGUENTUM GALLÆ CAMPHORATUM. ℞. Gallarum Pulveris Subtilissimi ʒij. Camphoræ ʒss. Adipis Suillæ præparatæ ℥ij. Misce.—This is a very good application to piles, after their inflammatory state has been diminished by the liq. plumbi acet. dilut. and leeches.

UNGUENTUM HELLEBORI ALBI.—℞. Hellebori Albi Pulv. ℥j. Adipis Suillæ præparatæ ℥iv. Olei Limonis ℈ss. Misce.—This ointment will cure the itch, and several other cutaneous diseases.

UNGUENTUM HYDRARGYRI FORTIUS.—℞. Hydrargyri purificati ℔ij. Adipis Suillæ præparatæ ℥xxiij. Sevi Ovilli præparati ℥j. First rub the quicksilver with the suet, and a little of the hog's lard, until the globules disappear; then add the remainder of the lard, and make an ointment.—This is the common, strong, mercurial ointment. Of its uses we need say nothing in this place.

UNGUENTUM HYDRARGYRI CAMPHORATUM,—℞. Unguenti Hydrargyri ℥j. Camphoræ ʒss. Misce.—This is often recommended to be rubbed on thickened, indurated parts, with the view of exciting the action of the absorbents. Rubbed along the course of the urethra, it is very serviceable in diminishing and removing chordee.

UNGUENTUM HYDRARGYRI MITIUS.—℞. Unguenti Hydrargyri fort. ℔j. Adipis Suillæ præparatæ ℔ij. Misce.—The weaker mercurial ointment is often rubbed on indurated, thickened parts and tumors, when the object is merely to promote their absorption; and, it is not advisable to employ the unguentum hydrargyri fort. lest a salivation should be induced.

UNGUENTUM HYDRARGYRI NITRATIS.—℞. Hydrarg. Purificati ℥j. Acidi Nitrosi ℥ij. Adipis præparatæ ℥vj. Olei Olivæ ℥iv. Dissolve the quicksilver in the nitrous acid; and whilst the solution is yet hot, mix with it the oil and hog's-lard, previously melted, but beginning to concrete, by being exposed to the air. This ointment is a celebrated application to the inside of the eyelids, in cases of chronic ophthalmy, and also to specks on the cornea. When blended with a little olive oil, it also forms a very eligible stimulating dressing for numerous kinds of sores. It is particularly efficacious in curing tinea capitis, and many other cutaneous diseases.

UNGUENTUM HYDRARGYRI NITRICO-OXYDI.—℞. Hydrargyri nitrico-oxydi ℥j. Ceræ Albæ ℥ij. Adipis præpar. ℥vj. Misce.—This is a common stimulating application to indolent ulcers, and sores in general.

UNGUENTUM HYDRARGYRI PRÆCIPITATI ALBI.—℞. Hydrarg. Præcip. Albi ʒj. Adipis præparatæ ℥iss. Misce. An useful application in certain cases of porrigo, and some other cutaneous diseases. See *Porrigo*.

UNGUENTUM IODINÆ. See *Iodine*.

UNGUENTUM LIQ. PLUMBI ACETATIS.—℞. Liquoris Plumbi Acetatis ℥v. Adipis Suillæ ℔j. Ceræ Albæ ℥iv. Melt the ingredients together, and continue to stir them till cold.—This ointment is employed with great advantage as a simple dressing. According to Mr. Dunn, of Searborough, it is much improved by pouring the liquified mixture, before the lead has been added to it, into cold water. It is then to be rubbed in a mortar, or on a slab, with the liq. plumbi acet. The water occasions a fine white cloudy precipitation, which gives to the composition a better appearance.

UNGUENTUM OPHTHALMICUM.—℞. Adipis Suillæ præparatæ ℥ss. Tutiæ præparatæ, Bol. Armen. sing. ʒij. Præcip. Hydrarg. Albi. ʒj. Misce.—Janin's celebrated ophthalmic ointment.

UNGUENTUM OXYGENATUM, vel ACIDI NITROSI.—℞. Axungiæ Suillæ recentis non salsæ uncias sedecim. Leni calore in vase vitreo lente liquefactis aut continua agitatione instillentur Acidi Nitrici unciæ duæ. Massa igni exponatur, donec ebullire cœpit; tunc ab igne removeatur, frigefactaque servetur.

In this process, the nitric acid is decomposed, the nitrous gas escaping, and the oxygen combining with the lard. This ointment was particularly recommended by Alyon, as an application to venereal and herpetic ulcers. Its virtues are said to vary considerably, according to the strength of the acid employed, and it is not generally deemed so efficacious as the ointment of nitrate of mercury.

UNGUENTUM PICIS.—℞. Picis, Sevi Ovilli præparati, sing. ℔ss. Melt, and then strain them.

UNGUENTUM PICIS COMPOSITUM.—℞. Unguenti Picis, Unguenti Plumbi Superacetatis sing. ℔ss. Misce.

The two preceding ointments are applicable to cases of tinea capitis, and some eruptive complaints. Also to some kinds of irritable ulcers.

UNGUENTUM PICIS CUM SULPHURE.—℞. Unguenti Picis, Unguenti Sulphuris, sing. ℥iv. Misce.—This is one of the most common, and, I believe, the most efficacious, applications for curing porrigo.

UNGUENTUM PLUMBI SUPERACETATIS.—℞. Plumbi Superacetatis ʒij. Ceræ Albæ ℥ij. Olei ℔ss. The superacetate of lead, previously powdered, is to be triturated with part of the olive oil. The melted wax and rest of the oil are then to be added. This is a good dressing for cases requiring a mild astringent application.

UNGUENTUM RESINÆ.—℞. Resinæ Flavæ, Ceræ Flavæ sing. ℔j. Olei Olivæ ℔j. Melt the resin and wax with a slow fire; then add the oil, and strain the mixture while hot.—This is a common application to ulcers, which stand in need of being gently stimulated.

UNGUENTUM SAMBUCI.—℞. Florum Sambuci, Adipis Suillæ, singulorum ℔j. The hog's-lard being melted, boil the elder flowers in it till they become crisp, then strain the mixture.

UNGUENTUM SULPHURIS.—℞. Adipis Suillæ ℔ss. Florum Sulphuris ℥iv. Misce.

UNGUENTUM TUTIÆ.—℞. Tutiæ præparatæ, Unguenti Cetacei q. s. Misce.—Used for smearing the borders and inside of the eyelids, in cases of chronic ophthalmy, &c.

UNGUENTUM TUTIÆ COMPOSITUM.—℞. Tutiæ præparatæ, Lapidis Calaminaris præparati, sing. ʒvj. Camphoræ ʒij. Unguenti Sambuci ℔j. Misce.

This formula is contained in the Pharmacopœia of St. Bartholomew's Hospital. It is occasionally applied to the inside of the eyelids, piles, ulcerations, excoriations, &c.

UNGUENTUM ZINCI.—℞. Zinci oxydi ℥j. Adipis præpar. ℥vj. Misce.—An astringent application in very common use.

UNGUIS. (*A Nail.*) Some surgical authors apply this term to a collection of pus, or matter in the eye, when the abscess appears, through the cornea, to be shaped like a finger nail.

UNION BY THE FIRST INTENTION.—When the opposite surfaces of a wound are brought into contact, and grow together at once, without suppurating, union by the first intention is said to take place. When wounds heal by suppurating, granulating, &c. they are sometimes surgically described as getting well by the second intention. See *Wounds.*

URETHRA, DESTRUCTION OF PART OF THE.—The attempts to complete the canal by operations, performed on the Taliacotian principles, will be noticed in the article URINARY FISTULA.

URETHRA, STRICTURES OF. — A stricture of the urethra, as a modern writer observes, "consists of some morbid alteration of action, or of structure, by which a part of the canal is rendered narrower, than the rest." (*Wilson on the Male Urinary and Genital Organs, p.* 361.) According to Mr. John Hunter, most obstructions to the passage of the urine, if not all, are attended with nearly the same symptoms. Few persons take notice of the first symptoms of a stricture, till they have either become violent, or other inconveniences have been the consequence. A patient may have a considerable stricture, yet be unconscious, that his urine does not freely come away; and in consequence of a stricture, there may even be a tendency to inflammation and suppuration in the perinæum, while he feels no obstruction to the passage of his urine, and does not suspect that he has any other complaint.

Three kinds of strictures are described; viz. the *permanent*, which arises from an alteration in the structure of the part of the urethra; the *mixed* case, consisting of a permanent stricture and a spasm; and the *spasmodic* stricture.

Whether the urethra is a truly muscular canal, and whether a variety of circumstances, remarkable in its healthy and diseased state, can be accounted for by its elasticity, the action of the muscles in the perinæum, and other principles, without supposing the canal to be itself muscular, are questions, on which different opinions are entertained. However, the generality of modern practitioners in this country have inclined to that view of the subject, which refers the property of muscularity either to the membrane of the urethra itself, or to the substance immediately surrounding it. The latter is now alleged to be the real case. "From Mr. Bauer's examinations (says Sir Everard Home) we find that the human urethra is made up of two parts, an internal membrane, and an external muscular covering. The internal membrane is exceedingly thin, and no fibres are met with that can give it a power of contraction. When it is put on the stretch in a transverse direction, the circumference of the canal is no ways increased; but, when stretched longitudinally, a small degree of elongation is produced. When a transverse section of the urethra is made, while in a collapsed state, the internal membrane is found thrown into folds, pressed together by the surrounding parts." It is afterwards explained, that "the muscular covering, by which the membrane is surrounded, or enclosed, is made up of fasciculi of very short fibres, which appear to be interwoven together, and to be connected by their origins and insertions with one another. *They all have a longitudinal direction.* There is a greater thickness of this muscular structure upon the upper than the under surface of the urethra, which is still more evident as it approaches nearer to the external orifice. The fasciculi are united together by an elastic substance of the consistence of mucus. Immediately beyond the muscular portion of the urethra, is the cellular structure of the corpus spongiosum."

Formerly "it was believed, that either the lining of the urethra was composed of *circular* fibres, possessed of a power of contraction, or that it was immediately surrounded by such fibres; and, therefore, that the disease, commonly known by the name of a stricture in the urethra, was produced by a contraction of some of these *circular* fibres; and that permanent stricture was a term applied to these parts, when, in consequence of inflammation, they became confined to that particular state. We now find, that *the lining of the urethra is never met with in a contracted state*, but is thrown into folds by the action of the elastic ligamentous covering of the corpus spongiosum, and the swell of the *longitudinal* muscular fibres within it; and when these fibres have, by acting through their whole length, reduced the urethra to its shortest state, the pressure upon the internal membrane is so great, that there is not room for the urine to pass, till these fibres are relaxed by elongating the whole canal.

"A *spasmodic stricture* is in reality *a contraction of a small portion of the longitudinal muscular fibres*, while the rest are relaxed; and as this may take place either all round, or upon any one side, it explains what is met with in practice, and could not before be satisfactorily accounted for; the mark, or impression of a stricture sometimes forming a circular depression upon the bougie; at other times, only on one side.

"A *permanent stricture* is *that contraction of the canal, which takes place in consequence of coagulable lymph being exuded between the fasciculi of muscular fibres, and upon the internal membrane*, in different quantities, according to circumstances; and, in the same proportion, diminishing the passage for the urine at that part, or completely closing it up." (*Sir Everard Home in Phil. Trans.* 1820, *and Pract. Obs. on Strictures, Vol.* 3, *p.* 26, *&c.* 8*vo. Lond.* 1821.)

For a particular detail of the arguments and remarks, urged against the doctrine of the urethra being a tube, capable of having its diameter suddenly lessened at every point by the contraction of muscular fibres, I must refer to the writings of Mr. C. Bell and Mr. Shaw, whose statements, indeed, have been noticed in my introductory work. (See *First Lines of the Practice of Surgery*, *ed.* 4, *Vol.* 2.)

In all obstructions of the urethra, the stream of water becomes small in proportion to the stoppage; but, though this symptom is probably the first, it is not always observed by the patient.

According to Sir A. Cooper, the earliest symptom of a stricture, is the retention of a few drops of urine in the urethra, after the patient has made water, which drops soon escape, and slightly wet the linen, while another small quantity of urine, collected between the neck of the bladder and the stricture, may be expelled by pressure on the lower side of the urethra. This inability of completely emptying the urethra, however, is observed in the generality of persons after a certain age, and even in youngish individuals, who have led irregular lives: much stress, therefore, cannot be laid upon this circumstance alone. The next thing noticed, he says, is an irritable state of the bladder, evinced by the patient not being able to sleep so long as usual, without discharging his urine. As the disease increases, the stream of urine is forked, spiral, or scattered; and, in a more advanced stage, the water is often voided only by drops, especially, when the urethra is under the influence of cold, irritation, or the effects of intemperance. When the stream of urine is thus altered, or broken, Mr. Hunter recommends the passage to be examined with a bougie; and, if one of a common size can be readily introduced, the difficulty of voiding the urine is likely to depend on a diseased enlargement of the prostate gland, which should, therefore, be examined. See *Prostate Gland.*

The spasmodic stricture may be known by its being only of temporary duration. This kind of case, and more particularly the permanent stricture, are generally attended with a gleet. The latter complaint is often suspected to be the only one, until all efforts to produce a cure, are found to be fruitless.

In diseases of the urethra, and also of the prostate gland and bladder, there is commonly an uneasiness about the perinæum, anus, and lower part of the abdomen. (*Hunter.*)

The first progress of the contraction is, in general, very slow; but, when once it has so far increased, that the longitudinal fibres, are not wholly relaxed by the force of the urine, its subsequent advances are more rapid, and new symptoms are perceived. The urine is voided more frequently, does not pass without a considerable effort, attended with pain; and a straining sensation continues, after the bladder is emptied. If the patient accidentally catches cold, drinks a glass of spirituous liquor, acid beverage, or punch, commits an excess in drinking wine, or removes quickly from a warm to a cold temperature, the urine will, perhaps, pass only in drops, or be entirely obstructed. These causes induce, in the longitudinal fibres at the contracted part, a spasmodic action, by which it is closed. Cold, externally applied to the body, has so great an effect upon a spasmodic stricture, that a patient, who can make water without the smallest difficulty in a warm room, is often quite unable to void a drop, on making the attempt in the open air. However, on returning to a warm room, and sitting down a little while, he becomes able again to expel his urine. The symptoms of a stricture are more frequent in persons, who lead a sedentary life, than in others, whose pursuits are active.

Strictures in the urethra, being attended with a discharge and pain in making water, especially after any excess, are frequently regarded and treated as a gonorrhœa. These two symptoms often come on a few hours after connexion with women; the degree of inflammation is very slight; the discharge is the first symptom, and is more violent at the commencement, than at any other period The inflammation subsides in a few days, leaving only the discharge, which also frequently disappears in five or six days, whether any means are employed or not for its removal. (*Home.*)

What renders a stricture particularly apt to be mistaken for a gonorrhœa, is, that, in both diseases, the pain in making water is experienced about an inch and a half from the orifice of the glans penis.

In a more advanced stage, the part of the urethra, which is the seat of stricture, is always much narrower, than the rest of the canal. The stricture is permanent, being combined with a thickening of structure, whereby the diameter of the diseased part of the passage is lessened. However, the diameter of the affected portion of the canal even now varies, according as the spasm and projection of the longitudinal fibres, the spasmodic action of the muscles about the perinæum, and the effects of inflammation, contribute more or less to a temporary increase of the obstruction. In the language of Sir Everard Home, the case is now both a permanent stricture, and a spasmodic one; permanent, because the diseased part of the urethra is always narrower, than the rest of this passage; and spasmodic, inasmuch as the stricture may be rendered still more contracted by spasm affecting the muscular structure, adjoining the disease. In the contracted state, the passage is closed up; in the relaxed, the urine can pass through it in a small stream.

In old cases of stricture, the muscular coat of the bladder becomes thickened and stronger than natural, in consequence of more force being necessary to propel the urine through the obstructed part. The bladder, in this thickened state, does not admit of the usual dilatation, so that the patient is obliged to make water very frequently, and he is unable to pass the whole night without making this evacuation once or twice. (*Home.*)

A nocturnal emission of the semen is another very common symptom of a stricture; and some patients seem to have no other complaint attendant on the disease of the urethra.

A periodical discharge is sometimes brought on by cold, or other occasional causes. When the inflammation extends to the bladder; the frequency of making water is considerably increased, and the urine very turbid. It is voided for twelve, or twenty-four hours, once or even twice every hour; and, when allowed to stand, it deposits a substance in the form of powder, consisting of coagulable lymph. This is the slightest kind of attack.

Sometimes the bladder is inflamed in a greater degree, and secretes pus, which is discharged with the urine. In a still more violent attack, the discharge is similar to the white of an egg, and particularly adhesive, being, according to Sir Everard Home, the vitiated secretion of the prostate gland.

When the inflammation of the bladder becomes still worse, the affection sometimes extends to the peritoneum, and the patient dies.

As strictures of long standing always impede the passage of the urine, the bladder acts with augmented force to overcome the resistance. In this manner, the stricture is kept in a continual state of irritation, and the obstruction becomes more and more considerable.

In a few cases, indeed, the diseased part of the urethra is rendered quite impervious; and the patient's life is preserved by the urethra ulcerating, at some point within the obstruction, and fistulous openings taking place in the perinæum. See *Fistulæ in Perinæo.*

Sir A. Cooper has correctly observed, piles are sometimes a consequence of strictures; and the efforts, made to expel the urine, are occasionally a cause of the direct, or internal inguinal hernia.

Strictures are frequently attended with constitutional symptoms, one of which is a complete paroxysm of fever. The cold fit is very severe; this is followed by a hot fit, and then a profuse perspiration. During the rigor, nausea and vomiting generally occur, and at this period the patient has occasion to make water frequently, seldom experiencing at the same time any strangury. When the fit is tolerably complete, the patient suffers, in general, only one; in the opposite circumstance, two; but a greater number rarely happens. Such febrile paroxysms are most frequent in warm countries; but do every now and then take place in this climate, particularly in consequence of exposure to cold, excesses, and the introduction both of common and armed bougies. They are also said, by Sir A. Cooper, to be common in that stage of the disease, in which the urine is blended with pus.

According to the principles of Sir Everard Home, the longitudinal muscular fibres on the outside of the membrane of the urethra are liable to a spasmodic contraction, in which state their swell lessens the diameter of the passage, and they are incapable of becoming relaxed again, until the spasm is removed. This spasmodic stricture is only a wrong action of these longitudinal fibres; and, if the parts could be examined in their relaxed state, there would be no appearance of disease.

When the contraction is not considerable, it appears, on examination after death, to be merely a narrowing of the urethra; but a permanent stricture, in a more advanced state, usually consists of a ridge, which forms a projection in the passage. *(Home.)* The latter form of the disease is now described by the generality of modern writers, as the effect of chronic inflammation. (*C. Bell*, *Boyer*, *Sir A. Cooper*, *&c.*)

Mr. Hunter informs us, that the disease generally occupies no great length of the passage; at least, that this was the case in most of the instances, which he examined. In these cases, the contraction was not broader, than if it had been produced by surrounding the urethra with a piece of packthread; and in many it had a good deal of the appearance, which one may fancy such a cause would produce. He had seen, however, the urethra contracted for more than an inch in length, owing to its coats, or internal membrane, being irregularly thickened, and forming a winding canal. Besides these forms of stricture, Sir A. Cooper used to show in his lectures a kind of stricture, produced by the extension of a membranous band across the passage.

A stricture does not always arise from an equal contraction of the urethra all round; for, in some instances, the contraction is only on one side; a fact, which appears to me to be better accounted for by the consideration of the longitudinal arrangement of the muscular fibres in packets, on the outside of the membrane of the urethra, than the circular kind of stricture, only occupying as small an extent of the passage, as the constriction, which would arise from the application of a piece of packthread round it. The contraction of one side of the canal only throws the passage to the opposite side, which often renders the introduction of a bougie difficult. The contracted part is whiter than the rest of the urethra, and is harder in its consistence. In some cases, there are several strictures. Mr. Hunter saw half a dozen in one urethra, and he observes, that a stricture is frequently attended with small tightnesses in other parts of the passage. According to the same authority, every part of the urethra is not equally subject to strictures, the bulbous portion being much the most subject to them. A stricture is sometimes situated on this side of the bulb, *but very seldom beyond it*, that is, *nearer the bladder.* Mr. Hunter never saw a stricture in that part of the urethra, which passes through the prostate gland; and the bulb, besides being the most frequent seat of this disease, is also subject to it in its worst forms. (*Hunter.*)

Sir Everard Home measured the length of the urethra in different subjects, and examined the diameters of the several parts of the passage. Strictures, according to this gentleman, *occur most commonly just behind the bulb* of the urethra, the distance from the external orifice being 6½, or 7 inches. The situation, next in the order of frequency, is about 4½ inches from the orifice of the glans. The disease does also occur at 3½ inches, and, sometimes, almost close to the external orifice. The two parts of the urethra, most frequently affected with strictures, are naturally the narrowest. Sometimes the very orifice of the urethra is contracted, and the circumstance often leads to an erroneous supposition, that the whole canal is naturally formed of the same size. In cases of strictures, the prepuce also is observed to be particularly often affected with a natural phymosis.

In almost all the cases which Sir E. Home met with, there was one stricture, about seven inches from the external orifice, whether there were any others, or not.

We have seen that Mr. Hunter and Sir E. Home do not agree, respecting the most frequent place of strictures. Sir A. Cooper also partly differs from both these authorities; for, though he coincides with Mr. Hunter, in setting down the most common situation to be in front of the bulb, just where this part joins the corpus spongiosum, yet, he varies from both in representing strictures in the membranous and prostatic portions of the urethra, as next in order of frequency.

Amongst the consequences of the disease, which are found on dissection, are, first, in very bad cases, a great dilatation of the urethra behind the stricture: secondly, a considerable thickening of the coats of the bladder, as already mentioned: thirdly, enlargement of the ureters, an effect of their being distended with urine, during the retentions common in the advanced stages of the disease. Fourthly, the kidneys are diseased, the glandular structure of which is sometimes entirely destroyed, and the rest of them enormously dilated; a mode, in which the case may prove fatal.

With respect to the causes of strictures, some writers have imputed the disorder to the effects of gonorrhœa, and often to the method of cure. Mr. Hunter entertained strong doubts, however, whether strictures commonly, or ever, proceeded from these causes; though he acknowledges, that since most men have had gonorrhœa, a refutation of the opinion is very difficult. He was led to think, that strictures did not commonly arise from such causes, from reflecting that they are common to most passages in the human body. They often take place in the œsophagus; the intestines, particularly the rectum; the anus; the prepuce, so as to produce phymosis; and in the lachrymal duct, so as to occasion a fistula lachrymalis. Strictures sometimes take place, when there have been no previous venereal complaints. Mr. Hunter saw an instance of this kind in a young man, nineteen years of age, who had had the complaint for eight years, and which therefore began, when he was only eleven years old. He was of a weak scrophulous habit. Mr. Hunter had also seen a stricture in a boy only four years old, and a fistula in perinæo in consequence of it. Strictures, he says, happen as frequently in persons, who have had gonorrhœa in a slight degree, as in others, who have had it in a severe form.

However, it must not be dissembled, that many very judicious and experienced men still regard Mr. Hunter's conclusions on this question as erroneous, and Sir A. Cooper, in particular, differs from him so much, as to say, that he considers gonorrhœa, in ninety-nine cases out of a hundred, the cause of strictures. At the same time, he admits the possibility of their origin from other causes, and mentions a case which he saw himself, and which arose from an injury received by a child, as it was riding on horseback. Delpech also describes strictures as a very frequent consequence of gonorrhœa; and he is a zealous advocate for cubebs and copaiva, in this last disorder, because his observations lead him to believe, that, by shortening its duration, they materially lessen the chance of strictures. (*Clinique de Chir. p.* 271.)

It is not an uncommon belief, that strictures arise from the use of astringent injections in the treatment of the gonorrhœa. Sir Everard Home is of this sentiment, and so was the late Mr. Wilson. (*On the Male Genital and Urinary Organs, p.* 370.) The latter gentleman, however, mentions some circumstances, calculated to raise doubts on this point, especially the fact, that while injections rarely enter far into the urethra, the most common seat of a stricture is where the membranous part of the canal joins the bulb. Mr. Hunter himself deemed the opinion founded on prejudice, and states, that he had seen as many strictures after gonorrhœa, which had been cured without injections, as after cases which had been treated with these latter applications.

He rejected also the old doctrine, that strictures are a consequence of ulcers in the urethra; for, ulcers hardly ever occur in this passage, except when there are strictures: and it is now generally admitted, that, in gonorrhœa, there are no sores in the urethra. Strictures are sometimes produced by external violence, though the passage would appear to be capable of frequently bearing considerable wounds and other injuries, without this consequence. Thus, strictures are not common from lithotomy, and in a modern work, we read the case of a serious gunshot wound of the urethra, where no stricture ensued. (See *Annuaire Med. Chir. des Hôpitaux de Paris,* 4*to.* 1819.)

According to a well-informed modern writer, strictures are mostly preceded by a state of the passage, called an *irritable urethra,* which has great share in bringing them on. The morbid sensibility, by which it is chiefly characterized, may affect the whole passage, or only part of it, in which last case, the prostatic portion is almost always that which is affected. In cases of irritable urethra, the size of the stream of urine varies remarkably at different times, the variation being, it is said, much greater than in examples of stricture. (See *Macilwain's Treatise, p.* 9, *&c.*) There can be no doubt, that what this gentleman has so well described as the *irritable urethra,* is the same case which some other writers denominate *spasmodic stricture.*

TREATMENT OF STRICTURES WITH COMMON BOUGIES, ON THE PRINCIPLE OF DILATATION.

Mr. Hunter remarks, that the cure of strictures may be accomplished, either by a dilatation of the contracted part, or a destruction of it by ulceration, or escharotics. To these methods are to be added, first, the plan of forcing a passage through the stricture with a conical sound, as practised by the French surgeons, when they cannot otherwise pass the stricture, and the symptoms are urgent; (see *J. Cross, Sketches of the Medical Schools of Paris,* 8*vo. Lond.* 1815, *p.* 111; *and First Lines of the Practice of Surgery, Vol.* 2, *ed.* 4;) and secondly, the method of cutting down to obliterated portions of the urethra, and attempting to cure the obstruction by the removal of the diseased parts, tracing the continuation of the passage, and trying to heal the wound over a catheter. Both these practices are attended with such difficulties and dangers, as should make every prudent surgeon very reluctant to adopt them, except under very urgent circumstances, in which every milder method fails. The same remark is applicable to the practice of perforating strictures with a sharp instrument, introduced from the orifice of the urethra. The dilatation is accomplished by means of bougies, catheters, and dilators; but, Mr. Hunter considered, that a cure, effected on this principle, was seldom or never more than temporary. The removal of strictures by ulceration, may also be effected with bougies: their destruction, with *caustic,* or *armed bougies.*

The cure by dilatation is principally mechanical, when effected by bougies, the powers of which are generally those of a wedge. However, Mr. Hunter conceived, that their ultimate effect was not always so simple as that of a wedge upon inanimate matter: for, pressure makes living parts either adapt themselves to their new position, or else recede by ulceration. Bougies, of course, either dilate strictures, or make them ulcerate.

The disease has generally made considerable progress, before surgical assistance is required, and the stricture may be so advanced, that a small bougie cannot be made to pass, without a great deal of trouble. If the end of a small bougie, let it be ever so small, can be introduced through the stricture, *the cure is then in our power*. However, a small bougie frequently cannot pass in the first instance, and even not after repeated trials.

Often when the stricture is very considerable, a great deal of trouble is given by occasional spasms, which either resist the introduction of a bougie altogether, or only allow a very small one to pass. At other periods, however, a larger one may be introduced. In these circumstances Mr. Hunter sometimes made the point of the bougie enter, by rubbing the outside of the perinæum with the finger of one hand, while he pushed the bougie on with the other. He also frequently succeeded by letting the bougie remain a little while close to the stricture, and then pushing it on. Sometimes the spasm may be taken off by dipping the glans penis in cold water.

Although, in cases of permanent strictures, the bougie may not pass at first, yet, after repeated trials, it will every now and then find its way. In this manner, future attempts become more certain and easy.

However, the success of the subsequent trials to introduce a bougie does not always depend on the instrument having been once or twice passed. Sometimes it can be introduced to-day, but not to-morrow; and, in this state, the case may continue for weeks, notwithstanding every trial which can be made. But, according to Mr. Hunter, the introduction of the bougie generally becomes gradually less difficult.

According to Delpech, when the stricture is not very close, and permits the urine to flow out in a moderate jet, a fine gum elastic bougie, steadily pushed on, while the urethra is rendered tense by the penis being drawn forwards, will pass as far as the bladder, after some little difficulty, at the contracted point of the canal. If there exist at the same time some little swelling of the sides of the passage, the instrument may not have consistence enough to overcome the obstacle, which may be in other respects only moderate; in this circumstance, Delpech recommends the use of a hollow, but fine bougie, containing a whalebone stylet, whereby the necessary suppleness and consistence of the instrument will be united. But, he observes, the swelling of the parietes of the canal, is not always uniform: hence, deviations in the course of the passage. Also, he says, though ulcerations in it are very uncommon, yet they do occur; and their cicatrices are sometimes accompanied with deformity: hence, unusual particularities in the shape of the canal in the situation of the stricture. Possibly, by various examinations, made with a bougie, the principal difficulty to its introduction, may be found to lie especially on one particular side of the passage, so that a determinate inclination of the end of the bougie would elude the impediment. In such a case, Delpech has found great advantage in the use of fine flexible catheters, or hollow bougies, containing a small leaden stylet; the end of an instrument of this kind being capable of receiving and retaining a slight bend purposely given to it, and by means of which the obstacle at the contracted point of the canal is avoided, and the catheter or bougie passes into the bladder. Delpech then adverts to other examples, in which the stricture is such that no bougie can penetrate it. If the stricture and attendant swelling be then of small extent, he first employs catgut bougies, of greater or lesser fineness, softening their ends by biting them, and letting the saliva penetrate them, so as to give them the form of a small very supple pencil. When the catgut (as often happens in such a case) passes beyond the obstruction, Delpech fastens it to the penis, keeps the patient perfectly quiet, and changes the dilating substance every two hours, increasing its diameter every time. Immediately there is room enough for the admission of a small bougie, (which should be before the end of the day) he employs the latter, and relinquishes the catgut. A catgut bougie, he says, ought to be changed thus frequently, because the moisture of the passage makes it swell, and untwists it in an irregular manner, so that knots are liable to be formed, and render its extraction very difficult and painful, being sometimes an actual laceration. The catgut may even break, when it has been left in the passage too long, and the surgeon attempts to withdraw it. What remains behind may then glide into the bladder, and become the nucleus of a calculus. (*Delpech, Clinique de Chir. p.* 273.)

When the passage is very small, it is not easy to know whether the bougie has entered the stricture or not; for bougies, as slender as those which must be at first employed, bend so very easily, that the surgeon is apt to fancy, that they are passing along the urethra, while they are only bending. Mr. Hunter advises the surgeon first to make himself acquainted with the situation of the stricture, by means of a common-sized bougie; and then to take a smaller one, and when its point arrives at the stricture, the instrument is to be gently pushed forward, but only for a short time. If the bougie has passed further into the penis, the surgeon may know how far it has entered the stricture, by taking the pressure off the bougie. For, *if it recoil*, he may be sure, that *it has not passed*; at least, has not passed far, but only bent. On the contrary, *if it remain fixed, and do not recoil, it has certainly entered the stricture.*

However, the preceding remarks are said not to be so applicable when a very small bougie is employed, which may become bent, without our being aware of the circumstance.

For very close strictures, catgut bougies, or the smallest elastic gum catheters, are sometimes the most successful instruments to begin with; the latter I can recommend from repeated experience.

A bougie may frequently be introduced a very little way, for instance, only one-tenth of an inch, and then it bends, and cannot be pushed further. To determine whether this is the case, Mr. Hunter says, it is necessary to withdraw the bougie and examine its end. If the end be blunted, we may be sure that the bougie has not entered at all; but if it be flattened, for an eighth, or tenth of an inch, be grooved, or have its outer waxen coat pushed up to that extent; or if there be a circular impression made upon the bougie, or only a dent on one side, made by the stricture; we may be sure that the instrument has passed as far as these appearances extend. It then becomes necessary to introduce another of exactly the same size, and in the same manner, and to let it remain as long as the patient can bear it, or convenience will allow. By repetitions of this plan, the stricture will be overcome.

When wax bougies are employed, Sir A. Cooper, in his lectures, recommends the surgeon always to give them the natural curvature of the passage, before their introduction. He also approves of the plan of warming the bougie first used, so that it may be soft enough to receive the impression of the stricture, and show its form and situation. After the first bougie is withdrawn, he directs one of rather larger size, to be introduced, and as soon as this is taken out, another of still larger size to be introduced. On repeating the operation, two bougies are again introduced, the first being of the same size as that last used, and the second of an increased diameter. By continuing this method, he assures us, that strictures may be more speedily cured, than in the ordinary mode. He does not consider it necessary to let the bougie remain any length of time in the urethra.

Mr. Hunter remarks, that the time which each bougie ought to remain in the passage must be determined by the feelings of the patient; for, if possible, no pain should ever be given. If the patient should experience very acute pain when the bougie is passing, it ought not to be left in the urethra above five, or, at most, ten minutes; or not so long if the pain be exceedingly severe. Each time of application should afterwards be lengthened so gradually as to be imperceptible to the feelings of the patient, and the irritability of the parts. Mr. Hunter affirms, that he has known many patients, who could not bear a bougie to remain in the passage ten, or even five, minutes, till after several days, and even weeks, but who in time were able to wear the instrument for hours, and this, at last, without any difficulty. The best time for keeping a bougie in the urethra, is when the patient has least to do; or in the morning, while he is in bed, if he can introduce the instrument himself.

The bougie should be increased in size, according to the facility with which the stricture becomes dilated, and the ease with which the patient bears the dilatation. If the parts are very firm, or very irritable, the increase of the size of the bougie should be very slow, so as to allow them to become gradually adapted to the augmented size of the instrument. But if the sensibility of the parts will allow, the increase of the size of the bougie may be somewhat quicker, but never more sudden than the patient can easily bear. The surgeon must continue to increase the size of the bougie, till one of large size can freely pass; nor should the use of this be discontinued, till after three weeks, or a month, in order that the dilated part may have time to become habituated to its new position, and lose its disposition to contract again. However, Mr. Hunter believed, that the permanency of a cure, effected on the principle of dilatation, could seldom be depended upon. I am decidedly of opinion, with Sir A. Cooper, that no bougies should ever be used, which are larger than those now usually numbered 14.

With respect to dilators, as they are called, I shall here merely observe, that their use is far from being much approved by the best modern surgeons, and their employment is impossible, except when the stricture will permit the entrance of a bougie, or other instrument, of small size, in which event, the dilator is deemed unnecessary, because the other instrument will operate with greater facility and certainty. (See *Macilwain on Strictures.*)

At the present day, many surgeons prefer bougies composed of metal, flexible enough to allow their curvature to be adapted to the bend of the urethra, yet sufficiently firm to retain the figure given them, while they are employed. These instruments do not seem to me eligible in the commencement of the treatment, unless made with a conical point. Others use iron sounds, which, in cases where it is necessary to have an instrument possessing more firmness than a wax bougie, and having a point more unchangeably turned upwards than that of the latter instrument, may have advantages. Sir A. Cooper commonly uses what he calls a silver bougie, shaped like a catheter, but conical towards the point, and gradually increasing in breadth for some distance from it. The situation, form, and size of the stricture having been first ascertained with a wax bougie, the silver one is introduced, the point of which is passed into the stricture, and dilates it more and more the further it enters. When this instrument is not at hand, a silver catheter may be used instead of it. Respecting the shape of catheters and instruments in general for the urethra, an observation has been made by Mr. Stanley, which merits great attention; viz. that, according to the natural course of the urethra, as indicated by careful dissection, the part of them, corresponding to the curve of the urethra under the arch of the pubes should form a considerable segment of a circle, about one and a half, or two inches in diameter; and the remainder be perfectly straight. (See *Macilwain on Strictures.*) For all ordinary cases, I consider a common bougie the safest and best instrument; one, with which the surgeon is less apt to exert unwarrantable force, so as to occasion a dangerous degree of irritation, or, what is worse, a false passage; but, in obstinate, or urgent cases, other means are certainly proper, and, amongst them, the conical silver bougie, or sound.

CURE OF STRICTURES BY ULCERATION.

This is also accomplished by means of a bougie, or metallic instrument, and the plan may be tried both when they can or cannot be introduced through the stricture. In the first instance, the method is less proper, because the stricture admits of being dilated.

In order to cure a stricture by making it ulcerate, the bougie is to be introduced as far through the contracted part as possible, and the size of the instrument is to be augmented, as fast as the sensations of the patient can well bear. In this manner, ulceration will be produced in the part which is pressed; and Mr. Hunter remarks, that the cure will be more lasting, because more of the stricture is destroyed than when the parts are simply dilated. This eminent surgeon notices, however, that few patients will submit to this practice, and that few, indeed, would be able to bear it, since it is apt to bring on violent spasms, in the part, attended with a very troublesome retention of urine.

If the smallest bougie cannot be made to pass a stricture, by using some degree of force, dilatation becomes impracticable; and, as the stricture must be destroyed, something else must be tried. In many cases, says Mr. Hunter, it may be proper to get rid of the stricture, by making it ulcerate, or, in other words, be absorbed. Bougies, intended to excite ulceration, need not be so small as in the foregoing cases, as they are not designed to be passed through the stricture; and, in consequence of being of the common size, they may be more surely applied to the parts causing the obstruction. The force applied to a bougie, in this case, should not be great: for a stricture is the hardest part of the urethra; and if a bougie is forcibly pushed on, its end may slip off the stricture, before ulceration has commenced, and make a false passage for itself in the corpus spongiosum urethræ.

In trying to cure strictures by ulceration, the utmost attention must be paid; and if the patient does not make water better, notwithstanding the bougie passes further, the surgeon may be sure that he is forcing a false passage.

When the stricture has so far yielded, as to allow a small bougie to be introduced, the treatment is then to be conducted on the principle of dilatation.

Mr. Hunter observes, that whenever a bougie of a tolerable size passes with ease, and the parts and the patient have become accustomed to it, the surgeon need no longer attend for the purpose of introducing it. The patient may now be allowed to introduce bougies himself; and when he can do this with ease, the business may be trusted to him, as he can make use of the instruments at the most convenient times, so that they may be more frequently, and longer, applied. In the mean while, the surgeon should only pay occasional visits. Mr. Hunter adds, that this practice of the patient, under the surgeon's eye, by which means the former learns the art of introducing bougies, is the more necessary, since strictures are diseases which commonly recur; and, therefore, no man who has ever had a stricture, and is cured of it, should rely on the cure as lasting; but should always be prepared for a return, and always have some bougies by him. He should not go a journey, even of a week, without them; and the number should be according to the time which he is absent, and the place to which he is going; for, in many parts of the world, he cannot be supplied with them.

To prevent the inconvenience of a bougie slipping out, or the mischief of its gliding into the uretha, a soft cotton thread must be tied round that end of the bougie which is out of the urethra, and then round the root of the glans. This last part of the thread should be very loose. The redundant part of the bougie, remaining out of the urethra, surgeons usually clip off.

In many examples, in which a stricture is accompanied with excessive irritability in the urethra, much pain, and a tendency to frequent retentions of urine, when a common bougie is employed, it becomes advisable to alter the plan of treatment, and use either flexible metallic, or elastic gum catheters: but, to elastic gum bougies, which always tend to a straight form, and therefore do not adapt themselves to the natural course of the urethra, I have a strong objection, founded on experience. Desault commonly cured all strictures by the skilful employment of flexible gum catheters, which his patients were directed to wear a certain length of time every day. These last instruments produce less pain and irritation than any kind of bougie, more especially when the wires are withdrawn; and were I to be myself afflicted with strictures, I should feel strongly disposed to attempt their removal by the use of elastic gum catheters, which are unquestionably the mildest and least painful means of cure. I have seen cases, however, in which the flexible metallic bougie seemed to cause much less irritation than any other kind of bougie; but, in general, those made of elastic gum give the least pain. Metallic instruments possess the advantage of retaining the exact curvature of the passage better than others; and, as I have observed, they enable the surgeon to employ more force, and this with more precision than can be done with a wax bougie. Yet, as force is not a principle to be much commended in the treatment of ordinary strictures, I doubted some time ago, whether such instruments would long retain as many employers as they once acquired, and many of whom used them indiscriminately in all cases. I am not yet prepared to say, whether they are on the decline, or not; but one very eminent surgeon whom I know, has already relinquished them, and the probability is, that the common bougie, elastic gum catheter, and in obstinate cases, the conical silver sound, will be the favourite instruments.

CURE OF STRICTURES WITH THE ARGENTUM NITRATUM.

Wiseman mentions the plan of curing strictures or caruncles, as they were once called, by means of caustic. Fr. Roncalli also described a method of applying the lapis infernalis to strictures, in a work published early in the last century; and this is the more worthy of being mentioned, because the instrument, used by him for the purpose, is very much like what was subsequently proposed by Mr. Hunter. (*Exercitatio agens novum methodum extirpandi carunculas et curandi fistulas urethræ; Brixiæ*, 1720.)

About the year 1752, Mr. Hunter attended a chimney-sweeper, who had a stricture. Not finding that any benefit was derived from the use of common bougies, for a space of six months, he conceived, that the stricture might be destroyed with escharotics, and the first attempt, which he made, was with red precipitate. He put some salve on the end of a bougie, and then dipped it in red precipitate. The bougie, in this state, was passed down to the stricture; but, it brought on considerable inflammation all along the passage. He then introduced a silver cannula down to the stricture, and again passed the bougie with precipitate through the tube. As the patient, however, did not make water any better, and the smallest bougie could not be introduced through the stricture, it was suspected, that the precipitate had not sufficient power to destroy the obstruction. Mr. Hunter was induced, therefore, to fasten a small piece of the argentum nitratum on the end of a piece of wire, with sealing-wax, and introduce the caustic through the cannula to the stricture. After having made the application three times, at intervals of two days, he found, that the man voided his urine much more freely, and, on applying the caustic a fourth time, the cannula went through the stricture. A bougie was introduced for a little while afterwards, and the man completely recovered.

Having experienced this success, Mr. Hunter tried to invent an instrument, better suited to the purpose, than the above contrivance; and one was devised, although he acknowledges, that it was not perfectly adapted to strictures in every situation in the urethra. He remarks, that the caustic should be prevented from hurting the unaffected part of the urethra by introducing the active substance, through a cannula, down to the stricture; and that it should be capable of protruding a little beyond the end of the cannula, by which means it will only act upon the stricture. The caustic should be fixed in a small portcrayon, and it is necessary to have a piece of silver of the length of the cannula, with a ring at one end, and a button at the other, of the same diameter as the cannula. The button forms a kind of plug, which should project beyond the end of the cannula in the urethra, so as to make a rounder end; or, as Mr. Hunter says, the portcrayon may be formed with this button at its other end. The cannula, with the button, is to be passed into the urethra, and when it reaches the stricture, the silver plug should be withdrawn, and the portcrayon with the caustic introduced in its place; or, if the plug and portcrayon are on the same instrument, then it is only necessary to withdraw the plug, and introduce the portcrayon with the caustic. The plug, besides giving a smooth rounded end to the cannula, answers another good purpose, by preventing the tube from being filled with the mucus of the urethra, when the instrument is passing inward, which mucus would be collected in the end of the cannula, dissolve the caustic too soon, and hinder its application to the stricture.

When the stricture was beyond the straight part of the urethra, Mr. Hunter owned that it was difficult to apply caustic to the disease through a cannula.

A better mode of applying lunar caustic to strictures was afterwards suggested by Hunter, and introduced into practice by Sir E. Home. This gentleman directs us to take a bougie of the size, that can be readily passed down to the stricture, and to insert a small piece of lunar caustic into the end of it, letting the caustic be even with the surface, but surrounded every where laterally by the substance of the bougie. This should be done some little time before it is required to be used; for, the materials, of which the bougie is composed, become warm and soft by being handled in inserting the caustic; and, therefore, the hold, which the bougie has of the caustic, is rendered more secure after the wax has been allowed to cool and harden. The bougie thus prepared, is to be oiled and made ready for use; but, before passing it, a common bougie of the same size is to be introduced down to the stricture, in order to clear the canal, and to measure the exact distance of the stricture from the orifice of the urethra. This distance being marked upon the armed bougie, it is to be passed down to the stricture, as soon as the other is withdrawn. The caustic, in its passage, is scarcely allowed to come into contact with any part of the membrane, because the point of the bougie, of which the argentum nitratum forms the central part, always moves in the middle line of the canal; and, indeed, the quickness, with which it is conveyed to the stricture, prevents any injury of the membrane lining the passage when the caustic accidentally touches it.

In this mode, the caustic is passed down with little or no irritation to the lining of the urethra; it is applied in the most advantageous manner to the stricture, and can be retained in that situation sufficiently long to produce the desired effect.

The reasons, urged in favour of the employment of bougies armed with the lunar caustic, are: that a permanent cure is effected, which common bougies cannot accomplish; that the pain, arising from the application of the argentum nitratum to the stricture, is very inconsiderable; and that neither irritation nor inflammation is found to ensue. The meaning of these remarks, however, is to be received as a general one, liable to exceptions. Indeed, Sir E. Home himself acknowledges, that some inconveniences occasionally follow the use of armed bougies. He remarks, however, that "whatever, *a priori*, might be supposed to be the effects of so violent an application, to a membrane so sensible and irritable as the urethra, and I will admit, that it is very natural to conceive they would be very severe, the result of experience, the only thing to be relied on, evinces the contrary. The pain, that is brought on, is by no means violent; and neither irritation, nor inflammation, is found to take place.

"That cases do occur, in which strictures have produced so much mischief, and rendered so great an extent of the canal diseased, that the use of the caustic has proved unsuccessful, is certainly true; and several of these cases have fallen within my own knowledge. But, when it is stated that none, even of these, were made worse by its use; that no bad consequences attend it; and that no other mode, at present known, is equally efficacious; any occasional want of success cannot be considered as an objection to this mode of practice.

"But if the apprehension of violent effects from the caustic, however ill-founded, cannot be removed, let the alternative be considered; namely, the only operation previously in use, where a stricture cannot be dilated by the bougie.

"In those cases we are obliged to have recourse to means certainly more severe and violent, laying open with a knife the diseased urethra, and passing through the divided parts a flexible gum catheter into the bladder. This I have done myself, and have frequently seen it performed by Mr. Hunter, and it always succeeded; neither bringing on so much inflammation as was expected, nor being attended with any symptoms of irritation.

"This practice has by other surgeons been carried still further; the portion of diseased urethra has been dissected out, and entirely removed; nor has so severe an operation always brought on untoward symptoms; and patients have recovered.

"If the membrane of the urethra, when diseased, is capable of suffering so much injury, without any consequent symptoms of irritation, it cannot be doubted, that it will bear with impunity to be touched, in a very partial manner, several different times with lunar caustic."

Sir Everard afterwards proceeds: "Having met with a number of facts, from which a general principle appears to be established, that the irritable state of a stricture is kept up, and even increased, by the use of the bougie, but lessened and entirely destroyed by the application of lunar caustic; I am desirous to communicate my observations upon these facts, and to recommend the use of the caustic, in many cases of irritable stricture, *in preference to the bougie.*

"As the use of the caustic, upon this principle, is, I believe, entirely new, and is contrary to every notion that has been formed upon the subject, it will require something more, than general assertion, to gain even the attention of many of my readers, still more their belief; I shall therefore detail the circumstances, as they occurred, by which I conceive the propriety of this practice to be established; and afterwards make some observations upon the principle on which it depends.

"My connexion in practice with Mr. Hunter afforded me opportunities of attending to cases of stricture, in all their different stages; many of them brought on during a long residence in India, attended with great irritability, and exceedingly difficult of cure.

"One case of this kind admitted the passing of a small bougie; but, in the course of three years, very little was gained by a steady perseverance in the use of that instrument, either in dilating the canal, or palliating the symptoms of stricture; this made me look upon the bougie as less efficacious, than I had always been taught to believe it. I was willing, however, to consider this as an uncommon case, depending more on the peculiarities of the patient's constitution, than on the nature of the disease: but, I found, on a particular inquiry, that several other gentlemen, from India, were under circumstances nearly similar; the bougie only preventing the increase of the stricture, but being unable to dilate it beyond a certain size; and when it was left off, the stricture in less than two months returned to its former state of contraction.

"In August, 1794, a gentleman consulted me for some symptoms, which had been considered as indicating the presence of gonorrhœa; but, as they did not yield to the common treatment in the usual time, he was induced to take my advice respecting the nature of his complaint. In the necessary inquiry, to obtain a perfect history of the case, among other things it was stated, that, nineteen years before, there was a stricture, which became very troublesome, and that Mr. Hunter, by the desire of the patient, had applied the caustic, by which the stricture was removed, and never afterwards returned. He said that he was one of the first persons, on whom the caustic had been used. From this account, I was naturally led to believe, that the stricture had gradually returned, and was now increased, so much as to produce the present symptoms; a discharge being almost always a symptom of stricture, when it is much contracted; but, upon examining the canal, a bougie of full size passed on to the bladder without the smallest impediment. I therefore took up the case as an inflammation in the urethra; and large doses of the balsam of copaiva, given internally, effected a cure.

"The circumstance of a stricture having been removed nineteen years before, and not returning, made a strong impression on my mind; and made me desirous to ascertain, whether this practice could be employed in cases of stricture in general, and the cure produced by it, equally permanent. A short time afterwards, I had an opportunity of trying it in the following case.

"A captain, in the East India Company's service, in September, 1794, applied to me for assistance. His complaints were, great irritation in the urethra and bladder, constant desire to make water, and an inability to void it, except in very small quantities. These symptoms had been at first supposed to arise from gonorrhœa, afterwards rendered more severe by catching cold: but, not yielding to the usual remedies for gonorrhœa, they were investigated more minutely, and a stricture was discovered in the urethra. The mode of treatment was now changed, and the bougie employed; but its use aggravated all the symptoms, and brought on so great a degree of irritability in the bladder and urethra, that there was an alarm for the patient's life, which was the reason for applying for my assistance.

"Besides the local symptoms, this patient had those of quick pulse, white tongue, hot and dry skin, loss of appetite, and total want of sleep, with frequent attacks of spasm on the bladder and urethra. A very small flexible gum catheter was passed, and the water drawn off, in quantity about a pint, which gave him great relief; this was repeated morning and evening, to keep the bladder in as easy a state as possible; but, in other respects, he continued much the same.

"As the present symptoms were brought on by the use of the bougie, little good was to be expected from that instrument; and where the urethra had been so easily irritated, and was disposed to continue in that state, there was no prospect of the use of the bougie afterwards effecting a cure. These circumstances I explained to the patient; and mentioned in proof of my opinion, the case, in which so little had been effected in three years.

"I then proposed to him a trial of the caustic, with a view to deaden the edge of the stricture, as the only probable means of effecting a cure. The degree of irritation was already great; I was, however, led to believe, that the application of the caustic was not likely to increase it; since, by destroying the irritable part, it might lessen, and even remove, the spasmodic affection; but if, contrary to my expectation, the irritation continued, we still should be able to draw off the water, as the slough formed by the caustic would prevent the edge of the stricture from acting, and obstructing the instrument.

"The application of the caustic was, upon these grounds, determined on; and it was applied in the following manner.

"I passed a common bougie, nearly the size of the canal, down to the stricture, to ascertain its exact situation, and to make the canal of the urethra as open as possible. The distance was then marked, upon a bougie armed with caustic, of the same size, which was conveyed down as quickly as the nature of the operation would admit. It was retained upon the stricture, with a slight degree of pressure; at first there was no pain from the caustic, but a soreness from pressure; in less than a minute, a change was felt in the sensation of the part; it was at first a heat, succeeded by the burning pain peculiar to caustic; as soon as this was distinctly felt, the bougie and caustic were withdrawn, having remained in the urethra about a minute altogether. The soreness, he said, was entirely local, by no means severe, was unaccompanied by irritation along the canal, and he thought the uneasiness in the bladder diminished by it. He described the pain as resembling very exactly the first symptoms of gonorrhœa. This sensation lasted half an hour after withdrawing the bougie.

" The caustic was applied about one o'clock in the forenoon, and he passed the day more free from irritation, than he had been since the beginning of the attack, which had lasted six days. In the evening, the water was drawn off, with more ease than the night before. He passed a tolerable night, and, the next day, continued free from irritation. On the third day, the caustic was again applied in the forenoon; the painful sensation was less than on the former application, lasted a shorter time, and in an hour after the armed bougie was withdrawn, he made water freely for the first time since the commencement of his indisposition. He said the irritation in the bladder was removed, and he felt very well; his appetite returned, he slept very well, and continued to void his urine with ease.

" In this state, nothing was done till the fifth day, leaving always a day between the applications of the caustic.

" On this day a common-sized bougie went readily into the bladder; it was immediately withdrawn, and the cure was considered as complete; no bougie was afterwards passed, lest it might bring back an irritation upon the passage. I met this gentleman twelve months afterwards, and he assured me, he had continued perfectly well; and I have since learned, that, in three years, there has been no return.

" From the result of this case, I was encouraged to hope, that the caustic might be applied to strictures in the urethra with more confidence than I had hitherto believed, since it evidently did not bring on, or increase the general irritation, but, on the contrary, seemed to allay it."

The foregoing case, together with another, which Sir E. Home has related, convinced this gentleman, that he had discovered an effectual mode of treating such strictures, as do not admit of being relieved by the common bougie. Hence, he adopted the use of armed bougies, as a general practice; but, he has not concealed the circumstances, under which the method does not prove successful. Sir Everard informs us that " In some constitutions, where the patients have resided long in warm climates, every time the caustic is applied to a stricture, a regular paroxysm of fever, called by the patient an ague, takes place; and this has been so violent as to render it impossible to pursue this mode of practice. Of this I have met with two instances. I consider this disposition to fever as the effect of climate, and not of any natural peculiarity of constitution; for the brother of one of these patients laboured under the same disease, but as he had not been in warm climates, it was removed by the caustic, without his experiencing such attacks."

In *gouty* constitutions, attacks of the gout have in two instances brought on spasmodic constrictions, after the stricture had been removed by caustic. This, however, cannot be called a failure of the caustic. It only shows, that gout can affect strictures, and reproduce them.

" In some patients, the strictures are so obdurate, that the use of the caustic is necessary to be continued for a longer time, than the parts can bear its application, or even that of the bougie passing along the urethra; irritation therefore comes on and stops the progress of the cure, and when the same means are resorted to again, the same thing takes place. The cases of failure of this kind that I have met with, some of which may yet ultimately be cured, if the patients will take the necessary steps for that purpose, amount in all to six.

" In some patients, the stricture is readily removed by the caustic, but, in a few weeks, contracts again. The stricture being wholly spasmodic, the caustic, by taking off the spasm, is allowed to pass through, and cannot completely destroy the stricture. Of this kind, I have met with one instance, which I must consider as a failure, as I have hitherto been unable to get the better of it.

" In those cases, where the caustic gradually removes the stricture, and brings the urethra to a size, that allows the patient to make water perfectly well, if there is any return, it is not to be attributed to the failure of the caustic, but to the want of proper management, either from the caustic being too small, or its use left off too soon; but, all such cases are, I believe, within the power of being cured by the caustic, if its use is recurred to when that is found necessary."

The power of caustic, however, to effect a more lasting cure, than other methods, begins now to be very generally disbelieved. I have known myself several patients, whose disease returned after they had been apparently cured with armed bougies. Indeed, the necessity of occasionally passing a common bougie is as great after this treatment, as after others; an important fact, which Baron Boyer insists upon, on account of the many relapses with which he is acquainted, (*Mal. Chir. T.* 9, *p.* 227.) Delpech also assures us, that he has had abundant opportunity of learning the incurable nature of strictures; they only admit (he says) of temporary relief, and have an invincible tendency gradually to return. He declares, that this is constantly the case, whatever treatment may have been adopted. It would be abusing the credulity of patients and medical men, and insulting truth, to pretend the contrary. (See *Chirurgie Clinique, T.* 1, *p.* 273.)

For the generality of strictures in the urethra, which do not occupy more extent of the canal, than if caused by a piece of packthread being tied round it, bougies, armed with lunar caustic, answer very well; and so, I believe, do common bougies, to which the general preference ought perhaps to be given. For cases, also, in which the urethra is diminished in diameter, for an inch or more, common bougies must be most advantageous, that is to say, when they can be introduced through the stricture, so as to cure it on the principle of dilatation.

Whether, in certain cases, where no progress can be made with common bougies, it is better to try caustic, or attempt to force the obstruction with a sound, is a question, on which there is a great deal of difference of opinion. "The practice of pressing firm bougies, or metallic instruments, so as to force the stricture, or to produce an ulceration of it (says a modern writer), so frequently has been found to form false passages, fistulæ, and gangrene, that I need here make no further observation on the practice, or its consequences. All the advantages, that can be gained by pressure, tearing through the stricture, or producing ulceration of it, may be obtained by a careful and judicious use of the caustic, which will be found on the whole a safer application, and will be attended with less inflammation and pain." (*Wilson on the Male Urinary and Genital Organs, p.* 383.) This gentleman is not, however, an advocate for the caustic in every case. "I consider it," says he, "the safest practice in cases, which will not yield to the introduction of bougies, and which require a portion of the stricture to be destroyed; but, the symptoms, which sometimes attend its use, and the injury which may be done by its improper application, should confine it to *those* cases." (*P.* 385.)

Sir A. Cooper in his lectures states his opinion, that caustic bougies ought never to be employed, except where the stricture is accompanied with fistula in perinæo, and the fistula is behind the stricture, in which case there can be no risk of a retention of urine being produced by the caustic. In France, caustic bougies have never had many advocates: under particular circumstances, however, their employment is sanctioned by Delpech. He says, that the swelling of the parietes of the urethra, in the situation of the stricture, may bring them into so close contact, that no bougies nor cat-gut will pass, and the difficulty may be still further increased by some slight deformity of the same point of the passage. Such, he remarks, are the cases, in which he has found bougies, armed with nitrate of silver, of great service. His plan, however, is only to remove with caustic the impediment to the passage of a small bougie, and as soon as this can be introduced, he discontinues the caustic, and practises simple dilatation. (*Chir. Clinique, T.* 1, *p.* 275.)

The following are some of the general directions, given by Sir E. Home, how to apply lunar caustic to strictures.

The distance of the stricture from the external orifice is to be measured, and the canal cleared by passing a common bougie, fully as large as that which is armed. The armed bougie, with the distance marked upon it, is then to be introduced, and applied to the stricture; when it is brought in contact with the obstruction, it is to be steadily retained there, with a moderate degree of pressure at first, and less as it is longer continued, since the bougie becomes soft by remaining in the urethra, and readily bends, if the pressure is too great. The time it is to remain depends a good deal upon the sensations of the patient, and the length of time the parts have been diseased; but on the first trial, it should be less than a minute, as it then commonly gives greater pain than on any subsequent application. The pain produced by the caustic is not felt so immediately as it would be natural to expect; the first sensation arises from the pressure of the bougie on the stricture; a little afterwards, there is the feeling of heat in the parts; and lastly, that of pain.

"As soon as the caustic begins to act, the surgeon, who makes the application, is made sensible of it by the smaller arteries of the parts beating with unusual violence, which is very distinctly felt by the finger and thumb, that grasp the penis.

"The pain, that is brought on by the caustic, lasts for some time after it is withdrawn; but this period differs in almost every patient, being sometimes extended to half an hour, and sometimes only a few minutes.

"The kind of pain is heat and soreness, which is not severe, not being accompanied with the peculiar irritation, upon so many occasions experienced by patients who have strictures; an irritation that cannot be described, which is most insupportable, and is too often brought on by dilating strictures with the bougie." In the vol. from which the above directions are taken, Sir Everard Home recommends the patient to make water, as soon as the armed bougie is withdrawn; but, in a subsequent vol. he explains his change of opinion upon this point: "I not only have no wish, that the patient should make water immediately after the application, but would rather that it be retained some time." (*On Strictures, vol.* 3, *p.* 51. *8vo. Lond.* 1821.)

"It happens not unfrequently," he says, "that, at the first time of making water, some blood passes along with it. This is rather favourable; as when the parts bleed, the stricture usually proves to be so far destroyed, that at the next trial the bougie passes through it. Every other day appears in general to be as often as it is prudent to apply the caustic. I have, however, done it every day, in very obstinate cases, where the parts are less sensible, without any detriment."

In his third volume, he states, that he now rarely passes the bougie oftener than every third day, and never when the pain from the last application has not entirely gone off. He also never continues any one application beyond the time, when the pain begins to extend further, than the spot to which the armed bougie is applied. (*Vol.* 3, *p.* 51.)

The bougie, which is passed down to prepare the way for the caustic and measure the distance for the armed bougie, must be made of soft materials, that it may readily receive an impression from the part against which it is pressed, and its colour should be light, so as to admit of those impressions being more distinctly seen. With the assistance of such bougies, the surgeon can discover the size and shape of the orifice of the stricture; ascertain with accuracy the progress of the caustic upon it; see whether it is on one side of the canal, or equally all round; and apply the caustic accordingly.

"When the soft bougie passes through the stricture, by leaving it in the canal a few minutes, it can be known, whether the stricture is completely destroyed or only relaxed; in the last case, there is an impression on the side of the bougie." (*Home on Strictures, vol.* 1.)

I think the advice given by Delpech, not to let the end of the caustic be covered with any greasy substance, is good; for, certainly its action would thus be lessened, or even defeated. At first, he applies the caustic half a minute, and, afterwards a minute, if the patient's feelings will permit. The application is repeated every two, or three days, and, before each time, the passage is examined with a small bougie, which, if it can be insinuated through the stricture, is used instead of that armed with lunar caustic. (*Chir. Clinique, p.* 276.) Delpech regards caustic as an application, liable to be attended with serious consequences, and unfit for practice, in cases where either several points of the canal would need its repeated use, or where the stricture is accompanied with an extensive firm thickening of parts, including the parietes of the canal, and all the perineum. In the first case, on discovering a second stricture, he has recourse without delay to the plan of forcing the obstruction with a conical sound, if a catgut bougie cannot be passed. Many of Sir E. Home's cases, however, were of this description, and yet successfully treated with caustic.

CURE OF STRICTURES WITH THE POTASSA FUSA.

Mr. Whately argues, that strictures, are not merely contracted fibres of the urethra, but really diseased portions of the membrane lining that canal, with a continued disposition to increased contraction. Hence, he conceives, that a remedy, calculated both to remove the diseased affection, and to dilate the contracted part, might perfectly cure the complaint, without putting the patient to the inconvenience of wearing a bougie. Such a remedy, he says, is caustic, when judiciously used; but, instead of lunar caustic, he recommends the potassa fusa, which he says, when used in the manner, and with the precautions about to be described, will be found to possess singular efficacy. Of its safety he is also as well convinced, as of its efficacy.

However, if the potassa fusa be applied while the parts are in a highly inflamed, or irritable state, or (as Mr. Whately expresses himself) tending to gangrene; if the habit be bad, and the patient very far advanced in years, the most mischievous effects may be expected from the application; and the use of any kind of caustic, under such circumstances, for strictures in the urethra, is censured as dangerous in the extreme.

Mr. Whately represents, that if the patient be affected with fever, or any other acute disease; if he be much indisposed from any cause; if, in particular, he have a gonorrhœa, attended with much inflammation and irritation in the urethra; if the prepuce, glans, or any other part of the penis, or the parts adjoining to it, be swelled and inflamed; if the urethra, and especially the strictured part of it, be so irritable, as not to bear the touch of a bougie; the use of the caustic is for the present forbidden. Mr. Whately also enjoins great caution in applying this remedy to persons advanced in years. Even when no objections of the above kind exist, the caustic should not be resorted to in the first instance. In every case of stricture, before venturing to employ the caustic, we ought to be able to pass into the bladder a bougie, of at least a size larger, than one of the finest sort. This is necessary, both to let the caustic be applied to the whole surface of the stricture, and to relieve a retention of urine, should it occur during the use of the caustic.

When a bougie of the preceding description can be introduced, without occasioning pain, faintness, or great dejection of spirits, the use of caustic may commence immediately, provided none of the above described objections exist.

When the urethra is very irritable, Mr. Whately recommends a common bougie to be introduced every day, and kept in the urethra; at first, for a few minutes only; but, by degrees, for a longer time; till the irritability of the parts has been sufficiently lessened.

When the urethra is rendered so impervious by a stricture, that a small bougie cannot be passed into the bladder, which viscus is also in a painful inflamed state, Mr. Whately asserts, that caustic, in any form, or quantity, must not be immediately employed; but, that the stricture should be first rendered capable of allowing a bougie a little larger, than one of the finest size, to be introduced into the bladder. When this is done, the urine is more freely evacuated, and the consequent irritation and inflammation of the bladder lessened, if not removed, together with the danger of a retention of urine. Caustic may then be advantageously conveyed into the centre of the stricture.

Mr. Whately considers the practice of at once thrusting down, in this sort of case, an armed bougie, considerably larger, than the narrowest part of the contracted canal, as most dangerous, and horridly painful. For, says this gentleman, it frequently happens, that nearly the whole of the urethra anterior to the bulb is so much contracted by numerous and uncommonly rigid strictures, that, it is impossible, by any art whatever, to dilate the passage to its natural size. If, therefore, the canal, whilst in such a state, be rudely torn open by a large caustic bougie, hemorrhage, pain, dangerous suppressions of urine, inflammation, mortification, and death itself, must sometimes inevitably ensue,—even before the caustic can be applied to the principal seat of the disease. In cases, like the one just mentioned, the first step, preparatory to the use of the caustic, should be, according to Mr. Whately, to dilate the strictured part of the urethra; for which purpose, he advises the slow and gentle introduction of a fine bougie, with its point inclined to the lower side of the canal, in order to avoid the large lacunæ, situated on its upper part. When the surgeon, by steady perseverance and dexterity, has succeeded in getting a fine bougie through the worst stricture into the bladder, the instrument should be worn, for a few hours, every day, till the passage is sufficiently dilated to admit a larger one.

Mr. Whately, after explaining, that caustic potassa ought not to be applied to strictures of the urethra, till a bougie of a proper size can be passed into the bladder; pointing out the methods to be taken, before applying this caustic; and enumerating certain cases and circumstances, in which its employment is interdicted; next proceeds to describe the mode of practice, which it is the particular object of his book to recommend.

For the purpose of arming a bougie, Mr. Whately advises us to put a small quantity of caustic potassa upon a piece of strong paper, and to break the bit of caustic with a hammer into small pieces of about the size of large and small pins' heads. In doing this, care should be taken not to reduce it to powder. Thus broken, it should be kept for use in a phial, closed with a ground stopper. The bougie should have a proper degree of curvature given to it, by drawing it several times between the finger and thumb of the left hand.

Mr. Whately next acquaints us, that before the caustic is inserted into the bougie, it is necessary to ascertain the exact distance of the stricture (to which the caustic is to be applied), from the extremity of the penis. For this purpose, the bougie, which should be just large enough to enter the stricture with some degree of tightness, ought to be gently introduced into the urethra; and when its point stops at the stricture, which it almost always does, before it will enter it, a notch is to be made with the finger nail, on the upper or curved portion of the bougie, on the outside of the urethra, exactly half an inch from the extremity of the penis. When the bougie is withdrawn, a small hole, about the sixteenth part of an inch deep, should be made at the extremity of its rounded end. A large blanket-pin, two inches and a half in length, with the head struck off, will answer the purpose; the hole being made with the point of the pin. The extremity of the bougie should then be made perfectly smooth with the finger and thumb, taking care, that, in doing this, the hole in its centre be not closed. Some of the broken caustic should then be put on a piece of writing paper, and a piece less in size, than the smallest pin's head, should be selected; the particle, indeed, says Mr. Whately, cannot be too small for the first application. Let this be inserted into the hole of the bougie with a pocket-knife, spatula, or some such instrument; and pushed into it with the blunt end of the pin, so as to make the caustic sink a very little below the margin of the hole. To prevent the potassa fusa from coming out, the hole should then be contracted a little with the finger, and the remaining vacancy in it is to be filled with hog's lard. This last substance (continues Mr. Whately) will prevent the caustic from acting on the sound part of the urethra, as the bougie passes to the stricture. When the bougie is quite prepared, let it be first oiled, and immediately afterwards introduced, by a very gentle motion, with the curvature upwards, as far as the anterior part of the stricture, upon which the caustic is to be applied. In doing this, the end of the bougie, held by the finger and thumb, should be a good deal inclined towards the abdomen, on the first introduction of the instrument in order to preserve its curvature. After it has passed about five inches, this end should be gradually brought downwards, as the bougie passes on, till it forms a right angle with the body. The bougie is known to have arrived at the stricture by the resistance made to its progress.

As soon as the bougie has reached the anterior part of the stricture, it should rest there for a few seconds, that the caustic may begin to dissolve. It should then be pushed very gently forward, about one-eighth of an inch; after which, there should be another pause, for a second, or two. The bougie should then be carried forward in the same gentle manner, till it has got through the stricture. The sense of feeling will generally inform the operator when the point of the bougie has proceeded so far; but, the notch in the bougie is to be an additional guide, by becoming very near the orifice of the urethra, when the end of the instrument has just got through the stricture.

The bougie should now be immediately withdrawn by a very gentle motion to the part, at which it was first made to rest awhile. Then it should be very slowly passed through the stricture a second time; but without letting the bougie stop in its passage. If the patient complain of pain, or be faint, the bougie should be immediately withdrawn; but, if these effects are not produced, we may repeat the operation of passing and withdrawing the bougie through the stricture once or twice more, before we finish the operation, which will take up, in the whole, about two minutes.

The first application of the potassa fusa, in this manner, gives, according to Mr. Whately's account, a very little pain. A slight scalding in making water, and a trifling discharge, during the first day or two, however, are commonly produced.

At the end of seven days, the application of the caustic is to be repeated in the same manner. When the first application has enlarged the aperture of the stricture, which may be known by passing a bougie through it, of the same size as that by which the caustic was conveyed, the bougie used in the second operation, should be a size larger than the one used in the first; but it must not be too large to pass through the stricture. If the patient had no pain on the first application, the bit of potassa fusa may also be trivially larger. At the end of seven days more, the armed bougie should be introduced a third time. At this, and all future applications, the bougie should be increased in size, in proportion as the aperture in the stricture becomes dilated. The quantity of caustic, however, is never to be increased in a ratio to the size of the bougie. In no cases whatever, does Mr. Whately apply more of the potassa fusa at a time, than a piece about the size of a common pin's-head. Twelve bits of the largest size, which this gentleman ever uses, weigh one grain.

When there are several strictures, the potassa fusa should be generally applied to only one at a time.

An interval of seven days is what Mr. Whately generally allows to elapse between the applications of the caustic. The rule, however, may now and then be deviated from; but, the potassa fusa ought never to be re-applied, till the action of the last application has completely ceased. In a few instances, the interval may only be five days; in some others, it may be eight, nine, or even a longer space.

In the above method of using the potassa fusa, Mr. Whately represents, that this substance is equally diffused over every part of the strictured surface, and only *abrades* the membrane of the stricture, without producing a slough. The *degree* of this abrasion, he says, may be increased, or lessened, as circumstances dictate, by paying attention to the quantity of the caustic.

The foregoing account will convey an adequate idea of Mr. Whately's method; in which I never saw any recommendation but that of novelty. To *abrade*, without destroying, is rather too nice a distinction for a practical man, doing business, as it were, in the dark. Nor can I conceive, that a liquid caustic (for so it is represented as becoming) can be applied with the accuracy to strictures, which Mr. Whately seems to suppose happens. This however is merely my own sentiment; and I do not wish to conceal, that there are yet a few surgeons who believe, that Mr. Whately's plan is the most eligible for all cases, in which the stricture is irritable, or far advanced. (See *Howship's Pract. Obs. on the Urinary Organs, p.* 207.) On the other hand, I know some very eminent surgeons, who formerly took up this practice with great zeal, yet now have entirely abandoned it. I consider it myself the worst and most random mode of applying caustic to strictures, and more likely to act on the sound, than the diseased portion of the urethra. Sir A. Cooper, in his lectures, dissuades his pupils from using caustic alkali, which, he says, is much too soluble, and calculated to produce a great deal of inflammation by running over an extensive surface. In this advice I fully concur.

Upon the whole I may safely declare, that caustic bougies are now much less frequently used by the best surgeons in London, than they were about twenty years ago. Several distinguished practitioners, who to my knowledge were then accustomed to recommend and employ them, have at present returned either to the use of common bougies, or those made of metal, or elastic gum, to which, after many comparative trials, I acknowledge, a general, but not universal, preference seems to me to be due. We learn from M. Roux, that caustic bougies never had many advocates in France; and the inquiries, which he made when he was in London, authorized him to announce to his countrymen after his return, that such instruments were not more in general favor here, than they were at Paris. (See *Voyage fait à Londres en* 1814, *ou Parallèle de la Chirurgie Angloise, &c. p.* 315.)

Cases of stricture, however, where the disease is far advanced, of long standing, and attended with such obstruction, that no kind of common bougie can be introduced, appear to me to be the examples, in which the employment of bougies, armed with the nitrate of silver, ought principally to be continued. This mode seems to me less violent, than that of employing a common bougie, or an iron sound, silver, or platina, with sufficient force to make its way through the stricture by laceration. It must also be attended with less risk of rupturing the urethra, and producing a false passage. At the same time, if the stricture occupy some length of the passage, and a small common or catgut bougie, which is the best instrument in this circumstance, cannot be introduced through the obstruction so as to dilate it, I believe a passage through it must often be attempted on the principle of exciting ulceration, and that for this purpose, a sound or metallic catheter should be employed. An interesting case of cartilaginous stricture and fistulæ in perinæo is recorded by Delpech, where a false passage was made with a lunar caustic bougie, which actually pierced the rectum: two days after this accident, the stricture was forced with a conical sound, which fortunately eluded the false passage, and entered the bladder. An abscess in the perinæum followed, but the case ended well, under the use of elastic gum catheters. (*Chir. Clin. p.* 280.) When the treatment of strictures brings on severe shiverings, followed by febrile symptoms, opium is the best medicine to be given, and the introduction of instruments into the passage should be suspended. When hemorrhage from the urethra is occasioned by the use of bougies, or other instruments, cold evaporating lotions to the perinæum, or the cold bath itself, is the most effectual way of suppressing it. In one case, mentioned by Sir A. Cooper in his lectures, he was under the necessity of dividing the artery of the bulb; a measure, which completely succeeded.

A Treatise on the Venereal Disease, by John Hunter, 2d Edit. Practical Obs. on the Treatment of Strictures in the Urethra and Œsophagus, by Sir Everard Home, in 3 Vols. 8vo. Lond. An improved Method of treating Strictures in the Urethra, by Thomas Whately, Edit. 2, 1806. *M. W. Andrews's Obs. on the Application of Lunar Caustic to Strictures in the Urethra and Œsophagus, 8vo. Lond.* 1807. *T. Luxmore's Practical Observations on Strictures, &c. 8vo. Lond.* 1809. *Howship's Practical Obs. on the Diseases of the Urinary Organs, 8vo. Lond.* 1816. *Soemmering Abhandlung über die schnell und langsam tödtlichen Krankheiten der Harnblase und Harnröhre bey Männern im hohen Alter, 4to. Frankf.* 1809. *Letters concerning the Diseases of the Urethra, by C. Bell,* 1810*; subsequently republished with additions by Mr. Shaw. James Wilson, Lectures on the Structure and Physiology of the Male Urinary and Genital Organs, and their Diseases, 8vo. Lond.* 1821. *James Arnott, a Treatise on Stricture of the Urethra, 8vo. Lond.* 1819. *An account of this gentleman's dilator, and his method of treatment is given, in the First Lines of the Practice of Surgery, Edit.* 4. *J. Cross, Sketches of the Medical Schools of Paris, p.* 111, *&c. 8vo. Lond.* 1815. *Boyer, Traité des Mal. Chir. T.* 9, *Paris,* 1824. *J. Howship on Diseases of the Urinary Organs, 8vo. Lond.* 1823. *G. Macilwain on Stricture of the Urethra, 8vo. Lond.* 1824*: a very useful manual. Delpech, Chirurgie Clinique de Montpellier, T.*1, *4to, Paris,* 1823.

URETHRA, FALSE PASSAGE IN.—One of the worst consequences of using catheters and bougies, in an improper manner, is the rupture of the urethra, or the formation of a false passage by ulceration. With bougies, this accident is generally occasioned by trials to excite ulceration by the application of the end of the bougie to the stricture, when this instrument cannot be passed through it. When once the new passage has been formed, whenever the bougie is introduced, it cannot be hindered from going into the false track, and its action on the stricture is altogether frustrated.

In this kind of case Mr. Hunter has advised the following operation to be practised. Pass a staff, or any such instrument into the urethra, as far as it will go, which will probably be to the bottom of the new passage, and this, we may be certain, is beyond the stricture. Feel for the end of the instrument externally, and cut upon it, making the wound about an inch long, if the disease be before the scrotum; and an inch and a half, or more, if in the perineum. If the new passage be between the urethra and body of the penis, you will most probably get into the sound urethra, before you come to the instrument, or new passage. If so, introduce a probe into the urethra, through the wound, and pass it towards the glans penis, or, in other words, towards the stricture. When it meets with an obstruction, this must be the stricture, which is now to be got through, and afterwards dilated. To complete the operation, withdraw the probe, and, instead of it, introduce a hollow cannula forwards to the stricture. Then introduce another cannula from the glans downward, till the two tubes are opposite each other, having the stricture between them. An assistant is now to take hold of the urethra on the outside, with his finger and thumb, just where the two cannulæ meet, in order to keep them in their places. Through the upper cannula next introduce a piercing instrument, which is to perforate the stricture, and enter the lower cannula. The piercing instrument is now to be withdrawn, and a bougie introduced through the first cannula and stricture, into the second cannula. The tubes are to be withdrawn, and the end of the bougie, in the wound, directed into the bladder, through the further portion of the urethra. It may also be necessary to lay the whole of the false passage open, in order to make it heal; for otherwise, it might still obstruct the future passage of bougies into the proper canal.

When the new passage is between the skin and urethra, the surgeon must extend his incision more deeply, for the purpose of finding out the natural passage. Then he is to proceed as above explained.

The longer the first bougie is allowed to remain in the canal, the more readily will the second pass. The bougies must be gradually increased in size, and used till the wound is healed. The only improvement, which seems proper to be made in this plan, is to employ flexible gum catheters, which might be worn longer than common bougies, as the patient could void his urine through them. (See *Hunter on the Venereal Disease*). *Additional Observations on this subject are contained in the 2d vol. of the First Lines of Surgery.*

URINARY ABSCESSES. Extravasations of urine may be in three different states. This fluid may be collected in a particular pouch; it may be widely diffused in the cellular membrane; or, lastly, it may present itself in a purulent form, after having excited inflammation and suppuration in the parts, amongst which it is situated. This case is termed an urinary abscess.

Such extravasations of urine always imply a rupture, either in the kidneys, or ureters, the bladder, or the urethra. The solution of continuity may be produced by a variety of causes. It is most frequently the effect of a forcible distention of these passages, in consequence of a retention of urine. The bursting of phlegmonous abscesses, into the same passages, may occasion the breach. It may also be produced by the penetration of the parts with a sword, or other foreign body: there are likewise examples of effusion of urine from the displacement of the cannula of the trocar, after the operation of puncturing the bladder. Others are caused by false passages in the urethra; or by violent contusions of the perineum, attended with laceration of the urethra.

In *Desault's Surgical Works*, (*T.* 3,) it is observed, that the ravages, which extravasated urine makes, are usually greater, and more extensive, when it enters the cellular membrane, than when it is confined in a particular cyst. The mischief is also less, when the excretory passage is free, than when it is closed by any obstacle, as in cases of retention. The more or less loose texture of the parts, in which such effusions happen, likewise makes a considerable difference in their progress and formation. When the pelvis, or infundibulum of the kidney, or the upper part of the ureter, gives way, the urine is commonly effused in the loins and the fossæ iliacæ, between the peritoneum and the adjacent parts. When the lower part of the ureter, or the bladder, near its lower portion, gives way, the extravasation is generally included within the pelvis.

But, when the rupture occurs in the anterior parietes of the bladder, near its upper part, and, especially, when it takes place at a time, when this organ is extremely distended and dilated, the urine becomes effused behind and above the pubes, sometimes ascends to the epigastric region, between the peritoneum and the abdominal muscles, and, after having followed the course of the spermatic vessels, it often makes its exit at the ring, and is extravasated in the groins and scrotum. If the rupture has happened in the urethra, the most common situation of the effusion is in the perineum and scrotum. The extravasation frequently extends to the penis and upper part of the thighs, and even sometimes propagates itself, under the skin of the abdomen, up to the hypochondria and sides of the chest.

There is no fluid, the extravasation of which is so fatal, as that of the urine. If it is not promptly discharged, it soon excites suppuration and sloughing of the cellular membrane, a gangrenous inflammation of the skin, and almost always a mortification of the parts, amongst which it flows.

While the extravasation of urine is confined to the interior of the pelvis, and lumbar and iliac regions, without manifesting itself externally, there is no certain sign of its existence. The circumstances, which may be recollected, however, joined with the symptoms, which the patient complains of, may lead to a suspicion of the extravasation. Thus, when in consequence of a retention of urine in the ureters, or bladder, the patient has suddenly experienced great relief, without any of the urine having been discharged the natural way; when he has at the same instant felt a kind of pricking in the loins, or pelvis; when to the ease, which lasted only a few hours, symptoms, more severe than the former ones, have succeeded, such as violent fever, hiccough, vomiting, &c. an internal extravasation is to be suspected.

As soon as the extravasation is apparent externally, the case is announced by symptoms, which hardly ever deceive. The preceding retention of urine; the sudden appearance of the swelling caused by this fluid; the rapid progress of the tumor; the kind of crepitation perceptible in it, like that which occurs in emphysema; the shining tension and œdema of the skin; the diminution of such symptoms as depended entirely upon the retention; are the first changes, which are observable, when the extravasation is somewhat considerable.

If the patient is not speedily assisted, and the urine continues to be extravasated, the tumor spreads more and more; the skin assumes a red violet colour; gangrenous eschars are formed, the separation of which gives issue to a very fetid sanies, in which the smell of urine is readily distinguishable. Portions of dead cellular membrane are presently discharged together with the sanies; the ulcer grows larger; and the dressings are continually wet with the urine.

When one of the ureters has given way, and an urinary abscess is formed in the loins, the aid to be derived from surgery is limited to making an opening in the extravasation, as soon as it can be felt externally. It is then not in the power of art to re-establish the natural course of the urine, or to hinder this fluid from passing through the wound, and rendering it fistulous. However, there are some circumstances, in which a radical cure may be attempted. For example, if the abscess were produced by a calculus lodged in the infundibulum, or ureter, and it could be felt, and taken hold of with a pair of forceps, introduced into the opening, the extraction of the foreign body might promote the healing of the ulcer, by rendering the natural channel for the urine free.

When the opening, by which the urine has become extravasated, exists in the bladder, or urethra, one indication, that does not present itself in the foregoing case, may be fulfilled, viz. the urine may be drawn off by means of a catheter passed into the bladder, and kept there. By this means, we not only immediately stop the progress of the extravasation, but attack the very cause of the malady, by removing the obstacles, which oppose the natural course of the urine. The introduction of the catheter then becomes a matter of the most urgent necessity. This operation is often attended with the greatest difficulties. Besides the ordinary obstruction of the canal, we have also to surmount the obstacles, which the urinary swellings situated in the course of the urethra, create to the passage of the instrument. When these tumors are considerable, they ought to be opened before the catheter is employed. The subsidence of the swellings would render catheterism more easy. Besides, Desault was assured by daily experience, that with a little skill, exercise, and patience, the catheter might always be got into the bladder. If, however, the thing could not be done, ought we to puncture the bladder, or have recourse to the operation termed by the French boutonnière?

Desault was an advocate for neither of these proceedings; he thought it was a more simple and beneficial practice merely to make an external opening in the collection of effused urine. This measure would both afford an outlet for the urine, and arrest the extension of the extravasation. Besides, such an opening is often indispensably requisite for the purpose of putting a stop to the symptoms depending upon the effusion and stagnation of the urine. But, if the catheter can be introduced, there may be cases, in which an opening would not only be useless, but hurtful; for instance, when the swelling, caused by the urine, is of little extent, or when it is situated in the thickness of the parietes of the passage, or along its track, it almost always admits of dispersion by the simple employment of the catheter. But, it seldom happens, that this swelling, however small, ends in resolution; it almost always suppurates; yet, as it breaks into the urethra, the matter escapes between this canal and the catheter, and renders the making of an external opening needless. Experience teaches us, also, that when the tumor is situated in the scrotum, or between the root of the penis and the symphysis pubis, even after the healing of the incisions, made in these situations, a fistula will often remain, which is very difficult of cure. With the exception of these particular cases, Desault was an advocate for opening all urinary abscesses.

The manner of opening such collections varies according as the urine may be in one cavity, or widely effused in the cellular membrane. In the first case, a simple incision, the whole length of the cavity, will suffice for emptying and healing it. In the second, if the extravasation is extensive, the incisions must be multiplied. It would be absurd to spare the parts; for, all those, with which the urine has come into contact, seldom escape mortification. The incisions, which are made, hardly ever have the effect of saving them; but, by accelerating the discharge of putrid sanies and stagnant urine, they prevent mischief, which would originate from a further lodgment. At all events, when the operation is at all delayed, the destruction of all the parts in contact with this irritating fluid, is inevitable. The approach of mortification is indicated by the crepitation under the bistoury, resembling the kind of noise produced by tearing parchment. The extent and depth of the incisions must be proportioned to those of the abscess. When the extravasation occupies the scrotum, long deep scarifications should be made in that part, as well as in the skin of the penis, and in every place, where the urine is effused.

Practitioners, unaccustomed to see such diseases, would be alarmed at the extent of the sore, produced by the separation of the eschars. Sometimes the whole scrotum, skin of the penis, and that of the groins, perinæum, and upper part of the thigh, mortify, and the naked testicles hang by the spermatic chords, in the midst of this enormous ulcer. It is hardly conceivable how cicatrization could take place over the exposed testicles; but, the resources of nature are unlimited. She unites the testicles and the chords to the subjacent parts, and drawing the skin from the circumference to the centre of the ulcer, she covers these organs again, and furnishes them with a sort of new scrotum. This statement is founded upon numerous cases, in which nature always followed this course. The cicatrization of the ulcer is even more expeditious, than might be apprehended, considering its extent. In all this business, what does art do? If the introduction of the catheter is excepted, which, indeed, is absolutely necessary for the radical cure, her assistance is very limited, and almost nothing, in the generality of instances; for, when patients are not exhausted by the tediousness of the disorder, when they are of a good constitution, and in the prime of life, they get well as quickly and certainly with the aid of a good diet and simple dressings, as when they take internal medicines, and use a multiplicity of compound topical applications. The practice of Desault at the Hôtel-Dieu, consisted in applying emollient poultices, until the sloughs were detached. The ulcer was then sometimes dressed with pledgets charged with styrax; but frequently mere dry lint was used, and continued till the cure was completed. If any complication occurred in the course of the treatment, suitable remedies were prescribed for it. Thus, when prostration of strength, and tendency to sloughing existed, bark, cordials, and antiseptics were ordered. But, in every case, the catheter is the essential means of cure; without it, the treatment is almost always imperfect, and the ulcer will not heal, without leaving several urinary fistulæ. (See *Œuvres Chir. de Desault, par Bichat, T.* 3, *p.* 277—287.)

URINARY CALCULI. A true explanation of the nature of urinary calculi was quite impossible, before chemistry had made considerable progress, and the methods of analysis had advanced a great way towards perfection; and as will appear, in the course of this article, all the valuable knowledge, which now exists upon this subject, is in reality the fruit of modern investigations. It is to be regretted, however, that our information on many points is far from being settled, or complete, as any impartial and judicious reader may soon convince himself by a reference to the able and scientific views, lately taken by Dr. Prout, of various questions, relative to the formation of gravel and calculi, and the treatment of such cases in all their varieties. (See *An Inquiry into the Nature and Treatment of Gravel and Calculus, and other Diseases connected with a deranged operation of the Urinary Organs, 8vo. Lond.* 1821.)

Mechanical deposites from the urine are divided by Dr. Prout into three classes. 1. Pulverulent, or amorphous sediments. 2. Crystalline sediments, usually denominated gravel. 3. Solid concretions, or calculi, formed by the aggregration of these sediments.

Pulverulent, or *amorphous sediments*, are described by Dr. Prout, as almost always existing in a state of solution in the urine before it is discharged, and even afterwards until it begins to cool, when they are deposited in the state of a fine powder, the particles of which do not appear to be crystalline. Their colour is for the most part brown, or yellow, and generally speaking, they consist of two species of neutral saline compounds; viz. the lithates of ammonia, soda, and lime, tinged more or less with the colouring principle of the urine, and with the purpurates of the same bases, and constituting what are usually denominated, *pink* and *latritious* sediments; and, secondly, the earthy phosphates, namely, the phosphate of lime, and the triple phosphate of magnesia and ammonia, constituting for the most part sediments nearly white. The two species of sediments are frequently mixed together; though the lithates generally prevail.

Crystalline Sediments, or *Gravel*, are commonly voided in the form of minute angular grains, or crystals, composed, 1. Of lithic acid, nearly pure. 2. Of triple phosphate of magnesia and ammonia; and, 3. Of oxalate of lime. The crystals of lithic acid, which are by far the most frequent, are always more or less of a red colour. Those, composed of the triple phosphate of magnesia and ammonia, are nearly white; while others, composed of the oxalate of lime, which are extremely rare, are of a dark, blackish, green colour. It is further remarked, by Dr. Prout, that these different varieties of crystalline deposites are never voided together, though they not unfrequently occur with amorphous sediments. (*Prout, Op. cit. p.* 79, *&c.*)

Solid Concretions, or *Urinary Calculi*, arising from the precipitation and consolidation of the urinary sediments, may be formed in any of the cavities, to which the urine has access; and hence, they are met with in the kidneys, ureters, bladder, and urethra. Their various appearances, and chemical properties, will be presently described. Most of them are believed to be originally produced in the kidneys, from which they afterwards descend with the urine. To this statement, however, the cases, in which calculi are formed upon foreign bodies introduced into the bladder through the urethra, an accidental wound, or some ulcerated communication between the intestines and the bladder, are manifest exceptions. In the centre of urinary calculi, bullets, splinters of bone, pieces of bougies, and wood, pins, needles, nuts, &c. are frequently observed; and it would appear, that a very minute substance is capable of becoming a nucleus; a mere clot of blood, or a little bit of chaff, if not soon voided, being sufficient to lead to the formation of a stone in the bladder. The lithic acid itself is a common nucleus, even where the whole calculus is not of the same material.

That many urinary calculi are originally produced in the kidney, is certain; first, from the severe pain, which the passage of such foreign bodies down the ureter always excites; and, secondly, from their being often discovered in the infundibula and pelvis of that viscus after death. This last fact is well illustrated in the first plate of Dr. Marcet's interesting "*Essay on the Chemical History and Medical Treatment of Calculous Disorders, 8vo.* 1817." The engraving is taken from a preparation in the Museum of Guy's Hospital. In this instance, there were several calculi closely pressed against each other; but, in another example, drawn from a specimen in Mr. Abernethy's museum, the renal concretion was composed of a single mass, which represented a complete cast of the pelvis and part of the infundibula of the kidney. In this form of the disease, the kidney loses at last all vestiges of its natural structure, and is converted into a kind of cyst, filled with the extraneous substance. When so complete an alteration of the structure takes place, the secretion of urine must of course be entirely carried on by the other kidney. However, in some instances, the inconvenience thus produced is so slight, that it almost escapes notice; and, sometimes even both kidneys are diseased in a very great degree, and yet life is preserved for a considerable time. (*Op. cit. p.* 3, 4.)

Calculi are sometimes found in the ureters, especially at the upper part; but, it is not supposed, that they are originally formed there; an event not likely to happen, unless there were some cause retarding the descent of the urine through those tubes. The common belief is, that all calculi, found in the ureter, are first produced in the infundibula and pelvis of the kidney, from which they afterwards descend with the urine.

The generality of calculi, however, which leave the kidney, are of small size, and, consequently, after a time, and exciting some pain and inconvenience, they usually pass into the cavity of the bladder. Indeed, as Dr. Marcet remarks, the bladder is the most frequent seat of calculi: not only because all urinary concretions, or their nuclei, formed in the kidneys, tend to fall into that organ; but, also, because a stone may be, and probably often is, originally formed in the bladder itself.

Renal concretions vary considerably in their number, size, and shape. In some cases, a single small calculus has been found occupying one of the foregoing situations; while, in other instances, an innumerable collection of calculous substances are observed filling the whole of the cavity of the pelvis and infundibula of the kidney, distending its parietes, and even obstructing the passage of the urine out of this viscus, which is converted into a sort of membranous cyst. Lastly, a single stone in the kidney may acquire a very large size there; or, a great number of small calculi, in the same situation, may become cemented together, so as to form one mass of enormous dimensions, and the shape of which invariably corresponds to the space, in which it is, as it were, moulded. Hence, renal calculi often present a variety of odd, irregular figures, resembling those commonly observed in specimens of coral.

Great disorder of the stomach, frequent vomiting, and great irritability of the bladder, are common effects of a calculus in the kidney. Sir A. Cooper met with a case, in which the chief pain was at the anterior superior spinous process of the ilium.

It has been already remarked, that urinary concretions of large size very often exist in the kidney, without their presence being indicated by any external circumstances, or attended with any symptoms, sufficiently unequivocal to constitute a ground for suspecting the importance of their cause. On the other hand, it is very usual for renal calculi, of middling dimensions, to excite serious and alarming complaints. The reason of this difference becomes obvious, when it is recollected, that smallish concretions are readily carried with the urine into the ureter, and become fixed in the narrow portion of the tube. But, very large calculi can be contained only in the upper part of this canal, where its parietes are more yielding, and the space in them more capacious.

Calculi, of middling size, in their passage through the ureter, cause, at first, a feeling of heaviness, or an indeterminate sense of uneasiness, and an obtuse pain in the region of the corresponding kidney. These complaints occur at intervals of greater, or less duration. At length, the pain grows more urgent and annoying, attended with flatulence, heart-burn, frequent vomiting, painful retraction of the testicle, and sometimes acute fever. As Sir A. Cooper has remarked in his lectures, it is at the period, when the calculus is passing over the lumbar plexus, that a great deal of pain is felt in the groin and in the course of the anterior crural nerve, just as the spasmodic contraction of the cremaster arises at the time, when the calculus is descending over the spermatic plexus. The patient makes water frequently, and in small quantities at a time; and the urine is high-coloured and bloody. The patient cannot sit upright, his body being bent forwards towards the affected side. These symptoms may have more or less duration, and then suddenly cease. They may also subside, and recur several times, at intervals of some days. In the latter case, the pain is felt at each attack to be situated lower in the track of the ureter. Lastly, when the symptoms have entirely disappeared, the urine is more abundant, not so high-coloured, and easily discharged, the stream sometimes bringing out with it the urinary concretion, after its entrance into the bladder.

Suppuration of the kidney, and an abscess in the lumbar region, in consequence of renal calculi, are not very common events. However, these are the only cases of the kind, in which the interposition of surgery can be useful. By adverting to previous circumstances, and irregularity of the pain about the kidney, the practitioner may suspect the nature of a phlegmonous tumor in the situation of this viscus. Whatever may be his conjectures, however, he must carefully abstain from the use of his lancet, until purulent matter is plainly under the integuments. He may then safely make an opening, from which urine and pus will be discharged, and through which the calculi themselves may sometimes be felt and extracted. If they cannot be readily touched with a probe, let not the surgeon rashly conceive, that he is justified in endeavouring to discover them with his knife. Their situation may be such as to baffle all his endeavours, and the operation itself might cause a most dangerous hemorrhage, and other fatal mischief. The opening of an abscess of the kidney may remain a long while fistulous, and indeed warrant the conclusion, that the healing is prevented by the presence of some extraneous substances; but, a prudent practitioner will never think of performing any operation for their extraction, unless they can be distinctly felt, and nature has brought them tolerably near to the surface. (See *Nephrotomy.*) Sir A. Cooper, in his lectures, mentions a singular case, in which Mr. Cline was able plainly to feel in a very thin patient a calculus situated in the kidney. He adverts also to another example, in which a great deal of purulent matter had been voided from the bowels before death, and, on opening the body, a calculus was found lodged in the ureter, between which tube and the colon an open communication existed, through which the abscess of the kidney had discharged itself into the intestines. In one particular case, related by the same experienced surgeon, a calculus, fixed in the ureter, gave rise to a renal abscess, which burst into the cavity of the abdomen, and the patient's death quickly followed.

Urinary calculi, which form upon foreign bodies, accidentally introduced into the bladder, and acting as nuclei, are always single, unless the number of foreign bodies themselves happen to be greater. It is curious also to find, from the observations of Mr. Murray Forbes, (*On Gravel and Gout, p.* 74, *8vo. Lond.* 1793,) and Dr. Marcet, that, in such instances, the deposition, most frequently, if not always, consists of the earthy phosphates, and especially of the fusible calculus. Thus, in the collection of Mr. R. Smith, of Bristol, there is a pin, a piece of bougie, and four pieces of stick, coated with fusible matter. (See *Med. Chir. Trans. Vol.* 11, *p.* 11.) But, when calculi originate from a particular diathesis, there may be many of them lodged in the bladder at the same time. Several distinct nuclei may descend successively from the kidneys, and each may increase in a separate manner. Sometimes, however, calculi in the bladder, which are at first distinct and unconnected, become afterwards cemented together, so as to make only one mass.

The magnitude of calculi in the bladder is generally in an inverse ratio to their number. Some hundreds have been found in one bladder; but they were not larger than a pea. One very remarkable instance has lately been recorded, in which 398 calculi, from the size of a pea to that of an olive, were found in the bladder after death. By analysis, they were found to consist of phosphate of lime, phosphate of magnesia, and uric acid. (*Mag. der Auslaendischen Literatur; Hamb. Jan. Feb.* 1822; *and Journ. of Foreign Med. No.* 15.) It is observed by Sir Astley Cooper, that when a great number of calculi are found in the bladder, the circumstance is generally attended with an enlargement of the prostate gland, directly behind which a sacculus is formed. In cases of diseased prostate gland, the bladder can seldom be completely emptied, and this partial stagnation of the urine in the sac, here alluded to, is supposed to facilitate the production of calculi. From their number and collision against each other, their surfaces are generally smooth, and their shape is commonly roundish. (See *Med. Chir. Trans. Vol.* 11, *p.* 359, *and art. Prostate Gland.*) Other calculi have been met with of so large a size, that they were more than six inches in diameter. In Fourcroy's museum, and in that of the Ecole de Médecine, at Paris, may be seen some calculi, which filled the whole cavity of the bladder; and, in the *Phil. Trans. for* 1809, the late Sir James Earle described an enormous stone, which he extracted after death from the bladder of the late Sir David Ogilvie, who had been unsuccessfully cut for it. This calculus, which was of the fusible kind, weighed forty-four ounces, and was of an oval shape, its long axis measuring sixteen inches, and the shorter fourteen. The average size of vesical calculi may be compared with that of a chestnut, walnut, or a small hen's egg. Their size depends very much upon their composition, the largest being of the fusible kind. Their weight differs from a few grains to upwards of fifty ounces; but, on an average, it is from two to six ounces. Their weight is not always proportioned to their size; for, substances of different qualities enter into their composition, and diversify their heaviness.

The urinary salts, in calculous patients, are not continually precipitated in the same quantities: in some cases, indeed, the process appears to be even suspended for a considerable time. Hence, a stone, of middling size, already formed, may increase but very slowly, and it has actually happened, that a calculus, which could be plainly felt with a sound, has remained more than ten years in the bladder; and, yet, after all this time, been only of a moderate size.

According to Dr. Marcet, the form of urinary calculi is mostly spheroidal, sometimes egg-shaped, but often flattened on two sides like an almond. (*P.* 50.) Sometimes, the calculous matter, which descends from the kidneys, is in the form of minute spherical grains, which have a singular tendency to unite either to each other, or to calculi already lodged in the bladder.

When there are several loose calculi in the bladder together, they seldom lie long in contact with each other, while their size is diminutive, but are incessantly changing their situation as the patient moves about, or alters the position of his body. Hence, their increase is at first regular and uniform; but, when they have attained a more considerable size, or by their numbers compose a large mass, their relative situation is more permanent, and many of their surfaces being in this manner usually covered, no longer receive any additional depositions. Every other part of these calculi, however, goes on increasing. It is thus, that stones, with surfaces corresponding to those of other stones, are produced, and which are aptly denominated by the French writers "*pierres à facettes.*"

Dr. Marcet has likewise taken notice of the angular shape of certain calculi, and remarked the rare occurrence of their being sometimes almost cubic. His work contains the engraving of a species of calculus, which somewhat resembles a pear, with a circular protuberance at its broader end, apparently moulded in the neck of the bladder.

The same intelligent writer has also particularly considered the variety in the colours and surfaces of calculi, which often afford indications of their chemical nature. "When they have a brownish, or fawn colour, somewhat like mahogany wood, with a smooth, though sometimes finely tuberculated surface, they almost always consist of lithic acid. When cut open, they appear to be formed of concentric layers, sometimes homogeneous, sometimes alternating with other substances. The colour, however, cannot be considered as a certain criterion, since other kinds of calculi may often be coloured in the bladder, in a similar manner, by bloody mucus, or other vitiated secretions.

"When calculi are white, or greyish-white, they always consist of earthy phosphates. This is particularly the case with the species called fusible. And, when they are dark brown, or almost black, hard in their texture, and covered with tubercles, or protuberances, they are generally of the species which has been distinguished by the name of *mulberry*, and consist of oxalate of lime.

"Calculi have sometimes an uneven, crystalline surface, studded with shining transparent particles. This appearance always denotes the presence of the ammoniaco-magnesian phosphate." (*Marcet, p.* 52.)

A large calculus, especially when it has a rough irregular surface, produces a great deal of irritation of the bladder, which contracts more closely round it. The contact, however, is remarked to be particularly exact at the transverse line, which extends between the terminations of the two ureters in the bladder; a part of this organ which generally becomes more thickened than the rest. Sometimes, indeed, the cavity of the bladder is nearly effaced, and the urine can be retained only a very short time, or if it be not evacuated, it spreads uniformly round the calculus, especially above and below the above-described transverse projection, which is less yielding than other parts of this organ. Hence, the surface of the stone, towards the orifices of the ureters, does not enlarge so fast as the other sides of it, and a circular groove is produced, giving the foreign body the shape of a calabash. Such calculi are generally very large, and sometimes even of enormous size. In the latter circumstance, the foreign body fills the cavity of the bladder so completely, that there is no space left for the lodgment of the urine there, which fluid then generally passes along a sort of groove, situated in a line reaching from the lower termination of the ureter to the neck of the bladder. This state is of course accompanied with a complete incontinence.

Urinary calculi are not always loose and moveable in the cavity of the bladder; being sometimes fixed in various ways to certain points of the circumference of this organ; a subject, which has been noticed in the article *Lithotomy.*

When the bladder protrudes from the abdomen, so as to form a hernia, a stone is occasionally situated in the displaced portion of it. This circumstance has the same effect, as the encysted state of a calculus; for the foreign body is thereby fixed, and it cannot be propelled towards the neck of the bladder, at the period when the urine is discharged. Also, in cases of prolapsus uteri, when the bladder is drawn downwards, a stone has sometimes been found lodged at the lowest part of it. The possibility of the complication of a calculus, with such displacements of the bladder, ought to be well remembered, since, if the nature of the case be detected, its treatment becomes materially simplified.

The symptoms of a stone in the bladder have been detailed in the article *Lithotomy*, and therefore need not here be repeated. They are all so equivocal, and bear so great a resemblance to the effects of several other disorders, that they cannot be depended upon, and consequently no well-informed surgeon will venture to pronounce positively, that there is a calculus in the bladder, unless he can distinctly feel it with a sound. (See *Lithotomy* and *Sounding.*) As for the operation, if the surgeon cannot plainly feel the calculus immediately before he commences the incisions, it ought to be postponed.

Notwithstanding the laudable zeal, with which various distinguished physicians and surgeons of the present day, have applied themselves to the consideration of the causes of urinary calculi, the subject is yet in great obscurity. The conjectures, which have been started, respecting the influence of particular kinds of food, drink, air, and habits of life, are all of them liable to such objections, as throw considerable doubts on their correctness, and sometimes amount to a decided refutation of them.

If a foreign body be introduced into a cavity, to which the urine has access, whatever may be the nature of the immersed substance, it always becomes after a time incrusted with calculous matter, though it undergoes no chemical change in its composition. In such cases, it is found (see *Forbes on Gravel and Gout*, 8*vo. Lond.* 1793, and *Marcet on the Chemical Hist., &c. of Calculous Disorders*, 8*vo. Lond.* 1817,) that the concretion mostly, if not always, consists of the earthy phosphates. Here, the operation of any particular diathesis is beyond all suspicion, because the foreign body, which forms the nucleus, would lead to the production of a calculus in all descriptions of patients.

There are some countries, where patients with calculi are tolerably numerous; and other parts of the world, where the disease is rare, or never met with; and yet the difference cannot always be accounted for by any geographical circumstance, which is constant, or any definable peculiarity of constitution, climate, diet, or mode of life. One fact, however, I believe is certain, viz. the uniform rarity of the disease in *very hot* countries. In tropical climates, urinary calculi are almost unknown, and, as Dr. Marcet observes, the testimony of Dr. Scott on this point, who long resided in India, must be considered valuable. Dr. Scott affirms, that, between the tropics, he never met with a single instance of the formation of a stone in the urinary bladder, although he knew of some cases, which had been imported, and were not cured by climate. (See *Marcet on the Chemical History and Med. Treatment of Calculous Disorders, Chap.* 2, 8*vo. Lond.* 1817.) Yet, as calculi frequently form on various nuclei, bullets, pieces of bougies, &c. I conceive, that, even in India, calculi will some day or another be found to originate from this cause, though not perhaps from diathesis.

Urinary calculi are said also to be very uncommon in Spain and Africa, though patients with gravel are numerous in Majorca, which lies between them. (*Magendie, Recherches sur les Causes, &c. de la Gravelle, p.* 31, 8*vo. Paris*, 1818.) The usual belief is, that calculi are most frequent in damp, cold countries, like England and Holland, but, that in such other parts of the world, as are either very hot, or cold, the disease is rare. However, in every estimate of this kind, the number of the inhabitants of the countries, or districts in question, is always an essential thing for consideration, because the proportion of stone-patients, in a given number of individuals, is invariably rather small; and, therefore, in referring to the rarity of such patients in very cold countries, it is to be considered, whether the fact may not be, in some measure, ascribable to the fewness of the inhabitants. The state of medicine and surgery, in the countries, from which the information is transmitted, is likewise another thing for contemplation, inasmuch as patients are not likely to be reported as suffering from, or dying of stone, where the nature of diseases is not scientifically observed, morbid anatomy is uncultivated, and the operation of sounding never attempted. However, as our East India native regiments are furnished with excellent surgeons, I consider it well proved, that in those regiments the disease is uncommon, for otherwise the statement would no doubt have been contradicted by them. The fact seems, therefore, well established, in relation to the East Indies. At the same time, the ages of the individuals, to whom any calculation applies, is always to be taken into consideration, before any inference be drawn respecting the cause of the rarity of calculi, because, if the disease be rare amongst soldiers in India, it is also rare amongst soldiers in Europe, and therefore climate would not explain the fact in both parts of the world. But, probably, the recollection, that common soldiers are neither children, nor men above the middle period of life, and that the first formation of stone in youths, adults, and middle-aged persons, is uncommon, unless some extraneous substance happen to enter the bladder and form the nucleus, may furnish a reason for the infrequency of the disease amongst soldiers, applicable perhaps to such individuals in every country. And, that the children of soldiers, like those of other persons, are not exempt from the disease, I know very well, having had occasion myself to operate upon a patient of this kind during my service with the army.

The preceding consideration also of the general age of sailors in the royal navy, and of the little chance there must be of a boy with stone being sent to sea, or of any sailor being admitted on board of a King's ship with that disorder, unless it be wilfully concealed by the man himself, furnish to my mind a better explanation of the cause of so few cases of stone having been met with amongst seafaring persons, than any of the references to the habits or mode of life of a sailor, made by Mr. C. Hutchison in his ingenious paper. (See *Med. Chir. Trans. Vol.* 9, *p.* 443, *&c.*) From this gentleman's account it seems, that out of 86,000 patients, admitted into the Naval Hospital at Haslar, Plymouth, and Deal, in the space of sixteen years, there has only been eight calculous cases, or one in 10,750 patients. *Two of these cases were boys, about fourteen years of age, "who had laboured under symptoms of stone for some years previously to their admission into the service, and into which they had recently entered, expressly for the purpose of deriving benefit from our magnificent institutions;* one was a marine who had been at sea a few months only; three were adult seamen, and the seventh a marine; *but, their length of service afloat could not be at all ascertained:* the eighth, and last case, was a warrant officer *advanced in years*, who had been serving in ordinary, that is, in a ship in harbour, for a considerable time previously to the operation." Subsequently to the period, embraced by the returns, collected by Mr. C. Hutchison, *a boy* has also been operated upon in Haslar Hospital. (*Vol. cit. p.* 449.) Mr. R. Smith, of Bristol, has published an interesting statistical inquiry into the frequency of stone in the bladder in Great Britain and Ireland, though strictly it is a comparative estimate of the number of operations for stone in different parts of the kingdom in given spaces of time, and not of the number of calculous patients. (See *Med. Chir. Trans. Vol.* 11.) As far as I can judge from the facts stated in Mr. Smith's paper, and from what I know about the average number of operations for stone in London, not more than 180 can be fairly reckoned as the annual total in Great Britain and Ireland, which is about 1 for each 100,000 of the population, taken at 18 millions. Now, if this fact be recollected, in computing the rarity of stone operations in the navy, and the other circumstances of there being few children and old men in that service, and of every man being examined by a surgeon, as to the state of his health, before he is entered, I think, the reason of the infrequency of stone in the navy will be tolerably clear. However, as sailors live partly in very hot and partly in very cold climates, even if they were of the ages most subject to calculi, they may perhaps be rather less disposed to the complaint, than individuals of the same periods of life, constantly resident in England. In the cold country of Sweden, urinary calculi are said to be infrequent, (*Richerand, Nosogr. Chir. T.* 3, *p.* 528, *Ed.* 4); and, as surgery is there highly cultivated, the uncontradicted statement weighs considerably in favour of the truth of the general belief in the rarity of this disorder in very cold countries. But, as I have already said, the number of inhabitants, to which any particular evidence on this point relates, is an essential inquiry, before a safe inference can be drawn.

It is perfectly well ascertained, that the greater number of urinary calculi are composed chiefly of lithic, or uric acid, which is naturally contained either in a free or combined state in the urine of man, and all other animals, which consume a great deal of food, abounding in azote, as flesh of every kind, fish, shell-fish, eggs, &c. Whenever the urine will redden the tincture of turnsol, Magendie infers, with the generality of chemists, that it contains lithic acid, the proportion of which, he says, varies, according to the quantity of substances abounding in azote, taken as food. And, Magendie further observes, that when animals live altogether on flesh, their urine is full of uric acid, and even may be entirely composed of it, as is proved, with respect to birds, by the experiments both of Dr. Wollaston and Vauquelin. Here Magendie cannot mean free uric acid, but this acid in a state of combination; for, as Dr. Prout has observed, there is no instance known, in which lithic, or uric acid is secreted in a pure state; birds, serpents, &c. always secrete it in combination with ammonia; in the gouty chalk-stone, it is secreted in combination with soda. (*On the Nature, &c. of Gravel and Calculus, p.* 13.) On the contrary, if animals live on vegetables, as is the case with the herbivorous class, Magendie states, that there is no appearance of lithic acid in their urine. In a series of experiments, communicated by Magendie to the Academy of Sciences in 1816, this distinguished physiologist exemplified, that, if a carnivorous animal be deprived of all nutriment, containing azote, and be fed with sugar, gum, oil, and other substances considered to be nutritious, and having no azote in their composition, the urine, in three or four weeks, will contain no lithic acid. (See *Mém. sur les Propriétés nutritives des Substances, qui ne con-*

tiennent pas d'azote. Paris, 1817.) A dog, allowed only sugar, and distilled water, soon began to grow lean, and died apparently starved on the 32d day from the commencement of his diet. The inference, which Magendie draws from his experiments, and from some cases, which he has detailed, is, that the quantity of uric acid in the urine, and of course, the tendency to gravel and calculous disorders, depend very much upon the kind of food. However, he takes into consideration the relative proportion of the uric acid to the urine itself, because if this be also abundant, the liability to calculi is counteracted. It would appear also, from his observations, that the urine not only becomes impregnated with a great proportion of uric acid in animals, which eat a large quantity of flesh, but is also scanty; and that, on the other hand, a vegetable diet always promotes the secretion of a large quantity of fluid from the kidneys, as well as checks the formation of the acid in question. Magendie is also disposed to believe, that the rarity of calculi in hot climates may be partly traced to the kind of food employed. In fact, it is well known, that, in a considerable part of Asia, many millions of the inhabitants never eat flesh. But, though this circumstance must be allowed to have full weight, with respect to the sects which religiously decline animal food, the influence of climate cannot be rejected, because calculi are rare in all hot countries, whether meat be freely eaten or not. At the same time, the tenor of this gentleman's reasoning may be true, that, setting out of the question the influence of climate, a vegetable diet tends to prevent the formation of lithic acid calculi, while eating large quantities of such food, as contains a great deal of azote, has the opposite effect.

However, Magendie himself is not so partial to his theory, as not to confess, that it is liable to objections; for, says he, individuals are met with every day, who from their age, manner of living, and habits, appear to be subjected to every condition, calculated to produce the gravel, and yet they remain free from it. Hence, he infers, that there must be some unknown causes, which sometimes keep the uric acid dissolved, even where its quantity in the urine is copious. On the other hand, he admits, that certain persons are met with, whose regimen and mode of life ought to exempt them from gravel, and still they are afflicted. In proof of this fact, he adverts to the poor inhabitants of a district in Sussex, mentioned by Dr. Scudamore, (*On the Nature and Cure of Gout, &c. 8vo. Lond.* 1817,) who live almost entirely on vegetable matter and hard beer, and many of whom are much troubled with gravel. Magendie might also have recollected, that some birds, which live entirely on vegetable matter, as several singing-birds kept in cages, void a good deal of the lithate of ammonia. Magendie refers to examples of gravel being always produced in certain individuals after any unusual exertion, and in other apparently healthy subjects, after any difficulty of digestion, flatulence, the eating of salad, raw fruit, &c. With regard to the dyspepsia, frequently attendant on calculous disorders, and other chronic diseases, Magendie sets down the complaints of the stomach and of the urinary organs, as probably only two effects of the same cause, and not mutually productive of each other. (See *Recherches, &c. sur les Causes, &c. de la Gravelle, 8vo. Paris,* 1818.)

It should be observed, that Magendie's observations are meant to apply only to cases of gravel, and where the substance voided is lithic acid. And, as for other instances, in which the calculous matter is formed of phosphate of lime, oxalate of lime, cystic oxide, &c. he deems the causes entirely unknown. One thing is certain, that Magendie's theory will not account for the origin of calculi, unless a predisposition to the disease from other unknown or conjectured causes, be taken as a matter of fact. Indeed, this admission he makes himself; and he enumerates various circumstances conducive to gravel, besides a diet of food abounding in azote; as advanced age; a sedentary life; and hard study; long retention of the urine in the bladder; strong wines and liquors. In fact, without the predisposition, arising from unknown causes, and particular periods of life, a meat diet will not render the occurrence of calculi frequent, as is exemplified in sailors, who eat a great deal of salt beef and pork. And, on the contrary, that the eating of little, or no animal food will not always prevent the formation of calculi, when there is tendency to it from time of life, diathesis, or other causes, is sufficiently proved by the frequency of the disease in infants, in whose food, there is a much smaller proportion of meat and azotic substances, than in the usual diet of an adult.

With respect to *amorphous sediments*, the circumstances, which Dr. Prout has observed to produce a lithic acid diathesis in persons, subject to slight dyspepsia, but, in other respects healthy, are: 1. Simple errors in diet. 2. Unusual, or unnatural exercise, either bodily, or mental, particularly after eating, and the want of proper exercise at all other times. 3. Debilitating circumstances. (*On Gravel Calculus, &c. p.* 113.) An unusually heavy meal, especially of animal food, or bread, he says, is *invariably* followed by a deposition of the lithate of ammonia from the urine. Heavy, unfermented bread, and compact, hard boiled, fat dumplings, or puddings, he finds, particularly apt to produce such an effect.

Crystallized sediments, or *gravel*, consisting of nearly pure lithic acid, Dr. Prout ascribes to a free acid being sometimes generated in the kidneys, and, combining with the ammonia, with which the lithic acid is previously united, so as to precipitate the latter in a pure crystallized state. According to the investigations of Dr. Prout, the precipitating acid is not constantly the same, though generally the phosphoric, and sometimes the sulphuric. (*P.* 127, 128.)

The same intelligent writer represents the circumstances, which promote the formation of urinary sediments in general, as being either *natural*, or *acquired*. "With respect to those of the first description, (says he) it cannot, I think, be doubted, that certain individuals are much more liable to these sediments, than others. This tendency is not infrequently inherited: thus, I know a family, where the grandfather and father have actually lithic calculi in the bladder; and where the grandson, a youth of twelve, or thirteen years of age, has a very strong tendency to the same disease; his urine depositing frequently very large quantities of lithic acid, both in the form of amorphous and crystalline sediments. On the other hand, the disposition to generate these sediments in excess, is, like gout, or rather simultaneously with gout, but too frequently acquired by indolent habits, and excess in eating and drinking. Most frequently, however, the tendency to these diseases is connected with some unknown causes, peculiar to certain districts, or countries, as, for example, the district, of which Norwich may be considered the centre; in which more calculous cases occur, than in the whole of Ireland, or Scotland. In such instances, the water, diet, temperature, &c. of the district, has been each accused, in its turn, of being the exciting cause; but, (says Dr. Prout) the circumstance, I believe, still remains unexplained. I have, in one or two instances, seen a fit of lithic gravel induced in the predisposed by sitting on a damp cold seat for some hours. Sometimes also a tendency to lithic calculus is evidently connected with local injury, or disease of the kidney." (*P.* 133.)

The difficulty of tracing the causes of the formation of calculi, is rather increased, than facilitated, by the fact, that, except when the urinary organs are much diseased, the patient may appear to be in perfect health. Indeed, persons of the strongest constitutions are often troubled with the stone, quite independently of the entrance of any foreign body, as a nucleus, into the bladder; and it is now universally admitted, that lithic acid itself constitutes by far the most common nucleus, even when other calculous matter is deposited round it. (See *Prout on Gravel, p.* 95.) It is sometimes conjectured, that the female is less liable, than the male sex, to calculi; but, whether this is the fact, or whether the circumstance can be satisfactorily explained on another principle, viz. the facility with which any calculi of moderate size are generally discharged through the short and capacious meatus urinarius, are questions perhaps not yet completely settled.

Infants, and children to the age of twelve, or fourteen, are very liable to stone. However, it is asserted by Delpech, that, at this period of life, relapses are unfrequent; that is to say, an entirely fresh stone is hardly ever formed again; and, if a return of the complaint happens, the quickness of its recurrence, and an attentive examination of the calculus, will mostly prove, either that the second stone has formed round a fragment of the first, left behind, or that it existed when the former one was taken out, but was not discovered. I am not inclined myself to put much faith in this statement, because it is hardly credible, that the calculous diathesis of childhood can be at all diminished by the circumstance of there having already been one calculus, and of the patient having had the bladder opened for its removal.

Dr. Marcet thinks, that the disorder is frequent only among the children of the poor classes; and that in those of the higher ranks, or even of the lowest classes, *provided they are well fed*, the same frequency is not observed. "In the Foundling Hospital, for instance, within the last 27 years, during which 1151 children have been admitted, only 3 cases of stone have occurred, all of which were among children while at nurse in the country. And, in the Military Asylum at Chelsea, which contains about 1250 children, and into which upwards of 6000 of them have been already admitted, no more than one single case of stone has occurred." (See *Marcet's Essay on Calculous Disorders, p.* 36.) However, supposing that the foregoing statement refers to operations for stone, and that the average number of operations for the population of Great Britain and Ireland, is annually about 1 for each 100,000 inhabitants, the inference, drawn by Dr. Marcet, which also does not agree with later statistical reports, cannot be received, because, in the total number of children, specified as having been admitted into the above charities, even when every allowance is made for the time comprised in the calculation, the proportion of operations is far beyond the average, with reference to the population in general. And, that stone cases are more numerous in the children of the poor, than in those of the higher classes, is a fact, which perhaps may be explained by the recollection, that the mass of the population consists of the poor and laborious classes.

In the period of life, between the age of twelve, or fourteen, and that of forty, the liability to stone in the bladder, is much less, than in infancy, childhood, or old age. And, no doubt, many of the cases, which do present themselves in adults, or middle-aged individuals, either began at an earlier period of life, or are owing to some extraneous nucleus.

According to Delpech, in old men, who are particularly subject to calculi, the disposition to the return of the disease always continues during life; and, hence, in them, relapses are frequent. (*Précis des Mal. Chir. T.* 2, *p.* 193, *&c.*)

The following table, collected by Dr. Prout, exhibits the proportion of stone cases before and after puberty, and of their occurrence in the different sexes:

	Bristol.	Leeds.	Norwich.	Total.	Consisting of	
					Males.	Females.
14 years and under,	178	96	235	509		
Above 14 years,	177	101	271	549		
	355	197	506		1014	44

Thus, nearly one half of the whole number of stone cases occur before the completion of the 14th year; and it appears also from Mr. Smith's valuable reports, that *there is an evident in-*

crease in the number of cases, about the age of 40 *years.* (See *Prout on Gravel, &c. p.* 210; *and R. Smith, in Med. Chir. Trans. Vol.* 10.)

Dr. Marcet has estimated the comparative frequency of the disease in various countries, and in the different stations of life, and tried to ascertain, whether its frequency be influenced by varieties of climate, or situation, or by peculiarities in our habits and occupations. He instituted inquiries at all the great hospitals of the metropolis, in the hope of getting at some useful records concerning the vast number of patients, on whom lithotomy had been performed in those establishments. In London, he found it impossible to obtain all the particulars of such cases, as no entry of them had been preserved. The Norwich Hospital, however, afforded him some details, which are interesting. All the calculi, which have been extracted in that hospital for 44 years, viz. from 1772 to 1816, and which amount to 506, have been carefully preserved, with the circumstances annexed to each stone, and the event of the operation distinctly recorded, Dr. Marcet has given the results of these records in the following table:

	Number of Operations.			Deaths.		
	Children under 14.	Adults.	Total.	Children.	Adults.	Total.
Males,	227	251	478	12	56	68
Females,	8	20	28	1	1	2
	235	271	506	13	57	70

It appears, says Dr. Marcet, from the above table, that the mean annual number of cases of lithotomy in the Norwich Hospital, during the last 44 years, has been $11\frac{1}{2}$, or 23 in every two years; and that the total number of fatal cases, in the 506 operations, is 70, or 1 in $7\frac{1}{4}$, or 4 in 29. The proportion of females, who have undergone the operation, is to that of males, as 58 to 1000, or about 1 to 17; that the mortality from the operation in children was only about 1 in 18; while, in adults, it was 4 in 19, or nearly quadruple.

According to Mr. Smith, the mortality from lithotomy at the Bristol Infirmary, has been in the following proportions:

Age.	Rate of Mortality.
10 years of age and under,	1 in $4\frac{1}{2}$
Between 10 and 20 ——	1 — 5
20 —— 30 ——	1 — 7
30 —— 40 ——	1 — 5
40 —— 50 ——	1 — $3\frac{1}{8}$
50 —— 60 ——	1 — $4\frac{2}{3}$
60 —— 70 ——	1 — $2\frac{1}{2}$
70 —— 80 ——	1 — 2
Mean at all ages	1 in $4\frac{1}{4}$

The following table is also from Mr. Smith's paper, and refers to the Leeds Hospital. (See *Med. Chir. Trans. Vol.* 10.)

		Cases of Lithotomy	died		
From 1767 to	1777	24 of which	2	or 1 in	12
1777	1787	62	8	1	$7\frac{3}{4}$
1787	1797	23	3	1	$7\frac{2}{3}$
1797	1807	42	7	1	6
1807	1817	46	8	1	$5\frac{3}{4}$
Mean at all ages,				1 in	$7\frac{4}{5}$

In the Norfolk Infirmary the mortality has been much less in children, than adults. But, at St. Bartholomew's the proportion of deaths in children, during the 20 years that I frequently attended operations for stone there, was very great. In the Bristol Infirmary, the risk in children seems to have been about equal to what it has been in adults. In all calculations of this kind, however, it is to be recollected, that as operations for the stone are done, not only by surgeons of various degrees of skill, but in different ways, and even with instruments of great diversity, such computations do not give the fair average of any one method of operating.

Now, where the patients are equally favourable, but the results of any given number of operations on them are considerably different, the skill of the surgeons, the particular methods of operating pursued, the kinds of instruments used, the general healthiness of the hospital itself, and the treatment after the patients are put to bed, are considerations, by which questions, apparently inexplicable, might sometimes be solved.

From the year 1772 to 1816, the Norwich Hospital received 12,859 patients of all kinds, making an average of 428 annual admissions; and Dr. Marcet observes, that the proportion of 506 operations of lithotomy, out of 18,859 patients, which corresponds to about 1 in 38, exceeds, in an astonishing degree, that obtained from any of the other public institutions, whose records he examined.

Next to the records of the Norwich Hospital, Dr. Marcet derived the most distinct information of this kind from Cheselden, who mentions in his work on anatomy, that, during the course of his public practice in St. Thomas's Hospital, a period of about 20 years, he had performed the operation of the stone 213 times, and lost only 20 patients. This was about 2 cases in 21, which is much less than the common average.

In St. Thomas's Hospital, during the last ten years, the operation of lithotomy seems to have been done, on an average, 11 times in each two years; and 1 case of stone has occurred in each 528 patients admitted.

In St. Bartholomew's, lithotomy was performed 56 times in the years 1812, 1813, 1814, 1815, and 1816. The annual average about 11, or 1 in each 340 patients of all descriptions.

In Guy's Hospital, lithotomy has been performed, on an average, about 9 or 10 times annually, during the last 20 or 30 years. The proportion of calculous patients there is also estimated as 1 in about 300 cases of all kinds.

Dr. Marcet's inquiries incline him to think, that, on the whole, lithotomy in the London hospitals, for some years, has been gradually becoming less frequent; and this, he conceives, may be owing, partly to a real reduction in the frequency of the stone, from some alteration in the diet, or habits of the people; partly to the use of appropriate medicines; and partly to the circumstance of calculous patients not resorting so exclusively, as was formerly the case, to the great London hospitals for the operation.

In the Royal Infirmary at Edinburgh, the average number of stone cases annually, during the last six years, is said not to have exceeded 2, although about 2000 patients are admitted there every year.

Dr. Marcet has been informed by M. Roux, that, in La Charité at Paris, ten or twelve cases of stone occur every year, out of about 2600 patients, and that the proportion of deaths from the operation there is 1 in 5 or 6.

With respect to the Hôpital des Enfans Malades, in the same city, Dr. Marcet states, on the authority of Dr. Biett, that about 6 cases of stone are received every year into that establishment, where about 3000 children of both sexes are annually admitted. There have been only 3 cases in females, and what is remarkable, only 2 deaths from the operation, in the course of the last seven years.

Dr. Marcet was acquainted, that lithotomy is comparatively rare at Vienna, not on account of the want of good surgeons, or the unfrequent occurrence of stone cases in that part of the Continent; but, in consequence of the little attention paid to this disease by the most eminent surgeons of the Austrian capital.

At Geneva, says Dr. Marcet, in a population of 30,000, lithotomy has been performed only thirteen times in the last twenty years, though good surgeons are never wanting in that town, to perform the operation whenever an opportunity presents itself. Out of these thirteen patients, seven were not strictly Genevese, though belonging to the neighbouring districts, and one was an Englishman; so that the disease would, at first sight, appear to be a rare occurrence at Geneva. But, continues Dr. Marcet, *if the smallness of the Genevese population be taken into account*, this proportion of calculous cases may not fall very short of that observed in other places. At Lyons, a populous town, not more than eighty miles distant from Geneva, the disease is stated to be rather frequent.

With regard to the chemical nature of urinary calculi, there was nothing known until 1776, when Scheele published, on the subject, in the Stockholm Transactions. He there stated, that all the urinary calculi, which he had examined, consisted of a peculiar concrete substance, now well known by the name of *lithic*, or *uric* acid, which he also showed was soluble in alkaline lixivia. Scheele further discovered, that the lithic matter was, in some degree, capable of being dissolved in cold water; that this solution possessed acid properties, and, in particular, that of reddening litmus; that it was acted upon in a peculiar manner when boiled in nitric acid; and, lastly, that human urine always contained this substance in greater or less quantity, and often let it separate in the form of a brick-coloured sediment, by the mere effect of cooling.

The discovery made by Scheele, was confirmed by Bergmann and Morveau, and the investigation of the subject was afterwards prosecuted by others with redoubled ardour. As Professor Murray observes, experiments continued to be repeated and diversified on these concretions, and on their solvents. At length, it was fully ascertained, that there existed others, besides those composed of uric acid; and, latterly, our knowledge of them has been much extended by the researches of Pearson, Wollaston, Fourcroy, and Vauquelin. Several important facts have also been established by the talents and industry of some other distinguished men; viz. Dr. Henry, of Manchester; Professor Brande, of the Royal Institution of London; Dr. Marcet, late of Guy's Hospital; and Dr. Prout, of London. The facts and considerations of the latter writer render it probable, however, that the common opinion of pure lithic acid being contained in the urine is not exactly correct; but that this acid "in healthy urine exists in a state of combination with ammonia, and that, in reality, this fluid contains no uncombined acid at all." (*On the Nature, &c. of Gravel and Calculus*, c. 13.)

The credit, which is due to Dr. Wollaston for his valuable and original discoveries, respecting urinary calculi, is very considerable; a truth, which I have particular pleasure in recording here, since his merits have not been fairly appreciated by the French chemists. Indeed, as Dr. Marcet observes, it is the more desirable, that his claims should be placed in the clearest point of view, as the late celebrated M. Fourcroy, both in his "Système des Connoissances Chimiques," and in his various papers on this particular subject, has, in a most unaccountable manner, overlooked Dr. Wollaston's labours, and, in describing results, exactly similar to those previously obtained and published by the English chemist, has claimed them as his own discoveries. Yet Dr. Wollaston's paper was printed in our Philosophical Transactions, two years before Fourcroy published his Memoir in the "Annales de Chimie," and three years before he gave to the world his "Système des Connoissances Chimiques;" and he discussed in these works a paper of Dr. Pearson on the lithic acid, published in a volume of the Philosophical Transactions (for 1798) subsequent to that which contained the account of Dr. Wollaston's discoveries! (See *Marcet's Essay on Calculous Disorders, p.* 60. Also *Murray's Syst. of Chem. vol.* 4, *p.* 686, *edit. of* 1809.)

It would appear then, that Scheele first discovered the nature of those urinary calculi which consist of lithic acid; but, that Dr. Wollaston first ascertained the nature of several other kinds, some of which have also been described at a later period by Fourcroy and Vauquelin. On the whole, there are five species of concretions, whose chemical properties were first pointed out by Dr. Wollaston, and no less than four belong to the urinary organs. These are, 1st. Gouty concretions. 2dly. The fusible calculus. 3dly. The mulberry calculus. 4thly. The calculus of the prostate gland. 5thly. The cystic oxide, discovered in 1810.

1. *Lithic Acid Calculus.* Dr. Prout believes, that, at least two-thirds of the whole number of calculi originate from lithic acid; for, as it forms by far the most common nucleus, round which other calculous matter is subsequently deposited, if such nuclei had not been formed and detained, two persons at least out of three who suffer from stone, would never have been troubled with the disorder. (*On Gravel, Calculus, &c. p.* 95.)

Lithic acid forms a hard, inodorous concretion, of a yellowish, or brown colour, similar to that of wood, of various shades. According to Professor Murray, calculi of this kind are in fine, close layers, fibrous, or radiated, and generally smooth on their surface, though sometimes a little rough. They are rather brittle, and have a specific gravity, varying from 1,276 to 1,786, but usually above 1,500. One part of lithic acid is said to dissolve in 1720 parts of cold water, and 1150 parts of boiling water; (*Marcet, p.* 65;) and this solution turns vegetable blues to a red colour. When it has been dissolved in boiling water, small yellowish crystals are deposited as the fluid becomes cold. Lithic acid calculi blacken, but are not melted by the blowpipe, emitting a peculiar animal smell, and gradually evaporating, until a small quantity of white ash remains, which is alkaline. By distillation, they yield ammonia and prussic acid. They are soluble, in the cold, in a solution of pure potassa, or soda, and from the solution, a precipitate of a fine white powder is thrown down by the acid. Lime water likewise dissolves them, but more sparingly. According to Scheele they remain unchanged in solutions of the alkaline carbonates; a statement which agrees with that of Dr. Prout, who accounts for the effect said to be produced by the alkaline carbonates upon calculi in the bladder, by their property of dissolving the lithate of ammonia. (*Egan, in Trans. of Irish Acad.* 1805. *Prout on Gravel, &c. p.* 84.) They are not much acted upon by ammonia. They are not soluble either in the muriatic, or sulphuric acid; though they are so in the nitric, when assisted by heat, and the residue of this solution, when evaporated to dryness, assumes a remarkably bright pink colour, which disappears on adding either an acid, or an alkali. In many of these calculi, the lithic acid is nearly pure; in others, there is an intermixture of other ingredients, particularly of phosphate of lime, and phosphate of ammonia and magnesia; and, in almost all of them, there is a portion of animal matter, which occasions the smell, when they are burnt, and the loss in their analysis. (See *Murray's Chemistry, vol.* 4, *p.* 640; *and Marcet's Essay on the Chem. and Med. Hist. of Calculous Disorders, 8vo. Lond.* 1817.)

A great quantity of uric acid is formed in gouty constitutions, and deposited in the joints, or soft parts, in the state of lithate of ammonia. Sir Everard Home removed a tumor weighing four ounces, from the heel of a gentleman, a martyr to the gout; and when analysed by Professor Brande, it was found to be principally composed of uric acid. (*On Strictures, vol.* 3. *p.* 313.)

2. *Lithate of Ammonia Calculus*, according to Dr. Prout, is generally of the colour of clay. Its surface is sometimes smooth; sometimes tuberculated. It is composed of concentric layers, and its fracture resembles that of compact limestone. It is generally of small size, and rather uncommon; but, the lithate of ammonia very frequently occurs, mixed with lithic acid, forming a mixed variety of calculus. Under the flame of the blow-pipe, it usually decrepitates strongly. It is much more soluble in water, than the lithic acid calculus; and always gives off a strong smell of ammonia on being heated with caustic potash. *The lithate of ammonia is also readily soluble in the alkaline subcarbonates, which pure lithic acid is not.* (*Prout on Gravel, &c. p.* 83.)

3. *Bone Earth, Phosphate of Lime Calculus.* The presence of phosphate of lime in urinary calculi had been mentioned by Bergmann and others, when Dr. Wollaston first ascertained, that some calculi are entirely composed of it. From the investigations of Dr. Wollaston, it appears, that this substance sometimes, though rarely, composes the entire calculus, but that in general it is mixed with other ingredients, particularly with uric acid, and phosphate of magnesia and ammonia. In the first case, the calculus is described as being of a pale brown colour, and so smooth as to appear polished. When sawn through, it is found very regularly laminated, and the laminæ, in general, adhere so slightly to each other, as to separate with ease into concentric crusts. It dissolves entirely, though slowly, in muriatic, or nitric acid. Exposed to the flame of the blow-pipe, it is at first slightly charred, but soon becomes perfectly white, retaining its form, until urged with the utmost heat from a common blow-pipe, when it may be completely fused. It appears to be more fusible, than the phosphate of lime, which forms the basis of bone; a circumstance, which Dr. Wollaston ascribes to the latter containing a larger quantity of lime. (*Phil. Trans.* 1797.)

4. *Triple Phosphate of Magnesia and Ammonia Calculus.* The existence of this calculus in the intestines of animals was first pointed out by Fourcroy; but, its being a constituent part of some urinary calculi of the human subject, was originally discovered by Dr. Wollaston. (*Phil. Trans.* 1797.) According to Dr. Prout, this species of calculus is always nearly white: its surface is commonly uneven, and covered with minute shining crystals. Its texture is not laminated, and it is easily broken and reduced to powder. In some rare instances, however, it is hard and compact, and when broken, exhibits a crystalline texture, and is more or less transparent. Calculi, composed entirely of the phosphate of magnesia and ammonia are rare, but specimens, in which they constitute the predominant ingredient, are by no means uncommon. (*Prout, p.* 86.) When the blow-pipe is applied, an ammoniacal smell is perceived, the fragment

diminishes in size, and if the heat be strongly urged, it ultimately undergoes an imperfect fusion, being reduced to the state of phosphate of magnesia. (*P.* 69.) Dr. Wollaston describes the form of the crystals of this salt, as being a short trilateral prism, having one angle a right angle, and the other two equal, terminated by a pyramid of three, or six sides. These crystals, as Dr. Marcet has explained, are but very sparingly soluble in water, but very readily in most, if not all, the acids, and, on precipitation, they reassume the crystalline form. From the solutions of these crystals in muriatic acid, sal ammoniac may be obtained by sublimation. Solutions of caustic alkalies disengage ammonia from the triple salt, the alkali combining with a portion of the phosphoric acid. One fact, of great importance, respecting this species of calculus, is mentioned by Sir A. Cooper in his lectures; viz. that it is particularly liable to be reproduced after lithotomy, and therefore, until the patient's diathesis has been corrected by medical treatment, he cautions surgeons not to perform the operation. In cases of this description, he says, a substance like mortar is discharged from the bladder, and the urine is very fetid.

5. *Fusible Calculus.* Mr. Tennant first discovered, that this substance was different from the lithic acid, and that, when urged by the blow-pipe, instead of being nearly consumed, a large part of it melted into a white vitreous globule. The nature of the fusible calculus was afterwards more fully investigated and explained by Dr. Wollaston. (*Phil. Trans.* 1797.) According to the excellent description, lately given of this calculus by Dr. Marcet, it is commonly whiter and more friable, than any other species. It sometimes resembles a mass of chalk, leaving a white dust on the fingers, and separates easily into layers, or laminæ, the interstices of which are often studded with sparkling crystals of the triple phosphate. At other times, it appears in the form of a spongy and very friable whitish mass, in which the laminated structure is not obvious. Calculi of this kind often acquire a very large size, and they are apt to mould themselves in the contracted cavity of the bladder, assuming a peculiarity of form, which Dr. Marcet has never observed in any of the other species of calculi, and which consists in the stone terminating, at its broader end, in a kind of peduncle, corresponding to the neck of the bladder. The chemical composition of the fusible calculus, is a mixture of the triple phosphate of magnesia and ammonia, and of the phosphate of lime. These two salts, which, when separate, are infusible, or nearly so, when mixed together and urged by the blow-pipe, easily run into a vitreous globule. The composition of this substance, says Dr. Marcet, may be shown in various ways. Thus, if it be pulverized, and acetic acid poured upon it, the triple crystals will be readily dissolved, while the phosphate of lime will scarcely be acted upon; after which the muriatic acid will readily dissolve the latter phosphate, leaving a small residue, consisting of lithic acid, a portion of which is always found mixed with the fusible calculus.

It is also remarked by Dr. Marcet, that many of the calculi, which form round extraneous bodies in the bladder, are of the fusible kind. And, the calculous matter, sometimes deposited between the prepuce and glans, is found to be of the same nature.

6. *Mulberry Calculus, or Oxalate of Lime,* is mostly of a dark brown colour, its interior being often grey. Its surface is usually uneven, presenting tubercles more or less prominent, frequently rounded, sometimes pointed, and either rough or polished. It is very hard, difficult to saw, and appears to consist of successive unequal layers: excepting the few stones, which contain a proportion of silica, it is the heaviest of the urinary concretions. Though this calculus has been named *mulberry*, from its resemblance to that fruit, yet, as Dr. Marcet has observed, there are many concretions of this class, which, far from having the mulberry appearance, are remarkably smooth and pale coloured, as may be seen in plate 8, fig. 6. of that gentleman's essay. According to Mr. Brande, persons, who have voided this species of calculus, are much less liable to a return of the complaint, than other patients, who discharge lithic calculi. (*Phil. Trans.* 1808.)

With regard to chemical characters (says Professor Murray), it is less affected by the application of the usual re-agents, than any other calculus. The pure alkaline solutions have no effect upon it, and the acids dissolve it with great difficulty. When it is reduced, however, to fine powder, both muriatic and nitric acid dissolve it slowly. The solutions of the alkaline carbonates decompose it, as Fourcroy and Vauquelin have observed; and this affords us the easiest method of analysing it. The calculus in powder being digested in the solution, carbonate of lime is soon formed, which remains insoluble, and is easily distinguished by the effervescence produced by the addition of weak acetic acid, while there is obtained in solution the compound of oxalic acid with the alkali of the alkaline carbonate. From this, the oxalic acid may be precipitated by the acetate of lead, or of barytes; and this oxalate, thus formed, may be afterwards decomposed by sulphuric acid. Another method of analysing this calculus is by exposure to heat: its acid is decomposed, and by raising the heat sufficiently, pure lime is obtained, amounting to about a third of the weight of the calculus. According to Fourcroy and Vauquelin, the oxalate of lime calculus contains more animal matter, than any other. This animal matter appeared to them to be a mixture of albumen and urée. The composition of a calculus of this species, analysed by Mr. Brande, was, oxalate of lime 65 grains; uric acid 16 grains; phosphate of lime 15 grains; animal matter four grains.

7. *The Cystic Oxide Calculus* is small, and very rare. It was first described by Dr. Wollaston. (*Phil. Trans. for* 1810.) In external appearance, it bears a greater resemblance to the triple phosphate of magnesia, than any other sort of calculus. However, it is more compact, and does not consist of distinct laminæ, but appears as one mass confusedly crystallized throughout its substance. It has a yellowish semi-transparency, and a peculiar glistening lustre. Under the blow-pipe, it gives a singularly fetid smell, quite different from that of lithic acid, or the smell of prussic acid. In consequence of the readiness, with which this spe-

cies of calculus unites both with acids and alkalies, in common with other oxides, and the fact of its also containing oxygen (as is proved by the formation of carbonic acid by distillation), Dr. Wollaston named it an oxide, and the term *cystic* was added from its having been originally found only in the bladder in two examples. Dr. Marcet, however, has subsequently met with no less than three instances of calculi formed of cystic oxide, all of which were unquestionably of *renal* origin.

8. *Alternating Calculus.* Lithic strata frequently alternate with layers of oxalate of lime, or with the phosphates. Sometimes also the mulberry alternates with the phosphates, and, in a few instances, three, or even four species of calculi occur in the same stone, disposed in distinct concentric laminæ. On the comparative frequency of these and other varieties of calculi, Dr. Prout's work contains valuable information.

9. *Compound Calculi, with their Ingredients intimately mixed.* Under this title, Dr. Marcet comprehends certain calculi, which have no characteristic feature, by which they can be considered as distinctly belonging to any of the other classes. He observes, that they may sometimes be recognized by their more or less irregular figure, and their less determinate color; by their being less distinctly, if at all divisible into strata; and by their often possessing a considerable hardness. By chemical analysis, confused results are obtained. (See *Essay on the Chem. and Med. Hist. of Calculous Disorders, p.* 90.)

10. *Calculi of the Prostate Gland.* The composition of these calculi is said to have been first explained by Dr. Wollaston. (See *Phil. Trans. for* 1797.) They all consist of phosphate of lime, the earth not being redundant as in bones. Their size varies from that of a pin's head to that of a hazel-nut. Their form is more or less spheroidal; and they are of a yellowish brown colour.

Fourcroy has described a species of urinary calculus, which is characterized by being composed of the urate or lithate of ammonia. Dr. Wollaston, Mr. Brande, and Dr. Marcet did not, however, satisfactorily ascertain the presence of this substance in any of the concretions, which they examined. As also urea and the triple phosphate, both of which afford ammonia, are frequently present in lithic calculi, it is conjectured, that these circumstances may have given rise to the analytical results, from which the existence of urate of ammonia has been inferred. (*Brande, in Phil. Trans.* 1808. *Marcet's Essay, p.* 93.)

The recent investigations of Dr. Prout, however, tend to establish the reality of the lithate of ammonia calculus.

Dr. Marcet has met with two specimens of urinary calculi entirely different from any which have hitherto been noticed. One of these he proposes to name *xanthic oxide*, from ξανθος, *yellow*, because one of its most characteristic properties is that of forming a lemon-coloured compound, when acted upon by nitric acid. The chemical properties of the other new calculus, mentioned by Dr. Marcet, correspond to those of fibrine, and he therefore suggests the propriety of distinguishing it by the term *fibrinous.* For a particular description of these new substances, I must refer to this gentleman's Essay.

11. *Carbonate of Lime Calculus.* This substance is not enumerated by Dr. Marcet, as entering into the composition of urinary calculi. But, according to Mr. R. Smith, there can be no doubt of the fact. Dr. W. H. Gilby, of Clifton, he says, detected it decidedly in four instances. "A notice of it will be found in Mr. Tilloch's Journ. for 1817, vol. 49, p. 188, in the account of a curious calculus, given to me by Mr. G. M. Burroughs, of Clifton; the nucleus of which is a common cinder, an inch and a half long, and one broad. Since the publication of that paper (continues Mr. Smith), Mr. H. Sully, of Wiveliscombe, sent me three oddly shaped calculi, which he removed from a lad, together with 15 pea-sized ones previously voided by the urethra, which are entirely carbonate of lime, held together by animal mucus." (See *Med. Chir. Trans. vol.* 11, *p.* 14.) Dr. Prout has also seen some small calculi, composed almost entirely of carbonate of lime. (*On Gravel, &c. p.* 89.)

Dr. Prout has investigated, with considerable talent, the comparative prevalency of the different forms of urinary deposites, and the order of their succession. His data are taken from the examinations, made by Professor Brande, of the calculi in the Hunterian Collection; by Dr. Marcet, of those at Norwich and Guy's Hospital; by Dr. Henry, of those at Manchester; and by Mr. Smith, of others preserved at the Bristol Infirmary. The whole number of calculi examined was 823; of these, 294 were classed under the name of lithic acid, 98 of which were nearly pure; 151 were mixed with a little of the oxalate of lime; and 45 with a little of the phosphates. 113 consisted of oxalate of lime. Three were of cystic oxide. 202 were phosphates; of which 16 were nearly pure; 84 mixed with a small proportion of lithic acid; eight consisted of phosphate of lime nearly pure; three of triple phosphate nearly pure; and 91 of the fusible, or mixed calculi. 186 were alternating calculi, or those whose laminæ varied, but consisted of lithic acid, oxalate of lime, and phosphates: of these, 15 consisted of lithic acid and oxalate of lime, the first being in the greatest proportion; 40 of the oxalate of lime, in the greatest proportion, and lithic acid in the least; 51 of the lithic acid and the phosphates; 49 of the oxalate of lime, and the phosphates; 12 of the oxalate of lime, lithic acid, and the phosphates; one of fusible and lithic; two of fusible, and oxalate of lime; and 16, the composition of which was not mentioned.

Of compound calculi, whose composition was not specified, there were 25. (See *W. Prout's Inquiry into the Nature and Treatment of Gravel and Calculus, p.* 94.)

The proportion of *lithic acid calculi* is somewhat more, than one-third of the whole number. But, as this acid is the common nucleus, round which other calculous matter is deposited, Dr. Prout computes the proportion of calculi, originating from it, to be at least two-thirds of the whole number. According to the experiments of the same physician, the red crystalline calculus is composed of nearly pure lithic acid; and the earthy, amorphous one, consists of lithic acid, more or less ammonia, generally a little of the phosphates, and sometimes a small portion of the oxalate of lime. The lighter the colour, the greater in general the proportion of lithate of ammonia and the phosphates. (*P.* 97.)

Oxalate of lime calculi form one-seventh of the whole number, without any regularity, however, in different museums.

Cystic oxide calculi are so rare, that the proportion found was only one in 274.

Calculi composed of the phosphates, made about one-fourth of the whole number.

Alternating calculi amounted to between one-fourth and one-fifth; but, Dr. Prout offers good reasons for believing, that the data, from which the estimate is drawn, cannot be depended upon. For additional information on this branch of the subject, I must refer to Dr. Prout's valuable work.

The stone being a severe affliction, and the operation extremely hazardous and painful, a variety of experiments have been instituted, for the purpose of discovering a solvent for urinary calculi. Hitherto, however, all the remedies and plans, which have been tried, have been attended with very limited, and, by no means, unequivocal success, notwithstanding many persons may have been deceived into a contrary opinion.

The dissolution of stones in the bladder has been attempted by *lithontriptic medicines,* as they are termed, and by fluids injected into this viscus. At the present day, practitioners direct their endeavours very much to the correction of those particular diatheses, or states of the constitution, on which the formation of various calculi depend, and more confidence seems to be placed in this aim, than in any schemes for the dissolution of urinary concretions. It is certain, that in the latter project, many difficulties present themselves, and amongst these, some of the most serious are the great variety in the composition of calculi; the impossibility of knowing the exact ingredients of a stone, while it is concealed in the bladder, though many useful suggestions for assisting the judgment on this point have been recently offered by Dr. Prout: and, lastly, if the right solvent were ascertained, as calculated upon chemical principles applied to urinary concretions out of the body, it is obvious, that any medicines, taken by the mouth, are liable to so many changes in the alimentary canal, and in the lymphatic and vascular systems, that it must be exceedingly difficult to get them in an unaltered state and effective quantity into the bladder; while, if this were possible (as it is in the way of injection through a catheter), the bladder itself might be incapable of bearing the application, and the patient lose his life in the experiment.

As Dr. Prout well observes, a calculus in the bladder may be considered, a substance placed in a solution of various principles in a certain quantity of water. If any of the more insoluble of these principles exist in this solution in a state of supersaturation, the calculus will afford a nucleus, round which the excess will be deposited. But, if none exist in a state of excess, of course, none can be deposited, and the calculus will not increase in bulk.

Whoever studies the chemical properties of the urine, says Dr. Marcet, will learn, that "if any alkali (a few drops of ammonia for instance) be added to recent urine, a white cloud appears, and a sediment, consisting of phosphate of lime, with some ammoniaco-magnesian phosphate, subsides, in the proportion of about two grains of the precipitate from four ounces of urine. Lime-water produces a precipitate of a similar kind, which is still more copious; for, the lime, in combining with the excess of phosphoric, and perhaps, also, of lactic acid, not only precipitates the phosphate of lime, which these acids held in solution; but, it decomposes the other phosphates, thus generating an additional quantity of the phosphate of lime, which is also deposited.

"If, on the contrary, (observes the same author), a small quantity of any acid, either the phosphoric, the muriatic, or, indeed, even common vinegar, be added to recent healthy urine, and the mixture be allowed to stand for one or two days, small reddish crystalline particles of lithic acid will be gradually deposited on the inner surface of the vessel.

"It is on these two general facts, that our principles of chemical treatment ultimately rest. Whenever the lithic secretion predominates, the alkalies are the appropriate remedies; and the acids, particularly the muriatic, are the agents to be resorted to, when the calcareous, or magnesian salts prevail in the deposit." (*P.* 147, 148.)

The alkalies taken into the stomach certainly reach the urinary passages through the medium of the circulation; and it is also strongly suspected, that the acids likewise do so, though this circumstance is still a question. Unfortunately, the quantity of either alkalies, or acids, which thus mixes with the urine, is so small, that no impression is made upon calculi of magnitude. The experience of Dr. Marcet, Dr. Prout, and others, however, has clearly ascertained, that such medicines are often capable of checking a tendency to the formation of stone, and sometimes of bringing on a calculous deposite depending upon the altered state of the system. Indeed, Dr. Marcet expresses his decided opinion, that, even supposing not an atom of alkali, or acid, ever reached the bladder, still it would not be unreasonable to expect, that these remedies may respectively produce the desired changes during the first stages of assimilation; in one case, by neutralizing any morbid excess of acid in the primæ viæ; and, in the other, by checking a tendency to alkalescence, or otherwise disturbing those affinities, which, in the subsequent processes of assimilation and secretion, give rise to calculous affections. (*P.* 153.)

When muriatic acid is prescribed, from 5 to 25 drops may be given two or three times a-day, diluted with a sufficient quantity of water.

The best way of taking the alkalies is by drinking soda water, as a common beverage. It is asserted, however, on the authority of Sir G. Blane, that, when the alkalies are combined with citric acid, as in the ordinary saline draught, they also have the effect of depriving the urine of its acid properties.

Dr. Marcet, with every appearance of probability, refers to carbonic acid itself no solvent power, and he does not even adopt Mr. Brande's opinion, that this acid passes into the urine, when patients drink fluids impregnated with it.

But, it may be inquired, if no known internal medicine will dissolve a stone already formed, what is the good of merely altering the diathesis, and checking the increase of the calculus, as lithotomy must still be necessary? The reasons for persevering in the aim of correcting any particular state of the system, and the urinary secretion, on which state the increase of a calculus depends, are very important; for, it is found, that, though medicines may be quite incapable of dissolving a calculus, they relieve a great deal of the distress and suffering apparently the effect of the diathesis itself, as will be presently noticed, and sometimes afford such ease, that the operation may be postponed until the health is improved, or, in a very old subject, even be dispensed with altogether. The aim is also of high importance, with the view of preventing relapses.

As the lithic acid diathesis seems to be concerned in the production of about two-thirds of the whole number of the urinary calculi, the correction of it has been a chief aim amongst modern practitioners. For this purpose, Magendie, whose experiments tend to prove, that the lithic acid diathesis may be lessened and removed by abstinence from animal food, and other nutriments abounding in azote, founds his practice very much upon this alleged fact. His indications, however, are four in number, viz. 1. to lessen the quantity of uric acid produced by the kidneys; 2. to augment the secretion of urine; a maxim, which leads him to consider cutaneous perspiration injurious; a statement, which I think must be rejected, considering the rarity of calculi in hot climates, independently of the sentiments of Dr. Wilson Philip, that the precipitating acid (if such be the cause) is thrown off by the skin, and consequently that ensuring a due performance of the cutaneous functions, must, in these cases, be beneficial. (See *Medical Trans. of the College of Physicians, Vol.* 6.) 3. To prevent the lithic acid from assuming a solid form, by saturating it. 4. When gravel and calculi are formed, to promote their discharge and attempt their dissolution. (*Récherches, &c. sur la Gravelle, p.* 42.)

For correcting the lithic acid diathesis, Dr. Prout particularly enjoins the avoidance of errors in diet, exercise, &c. The error of quantity of food, he deems worse, than the error of quality. Patients, he says, should abstain altogether from things, which manifestly disagree with them, and which must be unwholesome to all, such as heavy unfermented bread, hard-boiled and fat puddings, salted and dried meats, acescent fruits, and (if the digestive organs be debilitated) soups of every kind. In general also wine, and particularly those of an acescent quality, should be avoided. The wearing of flannel, the preserving a regular state of the bowels, and the occasional use of alterative medicines, are likewise commended. (*Prout on Gravel, &c. p.* 135.)

According to the same author, the treatment of calculous affections is either of a local, or general description. The local treatment is nearly the same in all the species; the general treatment will depend upon the nature of the calculous diathesis.

What Dr. Prout calls the local treatment consists chiefly in prescribing hyosciamus and opium, either alone, or combined with uva ursi. The hyosciamus, he says, is generally preferable in the lithic acid diathesis; and opium in the phosphatic. He also recommends the use of opium in the form of injection and embrocation, and especially in that of a suppository. The warm bath, fomentations, and sitting over hot water, are spoken of as other means of relief.

According to the observations of the same well-informed writer, the distressing symptoms, produced by lithic acid calculi, have a very constant relation to the severity of the diathesis present; a circumstance, which, he says, is also more or less true with respect to all the other kinds of calculi: that is to say, in proportion as the urine is unnatural, and loaded with gravel and amorphous sediments, in the same proportion are the patient's sufferings. Hence, our first object should be to restore the urine to its natural state. The first means to be recommended, in ordinary cases, is usually a dose of calomel and antimonial powder, the Plummer's pill, or some other alterative purgative, taken at night, to be followed up the next morning by an alkaline diuretic purgative, composed, for example, of Rochelle salts and magnesia, or subcarbonate of soda: during the day, a strong infusion of uva ursi, combined with hyosciamus and the liquor potassæ, may be taken. These means are to be persisted in for a greater or less time, according to the circumstances, and till the urine begins to be natural; they may then be gradually left off, or varied, as occasion may require; and, under this plan, it will be found, that, in the majority of cases, *not only the urine will assume its natural state, but most, or all the distressing symptoms of calculus in the bladder, will be very much diminished, and, in many instances, disappear.* It is obvious also that, while the urine is in its natural state, the calculus cannot increase in size.

"After the diathesis is once fairly broken by these means, it may in general be easily prevented from recurring, by attention to the diet and other circumstances, formerly mentioned as inducing this diathesis, and by the occasional use of medicines; and the patient will scarcely know, that he has a calculus in the bladder; at least, from the pain that it gives him. I state this with confidence; but at the same time, I wish to be understood to mean, that the freedom from pain, &c. depend, in no inconsiderable degree, upon the size of the calculus, its smoothness, upon the exercise a patient is obliged to take, &c. all of which are presumed to be favourable; for, it must be sufficiently obvious, that a foreign substance in the bladder cannot be prevented from acting *mechanically*, and from occasionally producing bloody urine, or a temporary stoppage of the discharge of that secretion from the bladder, and similar symptoms, if the patient is obliged to take severe exercise." (*Prout on Gravel, &c. p.* 202—204.)

At the beginning of the eighteenth century, lime and the alkalies were known to be frequently productive of relief in cases of stone, and in particular, the nostrum of a Mrs. Steevens, the active ingredients of which were calcined egg-shells and soap, acquired such celebrity for the cures which it effected, that much anxiety was expressed, that her formula should be made public. The consequence was, that, in the year 1739, parliament appointed a committee of 22 respectable men to investigate the merits of the remedy in question, and, on their very favourable report, the secret was purchased for the sum of 5000*l.* These proceedings naturally interested our neighbours, and in the years 1740 and 1741, Morand communicated to the Academy of Sciences two memoirs, in which are reported numerous cases, where the new remedy was tried, and mostly with success; the greater number of the patients being described as either benefited, or actually cured.

In many instances, stones which had been unquestionably felt, were no longer to be discovered; and, as the *same* persons were examined by surgeons of the greatest skill and eminence, both before, and after, the exhibition of the medicines, it is no wonder, that the conclusion was drawn, that the stones had been really dissolved. From the cessation of this success, however, and from its now being known, that stones occasionally become lodged in a kind of cyst, on the outside of the general cavity of the bladder, so as to cause no longer any material suffering, surgeons of the present day are inclined to suspect, that this must have happened in Mrs. Steevens's cases. This was certainly what happened to one of the persons, on whom the above medicine was tried, as Dr. W. Hunter informs us. It is evident, that a stone so situated, would not in general produce a great deal of irritation, nor admit of being felt with a sound; though, as I have stated in the article *Lithotomy*, there have been a few exceptions to this observation.

Mrs. Steevens first gave calcined egg-shells alone; but, finding costiveness produced, she added soap. In time, she rendered her process more complicated, adding snails burnt to blackness, a decoction of camomile flowers, parsley, sweet fennel, and the greater burdock.

That, in the lithic acid diathesis, the carbonated fixed alkalies, taken in large doses, have the effect of passing into the urine, and saturating the redundant lithic acid, in the unhealthy state of that fluid, is a fact decidedly proved. If there were any doubt yet remaining upon this point, it would be immediately removed by the perusal of the case of the celebrated Mascagni as detailed by himself. (See *Mem. della Soc. Ital.* 1804.) This eminent anatomist being much afflicted with gravel, derived benefit from drinking the *aqua alcalina mephitica*, or Seltzer water; but, conceiving, that more good might result from a trial of carbonate of potash, he took at first half a dram of this substance in the morning, and as much in the evening, dissolved in ten ounces of water. The second day, the dose was augmented to two drams, and on the third to three, which quantity, dissolved in 20 ounces of water, was continued for ten days. "Before taking the carbonate of potash (says Mascagni) my urine was very acid, and immediately reddened litmus paper: as soon as the medicine was begun, I made the same experiment with the urine then voided, and found the intensity of the colour of the paper less. *The second day, the paper was very little altered, and, on the third, the urine did not redden it at all.* The acid in my urine, therefore, was saturated, and, at the same time, the pain in my loins diminished, and no more gravel was voided with my urine. Afterwards, the pain ceased entirely, the urine became clearer, and I perceived that it contained an excess of potash." Being attacked again at a subsequent period with the gravel, Mascagni adopted the same treatment, and experienced equal benefit from it.

In the lithic acid diathesis, the caustic alkali, in the form of the liquor potassæ, has sometimes been thought to have more efficacy, than the carbonate.

Sir E. Home and Mr. Hatchet first suggested the utility of giving magnesia in cases of stone; and the proposal was communicated to the public by Mr. Brande (*Phil. Trans.* 1810). As Dr. Marcet observes, magnesia is often found advantageous in long protracted cases, in which the constant use of the subcarbonated, or caustic alkalies, would injure the stomach. But, he properly remarks, that, if magnesia is sometimes beneficial, it has of late years often done harm. For, as this earth is the base of one of the most common species of calculi, viz. that containing the phosphate of ammonia and magnesia, there is nearly an even chance, when magnesia is prescribed, without any previous knowledge of the nature of the calculus, that it will prove injurious. Magnesia, also, when long and profusely administered, sometimes forms large masses in the intestinal canal, causing serious distress, and even fatal consequences.

According to Dr. Prout, purgatives will sometimes stop calculous depositions, especially in children; and Dr. Henry, of Manchester, has observed, that a quack medicine, composed of turpentine and opium, will occasionally produce a plentiful discharge of lithic acid from the bladder.

On the whole, I believe, reason and experience will allow us to consider lime-water, soap, acidulous soda water, the carbonate of potassa, the liquor potassæ, and magnesia, only as palliative remedies, by which the pain of the disorder may sometimes be diminished, and the urinary secretion improved, it being more rational to impute the few supposed instances of greater success to the calculi becoming encysted.

As medicines, taken into the stomach, will not dissolve urinary calculi, solvent injections have been introduced through a catheter directly into the bladder. Fourcroy and Vauquelin ascertained, that a ley of potassa, or soda, not too strong to be swallowed, softens and dissolves small calculi, composed of the uric acid and urate of ammonia, when they are left in the liquid a few days. They proved, that a beverage, merely acidulated with nitric or muriatic acid, dissolves with still greater quickness, calculi, formed of the phosphate of lime, and of the triple phosphate of ammonia and magnesia. They also ascertained, that calculi, composed of the oxalate of lime, which are the most difficult of solution, may be softened, and almost quite dissolved, in nitric acid, greatly diluted, provided they are kept in the mixture a sufficient time.

Liquids are then known, which will dissolve calculi of various compositions; but, as I have already hinted, much difficulty occurs in employing them effectually in practice. For, although they can be easily injected into the bladder, this organ is so extremely tender and irritable, that the action of such liquids upon it, as would be requisite for dissolving a stone, would produce sufferings, which no man could endure, and the most dangerous and fatal effects on the bladder itself. Another objection to this practice also arises from the surgeon never knowing what the exact composition of a calculus is, before this body is extracted, and his consequent inability to determine what solvent ought to be tried.

Until the complete success of lithontriptics is established, therefore the operation of lithotomy, severe and hazardous as it is, must continue an indispensable practice, wherever the patient's sufferings are great, and the calculus too large to be voided, or extracted through the urethra, or the circumstances such as to prevent the successful application of Dr. Civiale's lithontriptor, which is calculated to reduce the calculus to powder, or small particles, so that it may be discharged with the urine. (See *Lithontriptor.*) In the early stage, however, before calculi have exceeded a certain size, if they cannot be expelled with the urine, they may sometimes be taken out by means of the urethral forceps invented by Mr. Weiss, of the Strand: this instrument is shaped like a sound, but its end, after introduction into the bladder, admits of being opened, and made to grasp the calculus, which is then to be drawn through the urethra. The urine is first to be discharged, through a catheter. See *an Account of a Case, in which numerous Calculi were extracted without cutting Instruments, by Sir A. Cooper, in Med. Chir. Trans. Vol.* 11, *p.* 349. *Also Lithotomy.*

Consult *T. Lobb, a Treatise on Dissolvents of the Stone, 8vo. Lond.* 1739. *Stephen Hales, Experiments and Observations on Mrs. Stevens's Medicines, 8vo. Lond.* 1741. *Morand, in Mem. de l'Acad. des Sciences,* 1740 *and* 1741. *J. Rutty, New Experiments on Joanna Steevens's Medicines, 8vo. Lond.* 1742. *R. Whytt, an Essay on the Virtues of Lime Water and Soap, in the Cure of Stone, 8vo. Edinb.* 1761. *D. Hartley, a View of the present Evidence for and against Mrs. Steevens's Medicine, 8vo. Lond.* 1739; *and Supplement,* 1740. *N. Hulme, a safe and easy Remedy for the Stone, &c. 4to. Lond.* 1778. *Wm. Butler, Method of Cure for the Stone, chiefly by injections, 12mo. Edinb.* 1754. *B. Langrish, Physical Experiments upon Brutes, in order to discover a safe Method of dissolving Stones in the Bladder by Injections, 8vo. Lond.* 1746. *J. Jurin, Effects of Soap-ley, taken internally for the Stone, 2d Edit. with an Appendix, 12mo. Lond.* 1745. *J. F. Schreiber, De Medicamento à J. Steevens, contra calculum, divulgato inefficaci et noxio, Gött.* 1744. *Murray Forbes, a Treatise upon Gravel and Gout, with an Examination of Dr. Austin's Theory of Stone, an Inquiry into the Operation of Solvents, &c. 8vo. Lond.* 1793. *W. Austin, a Treatise on the Origin and component Parts of the Stone, &c. 8vo. Lond.* 1791. *T. Beddoes, on the Nature and Cure of Calculus, &c. 8vo. Lond.* 1793. *J. S. Dorsey, an Essay on the Lithontriptic Virtues of the Gastric Liquor, 8vo. Piladelphia,* 1802. *M. Girardi, De Uva Ursina, ejusque et aquæ calcis vi lithontriptica, &c. Patav.* 1764. *Scheele, in Stockholm Trans. Fourcroy, in Systeme des Connoissances Chimiques. Wollaston, Pearson, and Brande, in Phil. Trans. and Journal of Science and Arts, Vols.* 6 *and* 8, *&c. A. Marcet, on the Chemical History and Medical Treatment of Calculous Disorders, 8vo. Lond.* 1817; *a work full of valuable information. Wilson Philip, in Medical Trans. Vol.* 6. *Dr. Henry, in Med. Chir. Trans. Vol.* 10. *C. Scudamore, on Gout, &c. Edit.* 3. *F. Magendie, Recherches Physiologiques et Médicales sur les Causes, &c. de la Gravelle, 8vo. Paris,* 1818. *Ph. v. Walther ueber die Harnsteine; in Journ. für Chir. B.* 1. *Berlin,* 1820. *A. Copland Hutchison, on the Comparative Infrequency of Urinary Calculi among Seafaring People, vid. Med. Chir. Trans. Vol.* 9. *R. Smith, a Statistical Inquiry into the Frequency of Stone in the Bladder, in Great Britain and Ireland, vid. Med. Chir. Trans. Vol.* 11. *W. Prout, an Inquiry into the Nature and Treatment of Gravel, Calculus, &c. 8vo. Lond.* 1821; *a work abounding in original valuable observations. J. Wilson, on the Structure and Physiology of the Male Urinary and Genital Organs, and the Nature and Treatment of their Diseases, 8vo. Lond.* 1821; *this publication contains an excellent summary of the latest observations on the subject. J. P. Frank on Urinary Calculi, see Journ. of Foreign Med. No.* 19.

URINARY FISTULÆ. By an urinary fistula, is implied a deep, narrow ulcer, which leads into some of the urinary passages. The application of this name to sinuses, which do not communicate with these passages, but only terminate near some point of their course, appears to me rather absurd. One of the chief circumstances, tending to evince, that a sinus has no communication with the urethra, is, that no urine has ever escaped through the opening; for, with respect to the judgment formed from the impossibility of making a probe touch a catheter in the passage, it must be exceedingly fallacious, because the winding course of the sinus, or the small size of its communication with the urethra, may prevent the instruments from touching each other.

According to Desault, the indications in the treatment of such a case, depend upon the nature of its complications. When the sinuses are kept up by a separation of the scrotum from the parietes of the urethra, Desault recommends exact compression to be made over the part, which method, he says, is sometimes sufficient to accomplish a cure. When this plan fails, he states, that the healing of the sinus may be promoted by practising an incision on one side of the scrotum, and carrying it as far as the denuded portion of the urethra. When sinuses exist, and they depend upon the smallness of the opening, or its unfavourable situation for the discharge of the matter, the aperture should be enlarged, by making an incision into the main collection of pus. When there are callosities, which resist cataplasms, and the most active resolvents, Desault advises us to introduce into the fistula, trochees of minium, for the purpose of destroying the indurated parts. When the bones are diseased, exfoliation must be awaited; and, in every instance, the treatment should vary, according to the cause, upon which the fistula depends.

Fistulæ communicating with the urethra, but having no external opening, are sometimes produced in consequence of the bursting of an abscess into this canal; the ulceration, from a retention of urine; a false passage; and the healing of the external part of the wound made in lithotomy, while the internal part is not united.

In these cases, there is a discharge of pus from the urethra, before, and sometimes after, the issue of the urine; and one may feel, in the course of the urethra, a tumor, which increases while the patient is making water, and afterwards disappears on pressure, attended with a fresh discharge from the penis of a mixture of pus and urine.

These internal urinary fistulæ cannot be cured, except by preventing the urine from passing into them and lodging there. The catheters employed should be neither too large, nor too small. If too large, they would exactly fill the canal, and the pus and urine contained in the fistulæ could not be discharged. If too small, the urine would insinuate itself between them and the sides of the urethra, and enter the fistulæ. Their use must be continued till the ulcer is entirely healed.

The most frequent urinary fistulæ are those which are termed *complete*. Their origin may be in the ureters, bladder, or urethra. Those which arise in the ureters, sometimes terminate in the colon, and the urine is discharged *per anum* mixed with the feces. But most commonly, they make their appearance externally, either in the lumbar, or inguinal regions. Those which communicate with the bladder, have also different terminations. When they proceed from the upper and interior part of this organ, they ordinarily pierce the parietes of the abdomen above the pubes, and towards the navel. They also sometimes terminate in the groins. When they originate in the posterior parietes of the bladder, they sometimes tend into the cavity of the abdomen, where they almost always prove mortal; and sometimes into the intestines, if there should be adhesions between these and the bladder, so as to favour this communication. When the opening in the bladder is near the bottom of this viscus, the fistula sometimes terminates in the rectum of the male, and the vagina of the female subject; but, most frequently, it ends in the perineum, in both sexes. With regard to the fistulæ which originate in the urethra, they usually open externally in the perinæum, the scrotum, or the penis, and sometimes also in the rectum. It is not uncommon to see the external opening of these fistulæ at a great distance from the internal one, and to find it in the middle, and even the lower part of the thighs, the groins, parietes of the abdomen, and as high as the sides of the chest. Often there is only one opening in the urethra, while there are several situated externally, more or less distant from one another.

Most of these fistulæ are the consequences of a retention of urine, and owing to the same causes, as the diseases of which they are a symptom. Those which communicate with the rectum, in the male subject, sometimes depend upon this intestine having been wounded in the operation of lithotomy; and those, which open into the vagina, are often the effect of a violent contusion, caused by the head of the child in difficult labours, or of ulceration produced by pessaries, which are too large, and the margins of which are too sharp and irregular. Carcinoma of the rectum and vagina also give rise to fistulæ, by extending into the bladder.

The discharge of urine from the external orifice of the fistula, is an unequivocal proof of its communication with the urinary passages; when the fistula is narrow, and there is no obstruction in the urethra, the urine sometimes escapes more readily the latter way, than through the fistula. It may also be difficult, or even impossible, to find out the internal orifice of the fistula with a probe. When the fistula communicates with the rectum or vagina, a staff introduced through the urethra, may sometimes be felt in those parts.

When fistulæ of the bladder, or urethra, are the consequences of a retention of urine, produced by strictures, which still exist, or have even increased since the formation of the fistulæ, the circumstance may render the introduction of the catheter difficult. In this sort of case, if the catheter cannot be passed, the surgeon must endeavour to remove the stricture with bougies, on the principles explained in the article *Urethra, Strictures of.* "In general, (as Sir Everard Home observes) where fistulæ take place in perinæo, in consequence of a stricture, the removal of the stricture is sufficient to give the fistula a disposition to heal. There are, however, cases, which require more being done for that purpose, and simply laying them open is not sufficient." (See *Fistulæ in Perinæo.*) Under such circumstances, he finds the actual cautery the surest means of making the part heal. In one case, he passed a bougie into the urethra, and seared the edge of the fistula with a hot wire, introduced as far as to touch the bougie. In another instance, a full-sized silver sound was passed into the bladder, and, the direction of the fistula having been ascertained with a probe, a female steel sound was heated to redness, and "at the moment at which it passed from a red to a black heat, it was hurried down through the fistula (about two inches and a half) to the sound in the urethra." In both these cases, a cure was effected. *(Home on Strictures, Vol.* 3, *p.* 262, *&c.)*

When fistulæ terminate in the lower part of the bladder, Desault advises the utmost care to be taken to prevent the catheter from being stopped up, and to hinder the instrument from becoming displaced, or slipping out of the bladder; for which last purpose, the catheter bracelet, described by Sir E. Home, seems well calculated. However, when the fistula communicates with the urethra, Desault believes, that no advantage would be derived from keeping the catheter open. In both cases, he recommends us to continue the catheter, not only until the fistula is cured, but also until the obstacles, which hinder the urine from passing the natural way, are removed.

Fistulæ of the bladder, communicating with the vagina, and produced by difficult labours, are almost always attended with loss of substance. The forcible contusion, occasioned by the child's head on the anterior parietes of the vagina and bottom of the bladder, gives rise to the formation of sloughs, the separation of which sometimes leaves apertures large enough to admit the finger, and hence the difficulty of the cure. In treating such fistulæ, there are two indications to be fulfilled: 1st, to hinder the urine from passing into the vagina; 2dly, to keep the edges of the division as closely as possible together, so as to give them an opportunity of uniting.

In women, the introduction of the catheter is easy; but the instrument is more difficult to be fixed, than in men. Desault contends, however, that it is very essential to have it so fixed in the bladder, that the urine may escape. He found, that the only effectual plan was to fasten the catheter to a point, that always retained the same position, with respect to the meatus urinarius. He used a kind of machine, made after the manner of a truss, the circle of which was long enough to embrace the upper part of the pelvis, and had in its middle an oval plate, intended to be placed upon the pubes. In the centre of this plate was a groove, to which a piece of silver was fitted, curved so that one of its ends, with an aperture in it, came over the vulva, on a level with the meatus urinarius. This piece of silver admitted of being fastened to the plate with a screw. After the catheter had been introduced and arranged in the bladder, so that its beak and eyes were situated at the lowest part of this viscus, the end of the instrument was put through the aperture of the piece of silver, which slided into the groove of the plate, and it was afterwards fixed in the way already explained. By means of this machine, the catheter was securely fixed, without incommoding the patient, even when she was walking.

In these last cases, large catheters, with full-sized apertures, should be employed, so that the urine may more readily escape through the instrument, than fall into the vagina. In the early part of the treatment, the catheters should also be left constantly open.

In order to keep the edges of the division as near together as possible, Desault introduced into the vagina, a soft kind of pessary, large enough to fill the vagina, without distending it. By this means, the form of the fistula was changed from round to oval, which is the most favourable to its re-union; and the advantage was gained of closing the fistula, and hindering the urine from falling into the vagina. The efficacy of the catheter, when properly fixed, has lately been illustrated in an interesting case, published by Dr. Cumin, of Glasgow, who, however considers the introduction of the pessary into the vagina useless and objectionable. (See *Edin. Med. Journ. No.* 78, *p.* 62—64.)

When the rectum is wounded in lithotomy, Desault advised dividing the parts, comprehended between the wound of the operation, the opening in the rectum, and the margin of the anus. That such an operation may become necessary in some instances, I will not say; but, it can never be proper, until it is seen whether the wound of the rectum will not heal up favourably, without such treatment. I have seen two cases, in which the rectum was cut in lithotomy, yet no fistula ensued; and other similar facts have been mentioned to me by professional friends. The success also, with which the wound has generally been healed after lithotomy, done through the rectum, is another fact, tending to prove, that the inconveniences of a wound of the latter bowel in the operation have been rather exaggerated.

In a case of urinary fistula, communicating with the rectum, and which could not be healed with the catheter, Sir A. Cooper introduced a catheter into the bladder, and his finger into the rectum, and then made an incision, as in the operation for the stone, in the left side of the raphe, until he felt the staff through the bulb. He then directed a double-edged knife across the perineum, between the prostate gland and the rectum, with the intention of dividing the fistulous communication between the urethra and the bowel. A piece of lint was introduced into the wound, and a poultice applied. When the lint was removed, the urine was found to take its course through the opening in perinæo; the aperture in the rectum gradually healed; and that in the perineum quickly closed; the urine being all now discharged in the natural way. (*A. Cooper, Surgical Essays, Part* 1, *p.* 215.)

As the same gentleman has observed, apertures in the urethra, attended with loss of substance, are extremely difficult to heal. He relates a case, where the urethra had sloughed at the junction of the scrotum with the penis; the opening healed at its margin, but a large fistulous orifice still remained. Bougies, the plans of excoriating the edges of the opening with blistering plaster, and even paring them off, and bringing the fresh cut surfaces together with the twisted suture, had all been tried in vain. In this example, a cure was effected by applying the nitrous acid to the edge of the fistulous orifice, and to the skin, three quarters of an inch around it, the principle, on which Sir A. Cooper rested his hopes of success, being the contraction of the skin in cicatrization. The first application having produced considerable amendment, the plan was repeated several times in the course of about nine months, at the end of which time, the fistula was closed. He is of opinion, that such practice will only succeed in cases where the skin is very loose, and the scrotum forms a part of the fistulous orifice. If the skin be much confined, he suggests, raising a piece of skin from the scrotum, paring off the edges of the fistulous orifice, and removing the skin to a small extent around it. The skin, thus raised, is to be turned half round, so that its raw surface may be applied to the opening, and unite. An elastic catheter is first to be introduced. In the successful operation of this kind, which was actually done, the flap was held by four sutures; and small slips of adhesive plaster, and a bandage to support the scrotum, were employed. In the course of the treatment, pressure was found necessary to prevent the occasional passage of urine through the wound. (*A. Cooper, Surgical Essays, Part* 2, *p.* 221, *&c.*)

Mr. Earle met with a case, in which the teguments in the perineum, and above an inch of the canal of the urethra, had sloughed away, in consequence of external violence. At the man's entrance into St. Bartholomew's Hospital, a large smooth cicatrix occupied the place of the urethra, no vestige of which remained in that part. The integuments on the right side had suffered less extensively, than those on the left; so that when the catheter was introduced, that portion of the instrument, which passed over the cicatrix, could be about half covered, by drawing the skin and healed part from the right, towards the opposite side. The treatment was therefore begun by confining the knees together over a pillow, and applying a kind of truss, which kept the skin constantly pressed towards the left side. While these measures were going on, the opportunity was taken of dilating the anterior portion of the urethra with bougies. Afterwards the following operation, which I had the pleasure of seeing, was performed; a portion of the integuments was removed, about an inch and a half long, and one-third of an inch in width, on the left side of the cicatrix. The groove, thus formed, was intended for the reception of the edge of the skin to be detached from the opposite side. An incision was then made across the perineum, above and below, so as to pare away the callous edges of the urethra. The skin was next dissected off from a portion of integument on the right side of the perineum, about an inch and a half in length, and half an inch broad, leaving a smooth space of rather more than an inch, between the cut surfaces. The integuments, on the right side, were now dissected up, turned over a catheter, and brought in contact with the opposite groove. The detached portion of cicatrix bled little during the operation, and before it could be applied to the groove, its edge had so livid an appearance, as to create an apprehension, that it must perish. Two sutures were employed to assist in retaining it in the desired position, and some straps of adhesive plaster, and a bandage, completed the dressings. The day after the operation, it was evident, that some urine had escaped by the side of the catheter; and, on the third day, when the dressings were removed, it was found, that the portion of flesh, which had been deprived of skin, had sloughed, but that a sufficient quantity had united, above and below, to form a canal, open at one side, and large enough to include the whole catheter. After the parts had healed, some urine could be made to pass through the urethra, when pressure was applied to the left side of the remaining fistula. Various attempts were afterwards made to excoriate its edges, and unite them, but without success.

A second operation was therefore done in the summer of 1820, and integuments were now borrowed from the opposite side to that, from which they had been taken in the first operation. "A deep groove was made on the right side, the surface was denuded of its cutis to some extent, a considerable portion of integument was then detached from the left side, and, in order to obtain healthy skin (says Mr. Earle) I encroached a little on the thigh, and laid bare the edge of the fascia lata. Instead of passing any ligature through the detached portion, the old quill-suture was employed, which was passed from the two outer cut surfaces. A pad of adhesive plaster was interposed between the ligatures and the flap of skin." The catheter was not left in the urethra, but introduced about three times in 24 hours. By this operation, much more was gained, and about two-thirds of the deficient part of the canal were restored; but, still a small aperture remained at the upper part. This opening could not be closed by touching it with escharotics, and, consequently, a third operation on a smaller scale was done, which so nearly completed the cure, as to leave only an orifice, large enough to admit a bristle, and this opening subsequently closed, and the patient remained quite well in March 1821. (See *Phil. Trans. for* 1821.)

Here we see the same art, by which new noses and under-lips are formed, extending itself to cases, where it may be the means of extricating some individuals from a state, in which life is hardly desirable. The surgeon of judgment, however, will never forget, that such an operation is only indicated, where the fistula is large, the urethra free from obstruction, and bougies and the catheter insufficient.

URINE, INCONTINENCE OF. This complaint is quite the reverse of retention of urine; for, as in the latter affection, the urine is continually flowing into the bladder, without the patient having the power to expel it; so, in the former, it flows out, without the patient being able to retain it.

According to Desault, children are particularly liable to the disorder; adults are less frequently afflicted with it; and persons of advanced years, appear to be still less liable to it. The last observation may seem an error to such practitioners, as have met with numerous examples, where patients, advanced in years, were incapable of retaining their urine. The fact is, that the overflow of this fluid, or, in other words, its dribbling away through the urethra, in some cases of retention, of which it is only a symptom, has been too commonly confounded with an incontinence of urine, though the cases are as different in their nature, as possible, and require very opposite modes of treatment. *In retentions, depending upon weakness and paralysis of the bladder, the involuntary dribbling of the urine*, is generally only an effect of the other disease, and they prevail together. The distended bladder reacts upon the urine, and forces some of it out of the urethra, until the resistance of the sphincter and of the urethra are precisely equal to the expelling power. Sometimes the urine even dribbles away incessantly, as is found to happen when the action of the bladder is entirely destroyed; for, being then constantly full, it cannot hold any more of the urine, descending to it through the ureters, unless as much be voided through the urethra, as is received from the kidneys, and as unremittingly as the addition from the latter organs continues to be made. Such case rather belongs to the article, *Urine, Retention of*, than the present subject.

It is correctly remarked by Desault, that the causes of an incontinence of urine, strictly so called, are the very reverse of those of a retention. The latter case happens, whenever the action of the bladder is weakened, and the resistance in the urethra increased. On the contrary, an incontinence originates, either from the expelling power of the bladder being augmented, while the resistance in the urethra is not proportionately increased; or from the resistance being lessened, while the expelling force continues the same. On these principles, Desault thought it easy to explain, why the disorder should be most common in children; and one reason, which he gives for the circumstance, is, that, in childhood, there is more irritability, than at any other period of life. The expulsion of the urine, he observes, is entirely effected by muscular action, while the resistance is merely owing to the sphincter vesicæ, the levatores ani, and perhaps to a few other inconsiderable fasciculi of muscular fibres; for, the different curvatures of the urethra, and the contractile power of this tube itself, he thought, could make only a feeble resistance to the discharge of the urine. An incontinence happens in children, because the bladder contracts so suddenly and forcibly, that its contents are voided almost before these young subjects are aware of the occasion to make water, and without their being able to restrain the evacuation. There are also many children, who, from indolence, or carelessness, do not make water immediately the first calls of nature invite them, and who afterwards, being urgently pressed, wet their clothes. In other young subjects, the sensation which makes the bladder contract, and accompanies the expulsion of the urine, is so slight, that the function is performed, without any formal act of the will,—without even exciting an impression sufficiently strong to disturb sleep. This is the case with such children, as are troubled only with an incontinence of urine in the night-time. Increasing years, by diminishing the irritability of the bladder, and making man more attentive to his necessities, usually bring about a cure of the infirmity, which seldom continues till the patient has attained the adult state.

It was not, however, the doctrine of Desault, that no period of life, excepting childhood, is subject to incontinence of urine. On the contrary, he admits, that other ages are subject to it; but, then, it depends almost always upon a want of resistance to the escape of the urine. Thus, it may be occasioned by weakness, or paralysis of the sphincter vesicæ, or levatores ani: sometimes also by a forcible dilatation of the urethra, and loss of its elasticity, and, (as Desault might have added) its muscular power of contraction, since the microscopical observations of Mr. Bauer, tend to confirm the existence of muscular fibres on the outside of the membrane of the canal, though, as is elsewhere mentioned, their arrangement and mode of action, are now represented to be quite different from what was formerly supposed. (See *Urethra, Strictures of the.*)

A calculus, a fungus, or any other extraneous body of an irregular shape, may lodge in the neck of the bladder, but, not accurately filling it, may allow the urine to escape at the sides; or there may even be in the calculus grooves through which the urine may pass into the urethra.

A violent contusion, or forcible distention of the sphincter, is often followed by an incontinence of urine. Formerly, the complaint used to be very common after the mode of lithotomy called the apparatus major, and it is even at present not an unusual consequence of the extraction of calculi from females, either by dilatation, or division, of the meatus urinarius and neck of the bladder.

Women, after difficult labours, and in whom the child's head has seriously contused and weakened the neck of the bladder, are also subject to a species of incontinence of urine; which, however, is in general experienced only when they laugh, or make exertions.

Incontinence of urine is stated by many writers to be an attendant on palsy and apoplexy. Here they mistake, what the French surgeons aptly call the "*retention d'urine avec regorgement,*" for an incontinence. In such cases, the involuntary discharge of urine has been referred to paralysis of the sphincter of the bladder; but, it is forgot, that the bladder itself also participates in the paralytic affection; for, the sphincter not being a particular muscle, but only a fasciculus of fleshy fibres, formed, as Desault observes, by the junction of those, which compose the inner layer of the muscular coat of the bladder, it can only be weakened in the same degree, and at the same time, as the rest of this organ. Besides, says Desault, it is proved, and all physiologists admit the fact, that the action of the bladder is absolutely necessary for the expulsion of the urine, and that when this organ cannot act, a retention always ensues. Although much less danger attends an incontinence, than a retention of urine, the infirmity is a serious affliction; for as the patient's clothes are continually wet with a fluid, that readily putrifies, the stench, which he carries about with him, is offensive to himself, and every body who approaches him.

In children, the disorder usually gets well of itself, as they grow up, and acquire strength. When they wet their beds really from idleness and carelessness, moderate chastisement may be proper, inasmuch as the fear of correction will make them pay more attention to the earliest call to make water. However, it has always been my own belief, that this doctrine is carried to an unjustifiable extent, particularly in schools, and been a pretext for the most absurd kind of severity. Nor is it doubted by any man, who understands the subject, that, in almost all cases, the disorder is a true infirmity, arising from the causes already indicated, and not from indolence; the supposed crime taking place, in fact, when the child is asleep, and unconscious of what is happening.

If excessive irritability, and constitutional weakness, be the cause of incontinence of urine, and a very small quantity of urine forces the bladder to contract, the resistance of the urethra being involuntarily overcome, an endeavour should be made to lessen such irritability by the use of the warm, or cold bath, sea-bathing, tonics, chalybeates, good air, &c. And, in order to prevent the accident from taking place in the night-time, the child should not take any drink for some time before being put to bed; the bladder should be always emptied before sleep; and, if necessary, the child ought to be taken up in the night for the same purpose.

If the infirmity arises from a want of action in the parts, causing the resistance in the urethra, tonics may be externally and internally employed. However, when the disorder has been of long standing, Desault found, that they rarely succeeded.

Palliative means are then the only resource; viz. instruments, calculated either to compress the urethra, and intercept the passage of the urine, or to receive the fluid immediately it is voided. The first of these plans is more difficult to accomplish in women, than men; but, it may be executed by means of an elastic hoop, which goes round the pelvis, and from the middle of which, in front, a curved elastic piece of steel descends, and terminates in a small compress, which is contrived to cover accurately the meatus urinarius. (See *Œuvres Chir. de Desault par Bichat, T.* 3, *p.* 95, *&c.*)

Large blisters, applied over the os sacrum, have often cured an incontinence of urine, both when the complaint seemingly arose from excessive irritability of the bladder, and from paralysis and loss of tone in this organ and the parts, which naturally resist the expulsion of the urine from it, the case being in fact a retention "par regorgement," or, as one might call it in plain English, a retention, combined with incontinence of urine. (See *Med. Obs. and Inq.*) As, in some of these cases, the blisters removed also a paralysis of the lower extremities, they might have furnished a hint to the practice of making issues for the relief of the palsy of the legs, connected with diseased vertebræ. Cantharides have also been given inwardly with success. (*See Journ. de Med. T.* 55, *p.* 72 ; *and Howship on Diseases of the Urinary Organs, p.* 205.)

URINE, RETENTION OF.—It is observed by the experienced Mr. Hey, that a retention of urine in the bladder, when the natural efforts are incapable of affording relief, is, in male subjects, a disease of great urgency and danger. Persons advanced in years, are more subject to this complaint, than the young, or middle-aged. It is often brought on by an incautious resistance to the calls of nature ; and, if not speedily relieved, generally excites some degree of fever.

The distinction, says Mr. Hey, which has sometimes been made, between a *suppression* and *retention* of urine, is practical and judicious. The former most properly points out a defect in the secretion of the kidneys ; the latter, an inability of expelling the urine when secreted.

The *retention of urine* is, an inability, whether *total* or *partial*, of expelling, by the natural efforts, the urine contained in the bladder. The characteristic symptom of this disease, previous to the introduction of the catheter, is a distention of the bladder (to be perceived by an examination of the hypogastrium), after the patient has discharged all the urine, which he is capable of expelling.

As this complaint may subsist, when the flow of urine from the bladder is by no means totally suppressed, great caution is required to avoid mistakes.

Violent efforts to make water are often excited at intervals, and, during these strainings, small quantities of urine are expelled. Such a case may be mistaken for strangury.

At other times a morbid retention of urine subsists, when the patient can make water in a stream, and discharge a quantity equal to that, which is commonly discharged by a person in health. Under this circumstance, Mr. Hey has known the pain in the hypogastrium, and distention of the bladder, continue, till the patient was relieved by the catheter.

And lastly, it sometimes happens, that when the bladder has suffered its utmost distention, the urine runs off by the urethra, as fast as it is brought into the bladder by the ureters. Mr. Hey has repeatedly known this circumstance cause a serious misapprehension of the true nature of the disease.

In forming a correct judgment of all these cases, it is very necessary to recollect the important division of retentions of urine into the *complete* and *incomplete* forms ; a distinction, which will at once put the surgeon on his guard against a variety of errors.

In every case of retention of urine, which the late Mr. Hey attended, the disease could be ascertained by an examination of the hypogastrium, taken in connexion with the other symptoms. The distended bladder forms there a hard and circumscribed tumor, giving pain to the patient when pressed with the hand. Some obscurity may arise upon the examination of a very corpulent person ; but, in all doubtful cases, the catheter should be introduced.

Mr. Hey has not adverted to the swelling in the rectum, or vagina ; nor to cases of contracted bladder, where, of course, the information, derived in ordinary instances from the tumor above the pubes, cannot be had ; but, in other respects, his observations on the diagnosis are practical and correct.

Mr. Hey had seen only a few cases of *ischuria renalis*, or complete suppression of the secretion of urine The disease proved fatal in all his patients except one, in whom it was brought on by the effect of lead, taken into the body by working in a pottery. It subsisted three days, during a violent attack of the colica pictonum, and was then removed, together with the original disease. Mr. Hey found no difficulty in distinguishing this disorder, in any of the cases, from the *ischuria vesicalis*, though, for the satisfaction of some of his patients, he introduced the catheter. (*Practical Obs. in Surgery, p.* 374, *&c.*)

Retention of urine, may be the effect of a great many different causes ; as paralysis of the bladder : inflammation of its neck ; the presence of foreign bodies in it ; pressure made on its cervix by the gravid uterus ; enlargement of the prostate gland ; strictures in the urethra ; &c.

Every case of retention of urine demands prompt assistance, but where the disorder presents itself in its complete form, the mischief of delay is of the most serious nature ; for, if the bladder remain preternaturally distended, it not only loses its contractile power, but is quickly attacked with inflammation and sloughing. At length, some point of it bursts, and the urine is extravasated in the cellular membrane of the pelvis ; spreading behind the peritoneum as far up as the loins, and, in other directions, into the perineum, scrotum, and the integuments of the penis, and upper part of the thighs. The common result then of the rupture of the bladder, and the effusion of its contents, is the speedy death of the patient, from the effects of this irritating fluid upon all the parts with which it comes in contact, amongst which effects is inflammation of the peritoneum and bowels. It appears also from the observations, both of Desault and Sir Everard Home, that a complete retention of urine, after a time, has the effect of putting a mechanical stoppage to the further secretion of this fluid in the kidneys ; a circumstance, which sometimes has a principal share in producing death, particularly where this event happens, before the urine becomes extravasated.

In all cases of retention of urine, the indications are sufficiently manifest: viz. 1st. to adopt such treatment as seems best calculated to procure a discharge of the urine through the natural passage, which object is performed, sometimes by means of fomentations, the warm bath, bleeding, opium, and other medicines; sometimes by the removal of mechanical obstacles to the flow of the urine; but more frequently by the use of the catheter, than any other means. When all these plans fail, it then becomes necessary to puncture the bladder. 2dly. The second indication, or that which presents itself, after the immediate dangers of the distention of the bladder, are thus guarded against, is to remove whatever disease, or other circumstance, constitutes the still existing impediment to the natural expulsion of the urine.

With respect to the fit manner and time of employing the several means for fulfilling the above indications, and the selection which should be made of them, these are important considerations, which vary in different cases, and actually cannot be understood, without due reference to the causes and circumstances of each individual case. Some of this subject belongs also to other parts of this work, to which, in order to avoid the necessity of repetition, I here refer. (See *Catheter; Bladder, Puncture of; Prostate Gland, Diseases of; Urethra, Strictures of; &c.)*

With respect to catheters, we shall find, that some cases require the urine to be drawn off two or three times a day, and the instrument to be taken out after each evacuation; while, in other instances, it is prudent to keep the tube continually introduced. Here one general caution may be conveniently offered, which is, never to let a silver catheter remain in the passage more than a week, or ten days, without taking it out, and cleaning it; for, if this be not done, the instrument becomes coated with deposits from the urine, so as afterwards not to admit of being withdrawn through the urethra, without great suffering and irritation. The eye in the beak is also apt to become completely blocked up; and sometimes the pressure, which the catheter makes on the part of the urethra, corresponding to the root of the penis, in front of the scrotum, causes in this situation inflammation, followed by a slough as large as a crown piece, and an opening, formed by the loss of substance, is left, which may even continue fistulous during the patient's life. These remarks particularly apply to metallic catheters; but, such as are supposed to be made of elastic gum, especially those ordinarily met with in the shops, are apt to spoil and become blocked up with mucus, if not taken out, and cleaned, or changed, every five or six days. However, as I have mentioned in the article, *Prostate Gland, Diseases of*, Mr. Weiss has succeeded in constructing elastic catheters, which may be retained more than a fortnight in the urethra, without becoming obstructed, besides having the advantage of always retaining a due curve.

1. *Of the Retention of Urine, to which persons of advanced age are liable.*—This disorder is so common in elderly persons, that it is generally allowed to be one of the grievances, to which their period of life is particularly exposed. In them, the bladder is less irritable, than in younger subjects, and hence, it is not so soon stimulated by the presence of the urine. In fact, it is not until a painful sensation arises from the distention of the coats of the bladder, that the patient is aware of the occasion to discharge the urine. The bladder then contracts; but, still would not be able to expel its contents, were it not for the powerful action of the abdominal muscles. Nor is the expulsion of the urine even now complete; since the bladder no longer retains the power of effacing the whole of its cavity. On the contrary, after each evacuation, some urine is still left undischarged, and already constitutes an incipient retention. The quantity daily augments, and at length, not more than half the fluid contained in the bladder, is voided at each evacuation.

According to Desault, the complaint particularly attacks old subjects of a plethoric state of body, and of sedentary and studious habits. It also especially afflicts those, who, from carelessness, or indolence, do not take time enough to expel the last drops of urine; and others, who are accustomed to discharge their urine into a pot, as they lie in bed, instead of rising for the purpose.

In these cases, the urethra, and neighbouring parts, seem to be free from every disease, capable of preventing the issue of the urine; which has always come away freely, and in a full stream, although it could not be discharged with the same force, nor to the same distance, as formerly. At length, instead of describing an arch as it flows out, it falls down perpendicularly between the legs. Towards the close of the evacuation, the patient is also not sensible of the final contractile effort of the bladder, of which he used to be conscious in his younger days. When he is about to make water, he is obliged to wait some time, before the evacuation commences; and as the disorder increases, he cannot make water, without considerable efforts; the quantity of urine, voided each time, manifestly decreases; the desire to empty the bladder becomes more and more frequent; and lastly, the urine only comes away by drops, and an incontinence succeeds a retention.

In this state, the patient's sufferings are not very great. The tumor, formed by the bladder above the pubes, is indolent, and, if it be pressed upon with some force, a certain quantity of urine is discharged from the urethra.

The retention of urine, arising from old age, is seldom complete: the urine, after having filled and distended the bladder, dribbles out of the urethra, so that the patient voids as much of this fluid in a given time, as he does in a state of health. Nor is this species of retention of urine commonly attended with very urgent symptoms. It does not occasion, like complete retention, a suppression of the urinary secretion in the kidneys; and as the urine escapes through the urethra, after the bladder is distended to a certain degree, the disorder is less apt to produce a rupture of this organ, and dangerous extravasations of the urine. The swelling of the bladder then continues, without any particular suffering, except a sense of weight about the pubes and perineum. These circumstances have often led to serious mistakes, and the disease has been set down as an abscess, or dropsy.

The indications are to evacuate the urine, and restore the tone of the bladder. When the retention is incipient, the proper action of the bladder will sometimes return after cold applications are made to the hypogastric region, or thighs, and the patient goes from a warm into a cool place in order to make water.

The patient must also be strictly careful to make water immediately the least inclination to do so is felt; for, if this precaution be neglected, the bladder grows more and more inert; the desire to make water subsides; and the retention, which at first consisted of only a few drops, very soon becomes complete. It would then be in vain, as Desault observes, to try the expedients above recommended. No stimulus will now make the bladder contract sufficiently to expel the whole of the urine, and the catheter is the only thing, by which this fluid can be discharged. This artificial mode of evacuation, however, only affords temporary relief; for, as the bladder is slow in recovering its tone, a relapse would be inevitable, if the employment of the catheter were not continued. Hence, this instrument must either be left in the bladder, or introduced as often as the patient has occasion to make water. When a skilful surgeon is constantly at hand, or when the patient knows how to pass the catheter himself, Desault thinks it better to introduce the instrument only when the bladder is to be emptied, by which means, the inconvenience arising from the continual presence of a foreign body, will be avoided. In this case, either a silver catheter, or an elastic gum one, may be used with equal advantage; but, if the instrument is to be kept in the bladder, one made of elastic gum, and provided with a curved stilet, is to be preferred. As in old subjects, the urethra is flaccid, a large catheter is generally found to enter more easily, than one of smaller diameter.

As the treatment must be continued for a long while, and the bladder seldom perfectly regains its tone in old age, the patient should be instructed how to introduce the catheter himself, and he is to pass it whenever he wants to make water. After a certain time, however, he may try if he can empty the bladder without this instrument. When he finds, that he can expel the urine, he should assure himself by means of the catheter, that the last drops of this fluid are duly voided. Should they not be so, he must persevere in the use of the instrument.

In this sort of retention of urine, it has been proposed to throw into the bladder astringent injections: Desault tried them; but he does not give a favourable report of the practice.

Warm, balsamic, diuretic medicines; cold bathing; and liniments containing the tinctura lyttæ; have likewise been praised: but, according to Desault, these means frequently prove hurtful to persons of advanced years, and are seldom useful. He restricted his own practice to the use of the catheter, which, when skilfully employed, often restored the tone of the bladder, and, when it failed, other means also were ineffectual. A blister over the sacrum may deserve a trial.

Passing over the cases of retention of urine, referred by Desault to the effects of intemperance with women, and the immoderate use of diuretic drinks; cases, which considerably resemble in their nature and treatment the retention, from the weakened state of the bladder in elderly persons, I proceed to another example of the disorder, still more interesting to the practical surgeon.

2. *Retention of Urine from an Affection of the Nerves of the Bladder.*—These nerves may be affected either at their origin, or in the course of their distribution. Injuries of the brain are seldom followed by a retention of urine; but, the complaint often accompanies those of the spinal marrow. A concussion of this medullary substance, from blows, or falls upon the vertebral column; the injury which it suffers in fractures and dislocations of the vertebræ, or from a violent strain of the back; its compression by blood, purulent matter, or other fluid effused in the vertebral canal, and the effects, which a caries of the spine has upon it; may all operate as so many causes of a retention of urine. This form of the complaint may also be the consequence of tumours situated in the track of the nerves, which are distributed to the bladder. Whether the retention of urine, common in typhus fever, arises from an affection of the nerves of the bladder, or from the general debility extending itself to the expelling powers, may be a question; but, the liability of patients in fevers to this disorder should never be out of the practitioner's recollection.

When a retention of urine arises from injury or disease of the spinal marrow, an insensibility and weakness of the lower extremities are almost always concomitant symptoms. The patients suffer very little; most of them are ignorant of their condition; and do not complain of any thing being wrong in the functions of the urinary organs. The surgeon, aware that a retention of urine is common in these cases, should examine, whether there is any interruption of the evacuation, either by feeling the state of the abdomen just above the pubes, or by introducing a catheter.

As this species of retention of urine is only symptomatic, and not dependent upon any previous defect in the bladder, it is not in itself alarming; but, with reference to its cause, it is exceedingly dangerous. Affections of the spine, complicated with injury of the spinal marrow, are often fatal. By means of a catheter, it is always easy to relieve the inconveniences, arising from the bladder not contracting, and thus fulfil the only indication, which this sort of retention of urine presents; viz. the evacuation of the urine. But, this proceeding is merely palliative; and the bladder will not recover its contractile power, until the causes of its weakness are removed. The last then is the main object in the treatment, which must vary according to the nature and extent of the disorder.

The consideration in detail of all the means, which may be requisite for the relief of the different accidents and diseases of the spine, belongs to other parts of this work. (See *Dislocations* *and Fractures of the Vertebræ; Vertebræ, Diseases of.)* In shocks and concussions of the spinal marrow, Desault had a high opinion of the benefit resulting from cupping. This was done on, or near the part of the back, which had been struck, and the number of scarifications was proportioned to the strength of the patient. The plan was sometimes repeated the same day, and for several days in succession; and when the patient could not bear the loss of more blood, dry cupping was employed, which, in this country, would be deemed less efficacious, than stimulating liniments or blisters. In diseases of the spine, Desault also preferred the moxa, to caustic issues.

3. *Retention of Urine from Distention of the Bladder.*—Desault thought that this form of the disorder might very properly be called *secondary*, because it is invariably preceded and produced by a *primary* retention. Of course, its remote causes are all those circumstances, which may bring on the other forms of the complaint; but, its immediate cause depends altogether upon the weakness and loss of irritability in the bladder, occasioned by the immoderate distention of its coats. The disorder frequently occurs in persons, who from bashfulness, indolence, or intense occupation, neglect to make water, when they first have a desire; or, who cannot for a time empty the bladder, in consequence of some temporary obstruction in the urethra. Although the impediment to the escape of the urine no longer exists, and the bladder is in other respects sound, yet, as this organ has been weakened by the excessive distention of its coats, it cannot now contract sufficiently to obliterate the whole of its cavity, and expel the last portion of urine.

The indication is simple; for, there is not here, as in other retentions of urine, another disease to be remedied. The catheter, when left in the bladder, generally proves adequate to the restoration of the tone of this viscus. I do not conceive, however, that English surgeons will place any confidence in warm diuretics, which were commended by Desault, though they may join him in the approval of a tonic plan of treatment in general. When the urine flows from the catheter in a rapid stream, and is projected to some distance, and, when it also passes out, between the catheter and the urethra, it is a sign, that the bladder has regained its power of contraction, and that it can empty itself, without the aid of the instrument. In this circumstance, the catheter is to be discontinued, and the patient may gradually resume his usual mode of life. But, when the urine passes through the catheter only in a slow stream, the catheter cannot be laid aside, without the bladder becoming distended again, and losing whatever degree of tone it may have recovered.

The time, which the bladder takes to regain its power of contracting, varies considerably in different cases. When the disease is accidental and sudden, it frequently goes off in a few days. When it has come on in a slow manner, it usually lasts about six weeks. However, the cure is not to be despaired of, if the paralytic affection of the bladder should continue much longer. Sabatier says, that he has seen patients wear a catheter upwards of ninety days, and yet ultimately get completely well. When there is reason for believing, that the urine will come away of itself, the use of the catheter may be discontinued. When the patient makes water very slowly; when he is obliged to make frequent attempts; and when he feels a sense of weight about the neck of the bladder; this organ has not completely recovered its tone, and the employment of the catheter is still necessary. When the patient could make water tolerably well in the day, but not during the rest of the 24 hours, Sabatier often saw benefit arise from the catheter being worn only in the night time.

When three or four months elapse, without amendment, Sabatier states his conviction, that the tone of the bladder is lost for ever. In this unfortunate case, the patient may continue the flexible catheter, which he should be taught to introduce himself, as often as necessary. (See *De la Medécine Operatoire, T. 2.*)

Among the means deserving of trial, when the contractile power of the bladder does not return with the use of the catheter, I have to mention the tincture of cantharides; blisters applied to the sacrum, and kept open with the savine ointment; and cold washes to the hypogastric region.

In all cases, where the incapacity of the bladder to contract, whether from weakness, or paralysis, is the cause of retention, and where, though the bladder continues distended, a certain quantity of urine is voided daily, mistakes are particularly liable to be made. Thus, besides the chance of the disease being mistaken for an abscess, as Colot states was not uncommon in his time, other errors may take place. Sabatier was consulted about a woman, who had been advised to repair to some distant mineral waters, with the view of dispersing a tumor, which remained after a difficult labour, and was supposed to be in the uterus itself. However, the swelling turned out to be only a retention of urine, as it disappeared as soon as the catheter was introduced. Here no suspicion had been entertained of the real nature of the case, because the patient had voided her urine in a voluntary manner, and in reasonable quantity, for the five, or six weeks during which the swelling existed.

In a thesis, by Murray, a case is recorded, in which the swelling of the bladder was so considerable, that it was mistaken for dropsy. The abdomen of a delicate woman began to enlarge, without any particular pain, and the cause was at first supposed to be pregnancy. This idea, however, was removed by the enlargement increasing too rapidly, attended with a great deal of anasarca of the lower extremities, arms, and face. The patient was now considered to be dropsical; and a surgeon was sent for to tap the abdomen. The fluctuation in the belly was quite evident. Fortunately, before the operation was done, a trial of diuretic medicines was determined upon; and while this plan was going on, the patient was attacked with a total retention of urine for three days; a symptom, which she had not previously suffered. It was now judged prudent to pass a catheter, before the trocar was employed. Eighteen pints of urine were drawn off, and the swelling of the abdomen subsided. The next day, twelve more pints of urine were drawn off. The anasarca, which was entirely symptomatic, disappeared. The application of cold water re-established the tone of the bladder, so that, when three pints of urine had been drawn off by means of the catheter, the patient herself could spontaneously expel three or four others, with the aid of pressure on the hypogastric region.

The retention of urine, caused by weakness, or paralysis of the bladder, and the swelling, above the pubes, may continue a long while, without any inconvenience, excepting a sense of weight about the hypogastric region, and frequent inclination to make water. Sabatier has known patients labour under the complaint more than six months.

4. *Retention of Urine from Inflammation of the Bladder.*—According to Desault, writers have ascribed different effects to an inflammation of the neck of the bladder, and to the same affection of the body of this viscus. They have in fact regarded the first case as a cause of retention; and the last as a cause of incontinence of urine. An inflamed, highly sensible bladder, instead of being weakened, has been supposed to acquire an increase of energy, and to contract with greater vigour. But, if there had not been retentions of urine, which could be referred to nothing but inflammation of the bladder, still analogy might have undeceived us; for an inflamed muscle is never found disposed to contract, and if it be compelled to act, its action is always feeble.

Plethoric, bilious subjects, are said to be particularly liable to this species of retention. It is also frequently occasioned by the abuse of wine, or other spirituous liquors, heating diuretic drinks, or the external, or internal employment of lyttæ. This form of the complaint makes its attack suddenly, and may be known by the frequent desire to make water; the acute pain, in the region of the bladder; pain, which is increased by the efforts to make water, and which shoots up to the loins, and along the urethra to the end of the glans; by the frequency and hardness of the pulse, and other symptoms of fever; by the aggravation of the pain, when the hypogastric region is pressed; by the easy passage of a catheter into the bladder; by the acute pain, which is excited by the instrument touching the inside of this organ; and by the red, inflammatory colour of the urine.

In this case, the most prompt assistance is necessary. The urine, which is a source of additional irritation, should be drawn off. The catheter should be introduced with great gentleness, and merely far enough to let its eye pass beyond the neck of the bladder.

The inflammation itself is to be counteracted by the most powerful antiphlogistic remedies, large and repeated venesections; the application of leeches to the perineum, and hypogastric regions; the warm bath; glysters; fomentations on the abdomen; and cold mucilaginous beverages. When the inflammation extends to the other abdominal viscera, attended with hiccough, and vomiting, and continues beyond the sixth day, the patient's life is in extreme danger.

5. *Retention of Urine from Hernia of the Bladder.*—An inability to discharge the urine is a symptom generally attending hernia of the bladder. But, the weakness of this organ is not always the sole cause of the infirmity; for the urethra itself makes greater resistance than natural to the issue of the urine. As the neck of the bladder is drawn out of its right position by the portion of this organ, which actually protrudes, the beginning of the urethra also undergoes an elongation, and a change of its curvature, by being pressed towards the symphysis of the pubes, and its diameter is likewise diminished. The urine may also be detained in the pouch composing the hernia, in consequence of the communication between this and the rest of the bladder being too small, or indirect, or perhaps from the hernial portion not being compressed by the action of the abdominal muscle, or capable of any contraction itself. However, the rest of this organ, within the pelvis, can itself rarely expel the last drops of the urine. Its complete contraction cannot be accomplished without great difficulty; and, in the end, it almost invariably follows, that the urine is retained both in the protruded and unprotruded portions.

When a retention, arising from a hernia of the bladder, is complete, and occurs in both parts of this organ, there is, in addition to the symptoms, common to other retentions produced by weakness of the bladder, a more or less considerable swelling in the situation of the hernia. The tumor is unattended with any change of the colour of the skin; is not very tender; and it presents a feeling of fluctuation, sometimes obscure, sometimes very distinct. When the swelling is pressed upon, the desire to make water is excited, or increased, and occasionally a few drops escape from the urethra. As soon as the urine has been drawn off with a catheter, and the patient is put in a posture, in which the protruded portion of the bladder is higher than the rest of this organ within the pelvis, the tumor subsides, and it is some time before it becomes large again.

When the hernia is recent, and the protruded portion of the bladder small and reducible, the part ought to be returned and kept up with a truss. When the part is adherent and irreducible, the swelling ought to be emptied by pressure, and supported with a suspensory bandage. If the hernia could in this manner be made gradually to return into the abdominal ring again, a truss would afterwards be requisite. Proposals have been made to endeavour to excite adhesive inflammation in the cavity of the protruded part of the bladder by compression, gradually increased, and thus obliterate the pouch, in which the urine lodges. Although Desault thought the attempt cautiously made justifiable, he deemed the result very uncertain.

Were the retention of urine accompanied with a strangulated state of the protruded bladder, and the contents could not be pressed into the other part of this organ, a puncture of the swelling with a trocar has been advised. But, if there were an enterocele also present, as often happens, this operation would be attended with risk of injuring the intestine. Hence, Desault preferred opening the tumor by a careful incision, and he even approved of cutting away the protruded cyst, if the communication betwixt it and the rest of the bladder were obliterated. For additional observations, I refer to the 2d vol. of the First Lines of Surgery, Ed. 4.

6. *Retention of Urine, caused by displacements of the Viscera of the Pelvis.*—The displacements, here signified, are a retroversion, prolapsus, and inversion of the uterus, and a prolapsus of the vagina, or rectum. When the intimate connexions of the bladder with the uterus, and vagina in the female, and with the rectum in the male subject, are considered, it is obvious, that the latter parts cannot be displaced, without drawing along with them the bladder; and that, in this state, whatever may be its contractile power, it cannot contract so perfectly as to expel the whole of the urine. To this deficient action of the bladder is necessarily joined an increase of resistance on the part of the urethra; for, the beginning of this canal, being drawn by the bladder, changes its accustomed direction, and such alteration cannot be made without the sides of the tube being pressed together. Thus the retroverted uterus draws the os tincæ above the pubes, and the posterior part of the bladder is displaced, which, in its turn, draws along with it the commencement of the urethra, pulls it upwards, and increases the curvature, which this canal describes under the symphysis of the pubes, against which it is forcibly applied.

In a prolapsus, or inversion, of the womb, vagina, and rectum, the back part of the bladder, instead of being drawn upward and forward, is pulled downward and backward, and the curvature of the urethra is totally altered. Below the pubes, the bladder forms a convexity, and not a large concavity, as in the instance of a retroversion of the womb. This position of the parts should always be recollected in passing the catheter, as it shows what curvature and direction should be given to the instrument, in order to facilitate its introduction.

These retentions of urine are not often followed by any very bad consequences. It is generally sufficient to rectify the wrong position of the bladder, and the commencement of the urethra, by the reduction of the displaced viscera, and a cure is then a matter of course, unless the excessive distention should have induced considerable weakness of the bladder, in which event, recourse must be had to the means previously recommended for this state of the organ. The reduction of the viscera generally forms the first indication, and the manner of accomplishing it is described under the head of *Uterus.* When the reduction is not immediately practicable, or when it fails to remove at once the retention of urine, the catheter is to be used. Frequently, when the urine has been drawn off, the reduction becomes more easy; but, sometimes, the altered direction of the urethra renders the introduction of the catheter difficult; nor will the instrument pass, unless it be accommodated to the preternatural state of that canal. Thus, in the retroversion of the uterus, a catheter, very much curved, answers better than one nearly straight, like that commonly used for females.

A curved catheter, says Desault, also answers in cases of prolapsus uteri, &c.; but, with this difference, that, in a retroversion, the concavity of the instrument must be turned towards the pubes, but, in the prolapsus, towards the anus. Sometimes, the catheter will not pass unless it be rotated, as it were, and sometimes, when a silver catheter cannot in any manner be introduced, an elastic one will readily enter.

Were every effort to reduce the viscera, and pass a catheter unavailing, and the hazard of the bladder giving way urgent, the surgeon would be called upon to let out the urine with a trocar. (See *Bladder, Puncture of.*)

7. *Retention of Urine from the pressure of the Uterus, or Vagina, on the Neck of the Bladder.*—Besides the distention of the uterus and vagina in pregnancy and parturition (which cases I mean to pass over as belonging more properly to midwifery), there are other conditions of these organs, which may give rise to a retention of urine. Thus it sometimes arises from the presence of various kinds of tumors, or collections of blood, or other fluid in the uterus, or ovary; or the distention of the vagina with the menses, pessaries, &c.

In such cases, the retention of urine being only symptomatic, the prognosis must depend upon the nature of the cause, of which the interruption of the urinary evacuation is only an effect. The latter complaint is here not very dangerous, because its inconvenience may be obviated by means of the catheter. But when the cause of the retention of urine is easily removed, and the tone of the bladder is not impaired, even the catheter is not always necessary, as when the complaint is induced by a pessary, or collection of blood in the vagina. In other examples, in which the cause of the difficulty of making water cannot be immediately obviated, as in cases of tumors, the catheter must be employed. In scirrhous and cancerous diseases of the uterus, also, this instrument is the only means of relieving the retention of urine, as nature and art can do little for the removal of the cause. It ought to be known, however, that as these last diseases increase, an incontinence often succeeds to a retention of urine, in consequence of ulceration taking place between the upper surface of the vagina, and the lower part of the bladder.

8. *Retention of Urine from pressure of the Rectum upon the Neck of the Bladder.*—Abscesses in the vicinity of this intestine; hemorrhoidal tumors; alvine concretions; and the scirrho-contracted state of the gut, &c. may bring on a retention of the urine by pressure on the neck of the bladder. The irritation, also, existing in these cases, may tend to produce the complaint by exciting a spasmodic contraction of the adjacent part of the urethra. Here the relief of the retention of the urine is to be effected by removing, or curing, the other disorder, which operates as its cause. If this cannot be immediately accomplished, the catheter must be used, though, in several instances, it will be better to avoid even the irritation of the catheter, and try the effects of bleeding, the warm bath and opium, which will frequently enable the patient to make water. The last means, however, will not suffice, when the cause of the retention is likely to continue a long time.

9. *Retention of Urine from Foreign Bodies in the Bladder.*—Without stopping to consider

the uncommon kinds of retention produced by carcinoma, fungous diseases, and hydatids in the bladder, let us pass on to the case, in which the urine is obstructed by a calculus at the neck of the bladder. Here the patient, by altering his position, frequently changes the situation of the stone, and is immediately able to make water again. However, this expedient will only procure relief while the calculus is loose in the cavity of the bladder; for, after it has become fixed in the commencement of the urethra, it must either be pushed back with a catheter, taken hold of and brought out with the urethra-forceps used by Sir A. Cooper, or extracted by a kind of operation, resembling the apparatus minor. (See *Lithotomy.*)

Many instances of various kinds of worms in the bladder are upon record. On this subject, an interesting paper was published a few years ago, by my friend Mr. Lawrence, who met with an example, in which an undescribed species of worms was abundantly voided from the bladder. "The origin of those animals (says Mr. Lawrence) which inhabit the internal parts of living bodies, is involved in much obscurity. Although the intestinal worms appear manifestly, from their peculiar form, consistence, and organs, to be particularly designed for those situations in which they are found; although they have generative organs, and no similar animals are known to exist out of living bodies, yet it has been generally conceived, that the germs, from which they spring, enter from the mouth. The production of hydatids in various parts of the body, cannot, however, be accounted for on such a supposition; neither can we very easily conceive, that ova should enter from without into the urinary organs." The following facts, also stated by Goeze (as Mr. Lawrence observes), entirely overturn this opinion. Professor Brendel, of Gottingen, found ascarides in the rectum of an immature embryo. Blumenbach discovered tæniæ in the intestinal canal of young dogs a few hours after birth, &c. (*Versuch einer Naturgeschichte der Eingeweidewürmer, p. 55.*) The case, which Mr. Lawrence has recorded, exhibits an unquestionable instance of peculiar and undescribed worms, voided from the urinary passages. This gentleman says, that he knows of no other case, in which a distinct species of worm has been clearly proved to come from the bladder. Most of the cases published were instances of common intestinal round worms, which sometimes perforate the intestines and are discharged by abscesses, or get into the bladder, after the formation of adhesions betwixt this organ and the bowels. In other instances, coagula of blood, mucus, or portions of the mucous coat of the bladder, have been mistaken for worms; and, as Mr. Lawrence further observes, some of the descriptions can apply only to larvæ of insects. Two specimens of this last sort, he has seen himself, which were sent from the country as worms voided from the bladder. (See *Medico-Chir. Trans. vol. 2, p. 382, &c.*)

In whatever way these animals get into the bladder, a retention of urine may be produced, either when they are numerous, or when there is only one present, but large enough to obstruct the vesical orifice of the urethra. In the very curious example, related by Mr. Lawrence, the passage of the urine was obstructed, and the use of the catheter continually necessary. The oil of turpentine was given internally, with some appearance of benefit at first; but, it afterwards brought on febrile symptoms and erysipelas, and its exhibition could not be kept up. It was then injected into the bladder, with an equal part of water. This rather accelerated the discharge of the worms; but, they came away at times, whether the injection was used, or not, and as this means produced the erysipelatous indisposition again, it was left off. Olive oil was afterwards injected; the irritation after it was less, and the fits of pain about the bladder less violent. It was calculated, at the time when Mr. Lawrence was writing the particulars of the case, that from 800 to 1000 worms had been discharged. For a detail of the symptoms, and a particular description of the worms themselves, I must refer to the above-mentioned publication.

According to the observations of Desault, a retention of urine is frequently occasioned by coagula of blood in the bladder. The blood is said sometimes to come from the kidneys, sometimes from the bladder, and sometimes it even regurgitates from the urethra. While fluid, it may be expelled with the urine; but, when coagulated, it is no longer capable of being discharged. It is the blood, which passes into the bladder, after wounds, or the operation of lithotomy, that is most disposed to coagulate. If the clots were too large to pass through a catheter, the best plan would be to inject into the bladder lukewarm water, for the purpose of loosening and dissolving them.

A retention of urine has sometimes arisen from the entrance of a piece of bougie into the bladder. Even whole bougies, which had not been properly secured, have been known to glide into the cavity of that organ. As Desault observes, the urethra appears to possess a kind of antiperistaltic action, by which it tends to draw into the bladder whatever substances it includes; for, says he, it is constantly noticed, that, when these substances are once within the urethra, if they be not expelled by the urine, they always advance towards the bladder; a circumstance, which cannot be accounted for by their weight.

The insinuation of these foreign bodies into the bladder is a serious occurrence both for the patient and surgeon. The former cannot avoid the consequence which will sooner or later originate from the extraneous substance, except by submitting to a dangerous and painful operation: the latter will be accused of being the author of all the evil, and will find it difficult to exculpate himself. In order to obviate the necessity of cutting into the bladder, in such cases, Desault proposed the use of small spring-forceps, passed into the bladder through a cannula, but, although the instrument seemed to answer on the dead subject, no instances of its doing so on living patients are on record. Were any instrument likely to succeed, I think it would be the urethra-forceps, shaped like a sound, employed by Sir A. Cooper for the extraction of small calculi from the bladder. (See *Lithotomy* and *Urinary Calculi.*)

10. *Retention of Urine from Inflammation*

of the Urethra.—In order to comprehend the mechanism of this case, it is necessary to remember, that inflammation never exists, without swelling, and that every tumefaction of the lining of the urethra, must necessarily lessen its diameter. Inflammation of the urethra is most commonly produced by the external application, or internal exhibition, of lyttæ; by gonorrhœa; the unskilful use of the catheter; the employment of stimulating injections; bougies; &c. Together with the lessening of the canal by the effect of swelling, there can also be no doubt, that, in many of these instances, a spasmodic contraction of the urethra and neck of the bladder also contributes to the retention of urine. Although Desault believed, that inflamed parts, endued with a contractile power, were not disposed to contract in that state, yet, it should be recollected, that even admitting this to be true, the whole length of the urethra is seldom inflamed, and a part of it may therefore be affected with a spasmodic action, without the theory espoused by Desault being at all implicated. The effects of opium, tobacco, and other antispasmodics, often evinced in immediately relieving these kinds of retention of urine, seem indeed to leave no doubt respecting the existence of a sort of spasm in the passage. Whatever may be the cause of inflammation of the urethra, the diagnosis is free from all obscurity. Besides the general symptoms of inflammation, the patient complains of a scalding sensation in the passage; he experiences a great deal of smarting, which is sometimes insupportable, when he makes water; the penis becomes in some degree swollen, and more tender; and a very little pressure on the urethra gives acute pain. In the mean time, the stream of urine becomes lessened; and, at length, this fluid can only be voided in a very narrow current, or only by drops, and often not at all.

The disorder is to be treated on antiphlogistic principles. Diluting, cooling, mucilaginous beverages; venesection; leeches to the perinæum; the warm bath; opium, particularly in the form of clysters, and fomentations, are the means, which usually give relief. When inflammation exists in the urethra, it is always desirable to avoid, as long as possible, the employment of catheters, which create irritation, and of course increase the cause of the retention. It is particularly, in cases of this description, and in the retentions of urine, arising from strictures, that Mr. Earle has suggested the use of tobacco in the form of clysters; a method, deserving adoption when the means above enumerated, are unavailing, and it is preferable to the catheter, because it does not cause any increase of irritation and inflammation in the urethra. (See *Med. Chir. Trans. Vol. 6, p. 82, &c.*)

11. *Retention of Urine from Laceration of the Urethra.*—The urethra is sometimes ruptured by violent contusions on the perinæum; and the rough and unskilful use of bougies and catheters. The consequences usually are an extravasation of urine in the cellular membrane of the scrotum and penis; a considerable dark coloured swelling of these parts, often followed by sloughing; and retention of urine. The treatment consists in introducing an elastic gum catheter into the bladder, with as little delay as possible, and keeping it there, until the breach in the canal is repaired. At the same time, the evils threatened from the effusion of the urine, are to be lessened as much as possible, by making two or three free incisions in a depending part of the swelling, and the employment of fomentations, and antiphlogistic remedies.

12. *Retention of Urine from Tumors situated in the Perinæum, Scrotum, or Penis.*—A retention of urine has been known to arise from phlegmonous swellings and abscesses; extravasations of blood; and urinary tumors and calculi formed in the perinæum, and scrotum; also from the pressure of a sarcocele; hydrocele; a very large scrotal hernia; an aneurism of the corpus cavernosum; a ligature on the penis; &c.

The radical cure of all such retentions of urine, can only be accomplished by curing the disease, on which they are dependent. However, until the cause can be obviated, the urine must be drawn off with a catheter. Elastic gum catheters usually enter more easily, than those made of silver, as by their flexibility they accommodate themselves better to any deviation of the urethra from its ordinary direction. Desault particularly recommended a catheter of middling size to be selected, and introduced armed with its stilet, until it stops in the canal; when he advised withdrawing the stilet for about an inch, in order to leave the beak of the instrument quite free, so that it may follow the curve of the urethra. Then the tube and the stilet are to be pushed further into the canal, care being taken, however, to keep the stilet drawn back some distance from the extremity of the instrument. By these precautions, says Desault, the catheter may always be got into the bladder. Should the introduction prove neither painful, nor difficult, Desault thought it better not to annoy the patient by making him continually wear the instrument.

13. *Retention of Urine from Disease of the Prostate Gland.*—When the swelling of the prostate gland is of an inflammatory kind, the retention of urine makes its appearance with the same kind of symptoms, as attend inflammation about the neck of the bladder.

Here, similar treatment to that commonly adopted for the retention of urine produced in the latter case, is indicated; particularly bleeding, fomentations, the warm bath, opening medicines, anodyne clysters, the tinctura ferri muriati, and in very obstinate urgent cases, an enema of tobacco. If these means fail, the surgeon may gently endeavour to introduce an elastic gum catheter.

The symptoms of the retention of urine, caused by chronic enlargement of the prostate gland, and the reason of the impediment to the discharge of that fluid, in such a case, are explained in another part of this work. (See *Prostate Gland.*) From the remarks there introduced, it appears, that, when the regular evacuation of the urine begins to be impeded, the catheter becomes indispensable, though the surgeon will often be foiled in his endeavour to draw off the urine with it, unless he be duly acquainted with the morbid changes produced in the parts. And, as Sabatier long ago very correctly observed, the urine may not be discharged, though the instrument enter a considerable way, either because its beak becomes entangled in the prostate gland, or *between a swollen portion of this gland and the neck of the bladder*, and does not reach the urine. Hence, he recommended the employment of a catheter with a very long beak, which should also be bent considerably upwards. When, however, all efforts to pass a catheter fail, the only resources are to force a passage with a conical catheter, or to puncture the bladder above the pubes. (See *Catheter*, and *Bladder*, *Puncture of.*)

14. *Of the Retention of Urine produced by Strictures in the Urethra.*—From the account, which is given of strictures in another part of this Dictionary, (see *Urethra, Strictures of,*) it appears, that almost every stricture, bad as it may be, is capable of being rendered still worse, and the morbid part of the urethra, more impervious by a spasmodic affection. Going out of a warm into a cold situation, drinking, and other kinds of intemperance, will often bring on an irritable state of the canal, attended with a spasmodic action of the strictured part, an increased difficulty of voiding the urine, and even a total retention of this fluid. The patient makes repeated efforts to relieve himself; but hardly a drop of urine is discharged. In the mean while, the bladder becomes filled, and ascends above the pubes; the abdomen grows tense and painful; fever comes on; the countenance looks red; the brain becomes affected; and circumstances assume an extremely urgent appearance.

In this case, antiphlogistic means should be adopted, without delay. The patient ought to be bled, if nothing in his constitution and age prohibit this evacuation, which it may even be proper to repeat. He should also be put into the warm bath, and fomentations should be continually applied to the hypogastric region. Slightly diuretic beverages may be prescribed; and leeches put on the perinæum. The principal means, however, from which the greatest benefit may be expected, is a liberal dose of the tinctura opii, together with an anodyne clyster. This is also another example, for which Mr. Earle has particularly recommended the exhibition of tobacco in the form of a clyster, and he has related a case in illustration of the efficacy of the plan. (See *Medico-Chir. Trans. Vol.* 6, *p.* 88.) The tinctura ferri muriati, which, according to Mr. Cline, has a specific effect in overcoming spasm of the urethra, seems also worthy of trial. Indeed, it should always be tried before tobacco, which being sometimes violent in its effects, ought perhaps to be the last resource in the way of medicines. When such measures fail in enabling the patient to empty his bladder, and this viscus is becoming more and more distended, an immediate attempt should be made to introduce a small flexible elastic gum catheter, through the stricture or strictures into the bladder, which object may be frequently accomplished, when due care, perseverance, and gentleness, are not neglected.

Sometimes when a small flexible catheter cannot be introduced, a fine bougie admits of being passed into the bladder, and on being withdrawn, the urine follows, and is discharged.

When all the preceding plans prove unavailing, and the danger, arising from the retention of urine, continues to increase, either the stricture must be forced with the conical sound, (see *Catheter,*) an incision practised behind the obstruction, or the bladder punctured. The cannula of the trocar should then be left in the wound, till the strictures are either cured, or at least till the urine resumes its natural course.

15. *Retention of Urine from the Lodgment of Foreign Bodies in the Urethra.*—That such accident must obstruct the discharge of urine, is too plain to need any particular explanation. Calculi are the most common substances, which bring on this kind of case, but articles, introduced into the urethra from without, such as bougies, large pins, &c. are occasionally lodged in the passage; and I once extracted from a man's urethra a long black pin, with which he had been examining the passage. The head of it was towards the perinæum, and the point about two inches from the orifice of the glans. I passed the point through the lower surface of the urethra, and then taking hold of it, drew it further out, turned the head towards the glans, from the orifice of which it was then easily removed. When substances, like calculi, lodge, oily injections are sometimes tried, with the view of rendering the passage more slippery; and occasionally the dilatation of the canal with bougies and catheters, followed by a very forcible expulsion of the urine, has answered. The ancients sometimes tried the effect of suction. When the foreign body is closely embraced by the urethra, and it cannot be pushed forward by the fingers, Desault recommends endeavouring to extract it with the forceps, invented for the purpose by Mr. Hunter, and which are contained in a cannula; or the urethra forceps, spoken of in the articles *Lithotomy* and *Urinary Calculi*, might be employed. When, however, the foreign body is too large to be taken out in this manner, it must be extracted by an incision. If an elastic catheter be now kept in the urethra, so as to prevent the urine from coming into contact with the cut part, the wound will heal very well. Some time ago, there was published a case of calculus in the urethra, attended with dysury, where almost instantaneous relief was obtained from the exhibition of a tobacco clyster. The patient soon felt a strong desire to void his urine, and "upon making the attempt, a large calculus came rolling along the urethra, with complete relief of all his complaints." (See *Edinb. Med. and Surgical Journal*, *Vol.* 12, *p.* 373.)

Fr. M. Colot, *Traité de l'Opération de la Taille*, *avec des Obs. sur la Formation de la Pierre*, *et les Suppressions de l'Urine*, *&c.* 12*mo. Paris*, 1727. *Sabatier*, *De la Médecine Opératoire*, *T.* 2. *C. B. Trye*, *Remarks on Morbid Retentions of Urine*, 2*d Ed.* 8*vo. Gloucester*, 1784. *Hey's Practical Obs. in Surgery*, *Ed.* 3. *Schreger Chirurgische*, *Versuche*, *p.* 187, *&c. der Ischuria Calculosa*, 8*vo. Nürnberg*, 1811. *Desault's Parisian Chirurgical Journal*. *S. T. Sœmmering*, *Abhandlung über die schnell und langsam todtlichen Krankheiten der Harnblase und Harnröhre bey Männern in hohen Alter.* 4*to. Frank.* 1809. *Richter*, *Anfangsgründe der Wundarzneykunst*, *B.* 6, *p.* 210, *&c. Œuvres Chir. de Desault par Bichat*, *T.* 3. *Desault et Chopart*, *Traité des Maladies des Voies Urinaires*, 8*vo.* 1796. *Nauche*, *Nouvelles Recherches sur les Retentions d'Urine par Retrecissement de l'Urétre*, *et*

par Paralysie de la Vessie, &c. 8vo. Paris, 1806. *Home's Practical Obs. on the Treatment of Strictures, &c. 3 vols. and on Diseases of the Prostate Gland, 2 vols. 8vo. Lond.* 1811—1818. *H. Earle, in Medico-Chir. Trans. Vol. 6, p. 82, &c. J. Howship, on Diseases of the Urinary Organs, 8vo. Lond.* 1823.

UTERUS, INVERSION OF. This case may either be complete, or incomplete. When it is incomplete, only the fundus of the uterus passes through the os tincæ. When the inversion is complete, the uterus becomes entirely turned inside out, passing through the opening in its cervix, dragging along with it a part of the vagina, and descending more or less far down, sometimes even between the patient's thighs.

The inversion of the uterus mostly arises from the manner in which the placenta is extracted after delivery. Immediately after parturition, the uterus is not yet contracted, and its cervix is in a widened state. When things are thus disposed, the uterus may easily follow the after-birth, which is attached to it, and thus become inverted. The event is particularly liable to happen; 1st, When a premature attempt is made to extract the placenta. 2dly, When the funis is pulled outward, without due care being taken to support the uterus with the fingers of the left hand. 3dly, When the operator draws out the after-birth too roughly and violently. Though the placenta is sometimes so adherent, that its extraction is difficult, and a risk must be encountered of dragging down the uterus with it, this disagreeable accident may generally be avoided by performing the necessary separation of the parts with the fingers introduced into the cavity of the uterus.

The inversion, following delivery, does not always proceed from unskilfulness; but sometimes happens, notwithstanding every precaution, either because the patients themselves make too violent efforts, or because the uterus is enlarged and heavy; or else in consequence of some predisposition, some unusual laxity of the organ, which can neither be foreseen, nor prevented. Ruysch saw an inversion of the uterus take place, after the expulsion of the placenta, although delivery had occurred in the most favourable way.

Mr. Windsor believes, that, where the uterus and vagina are in a relaxed state, and the female has been subject to prolapsus uteri, there is a greater disposition to the occurrence of inversion at the time of labour, than when such condition of the parts does not exist. (*Med. Chir. Trans. Vol.* 10, *p.* 360.)

A tendency to the accident is very common in women who have once been afflicted with it. Amand mentions a woman, who had an inversion of the uterus after her first delivery, but the part was reduced. She was attended by Amand again in her next confinement, and another inversion of the uterus, quite as bad as the first, would have happened, had he not, on perceiving the disposition to the accident, introduced his finger into the cavity of the uterus, and separated the placenta from its attachments, before making any attempt to extract it.

Besides causes, connected with parturition, there are others of a different nature. Ruysch, Mauriceau, and Lamotte, supposed an inversion of the uterus could only happen at the time, when the placenta was extracted, or a little while afterwards. The accident seemed to them impossible at any other period, both on account of the thickness of the uterus, and the smallness of the os tincæ. However, many facts prove, that the case may also depend on internal causes, and affect women who have never had children, as well as others, who have had them. Thus polypi of the uterus may bring on inversion of the part. As their pedicle is attached to the fundus of the uterus, they may easily drag it downward, when its texture is lax and soft, particularly, as the operation of their weight is continual. (See *Denman's Plates of a Polypus with an Inversion of the Uterus. Fol.* 1801.) Uterine hemorrhages may also be conducive to the accident, both because they relax the texture of the uterus, and because they are usually attended with acute pain, which makes the diaphragm and abdominal muscles act upon the uterus with all their power.

Levret speaks of a case of inversion of the uterus, where the displacement was not noticed, until five years after delivery. In this example, it is conjectured, that the very gradual and slow formation of the disease must have been the reason of its not having attracted earlier attention. (*Dict. des Sciences Méd. T.* 23, *p.* 288. *Also Baudelocque, in Brogniard, Bulletin des Sciences,* 2, *N.* 1.)

When an inversion of the uterus takes place after delivery, there are certain symptoms, by which it may easily be known. The uterus, in its natural situation, thickened and swelled as it is at this period, presents itself in the hypogastric region in the form of a round circumscribed tumor; but, when it has fallen downward, and become inverted, a vacancy is felt in the situation, which it ought to occupy. When the inversion is incomplete, an examination with the fingers detects in the vagina a tumor, shaped like the segment of a sphere, having a smooth surface, and surrounded with the cervix uteri, as with a kind of collar, round which the finger may easily be passed, either between it and the uterus, or between it and the vagina. When the inversion is complete, which case is more rare than the preceding, a tumor may be felt in the vagina, from which it sometimes even protrudes, apt to bleed, of an irregularly round shape, hanging by a neck, the lower part of which is surrounded by the above circular, thick, fleshy substance, consisting of the os uteri itself. The slightest touch makes the swelling bleed. The part has a red colour, which, however, generally diminishes in proportion to the duration of the displacement. In time, indeed, its surface becomes less sensible to external impressions, and only bleeds at the menstrual periods, the blood oozing from every point of the swelling, and not issuing from a single aperture at the lower part of the tumor, as in cases of prolapsus uteri.

In the incomplete inversion, patients feel acute pain in the groins, and kidneys, an oppressive sense of heaviness in the hypogastric region, and a tenesmus, which, compelling them to make violent efforts, forces the uterus further down, and sometimes produces a total inversion of it. Besides these symptoms, more or less copious hemorrhages also occur. When the inversion is complete, the pain is more acute, the loss of blood more considerable, and the patient often affected with peculiar weakness, followed by cold sweats, convulsions, and delirium.

In both forms of the disease, if the reduction be not almost immediately effected, fatal consequences frequently ensue, either very soon after the accident, from the violence of the hemorrhage, or at a more or less remote period, partly from repeated losses of blood, and partly from the constitutional irritation and disturbance incessantly kept up.

Happily, as Mr. Windsor observes, the accident admits of remedy, if an intelligent person be present to replace the uterus; for, if this be done immediately, and the hand of the accoucheur be retained in the cavity of this organ, until it has contracted, and the patient afterwards confined to the recumbent posture, she will generally do well. An unsettled point appears to be, whether the placenta, if still remaining, should be extracted before, or after, the reduction. Mr. Windsor, who appears inclined to prefer the latter method, refers to two examples, in which each plan was followed by a recovery. (See *Med. Chir. Trans. Vol.* 10, *p.* 360.)

And, in all cases, as the same author remarks, the accoucheur, after the expulsion of the placenta, should assure himself by manual examination, that the os internum is free, while an endeavour is made to feel the uterus with the hand placed upon the abdomen. " In consequence of the neglect of this practice (says Mr. Windsor) it is to be feared, that many lives have been lost; the true cause of the succeeding hemorrhage not being ascertained till too late, as happened in the fatal case that occurred to a midwife here (Manchester) last winter." Some women perish at once, or within a few hours, and, when they live longer, the reduction is exceedingly difficult, because the uterus and its cervix are becoming more and more contracted.

In the reduction, Sabatier regards the interposition of linen, between the hands and the uterus, as unnecessary, and even disadvantageous, because it prevents the practitioner from having the assistance of a correct feel of the part. The trial should be continued, as long as the patient's strength will allow. However, if the tumor were in an inflamed state, it would be prudent, to put the patient in the warm bath, use emollient applications, and exhibit anodyne and laxative medicines, &c.

When the reduction cannot be accomplished, many die; while others survive, subject to an oppressive sense of weight, and frequent hemorrhages, which bring on great emaciation. Sabatier attended two patients, who had had an inversion of the uterus, six months, and yet they were able to go about their family affairs. The same author had heard of other women, who had been afflicted with an inversion of the uterus several years.

If the reduction cannot be performed, and the patient survive the immediate effects of the injury, " some degree of inflammatory symptoms, accompanied with fever, ensues. The abdomen becomes full, tender to the touch, and, at its lower part, sometimes rather hard. There is costiveness of the bowels, and sometimes retention of urine, requiring for a time the use of the catheter. By the use of fomentations, enemata, laxatives, and an antiphlogistic regimen, the symptoms abate, the power of expelling the urine, especially if the uterus is first raised a little in the vagina, is regained, and the patient gradually recovers the full power of this function. Afterwards she becomes able to walk about, suckles her infant, and perhaps enjoys apparently even a tolerable state of health; yet, the sanguineous discharges generally after a time, return profusely, and her pale countenance and emaciated appearance indicate the greatest debility.

" About the time, when she relinquishes the office of suckling, the menses return more regularly, the discharges of blood are very considerable in quantity, or of long duration; the mucous discharges are generally copious at other times; and the constitution begins to sink under the reiterated losses it sustains. The pulse becomes frequent, the appetite is impaired, a cough, with hectic symptoms, sometimes occurs, and the patient is quite unable to pursue her usual domestic duties. In this state, palliative means, as the use of astringent and other remedies, become inadequate to check the exhausted progress of the complaint, and the unfortunate sufferer must soon perish, unless some decisive means be devised for her relief. In this painful extremity, the extirpation of the uterus itself has been proposed, as the most efficient means of relief, and formidable as the operation at first view seems, it is known to have been already performed with success." (*Windsor, in Med. Chir. Trans. Vol.* 10, *p.* 361—63.)

One of the most afflicting consequences of an inversion of the uterus, is so considerable an inflammation of the part, as to induce a danger of its mortifying. In this circumstance, the extirpation of the uterus has been also suggested, and even practised; an operation, that has had but little success, the majority of patients on whom it has been practised under such circumstances having died.

The practice of extirpating the inverted uterus, through apprehension of the part mortifying, cannot be too strongly reprobated; for, unless mortification has really happened, the uterus may possibly be brought into a state again, in which the inconveniences, arising from its inversion would be very supportable, and the operation altogether avoided. Even supposing mortification were to take place, the indication would be to appease the bad symptoms, and promote the separation of the sloughs by suitable applications, without doing any injury to the living parts. One example, in which the latter practice was successfully adopted, is recorded by Rousset. That the extirpation of the uterus, when this organ is completely or incompletely inverted, totally irreducible, and attended with the sufferings and reduced health, so well described by Mr. Windsor, may sometimes be advisable, cannot now be doubted. The unequivocal examples on record of the removal of the cancerous uterus by Osiander, Dupuytren, Langenbeck, and others, and the cases, published by Mr. Newnham, Mr. Windsor, and Dr. C. Johnson, (*Dublin Hospital Reports, Vol.* 3,) where the inverted and irreducible uterus, was successfully extirpated, furnish sufficient evidence in favour of the practice, without referring to numerous other cases reported on older authorities, the correctness of some of which may be questionable.

In fact, polypi, growing from the uterus, frequently attain so considerable a size, that they protrude out of the vagina, and are occasionally mistaken for the uterus itself. The surgeon extirpates the tumor with a ligature; the operation does not undeceive him about the nature of the part; his patient has a favourable recovery; and the case is published as an instance of the successful extirpation of the uterus itself.

Although it is easy to distinguish the inversion of the uterus, which happens soon after delivery, it is not so to make out the nature of such cases, as happen in other circumstances, notwithstanding the presence of the same kind of symptoms. As cases of the latter kind are uncommon, and, consequently, not expected, mistakes are the more liable to be made. A polypus has often been mistaken for an inversion of the uterus, but, it should be recollected, that the upper part of a polypus is always narrow; and the tumor, which is not very sensible, is irreducible; whereas, the uterus, in a state of incomplete inversion, forms a semi-spherical swelling, sometimes a little oblong, but always broader above than below. It is very sensible, and may generally be reduced. And, when the inversion is complete, the tumor has a greater resemblance to a polypus, inasmuch as it seems to have a pedicle, but, the impossibility of introducing a probe far at the circumference of such pedicle, as can be done in cases of polypi, will generally serve at once as a criterion of the nature of the disease.

The greatest obscurity in the diagnosis is said to prevail when the inversion is partial and chronic, because the os uteri then encircles the summit of the tumor, just as it does a polypus, and, in both cases, the finger will pass all round between the parts. (See *Newnham's Essay on Inversio Uteri, with a History of the successful Extirpation of that Organ, p. 82, 8vo. Lond.* 1818.) However, as I do not believe with this gentleman, that the neck of a polypus is frequently as large, and sometimes larger, than its inferior portion, I should yet expect, that the difference in the form of the two swellings, perceptible on manual examination, would here be an important criterion. In general, also, the fact, that inversion of the uterus first happens, at or soon after delivery, is a consideration, that would tend to a right discrimination of the cases, inasmuch as the first protrusion of a polypus directly after delivery, is rare, and, when it does happen, under these circumstances, is probably always complete, and not partial.

Reduction is the only plan, whether the case has arisen from the weight of a polypus, or from uterine hemorrhage. However, this proceeding is generally useless, when the disease originates from obesity. In the latter case, as the cause still continues in full force, the uterus is soon displaced again, and a pessary is the only means, to which the patient can resort.

Having delivered many additional observations on the subject of inversion of the womb, in the 2d vol. of the First Lines of Surgery, Ed. 4, I shall here conclude with referring to some works, in which the reader will find valuable instruction on the subject. *F. B. Wachter, de Prolapsu et Inversione Uteri, Halæ,* 1745. *Act. Naturæ Cur. Vol.* 6, *Obs.* 107, *uterus feliciter extirpatus. Nauche, des Maladies de l'Uterus, 8vo. Paris,* 1816. *Osiander, Neue Denkwürdigkeiten,* 1 *B. p.* 307. *Sabatier, Médecine Opératoire, T.* 2. *Dict. des Sciences Méd. T.* 23, *p.* 287. *W. Newnham, on the Symptoms, Causes, and Treatment of Inversio Uteri, with a History of the successful Extirpation of that Organ, during the Chronic Stage of the Disease, 8vo. Lond.* 1818. *J. Windsor, Obs. on Inversion of the Uterus, with a Case of successful Extirpation of that Organ, Med. Chir. Trans. Vol.* 10, *p.* 358, *&c. Denman's Plates* of *a Polypus, with an Inversion of the Uterus,* 1801. *Dr. Baillie's Series of Engravings, &c., Fasc.* 9, *Tab.* 5. *Cleghorn, in Med. Communications, Vol.* 2: *a chronic case. E. B. Herzog de Inversione Uteri, 4to. Wirceb.* 1817.

UTERUS, POLYPI OF. (See *Polypus.*)

UTERUS, PROLAPSUS OF. The womb, situated in the upper and middle part of the pelvis, is but imperfectly secured in its natural place by means of its broad and round ligaments: hence, it sometimes descends into the lesser cavity of the pelvis, so as to pass more or less down the vagina, or even protrude beyond the labia. The first case is the *incomplete;* the second, the *complete* prolapsus uteri.

In the first form of the disease, where the uterus has not passed down so low as to protrude externally, some of the complaints, which the patient experiences, depend upon the pressure of the displaced viscus upon the parts unaccustomed to it, particularly the bladder and rectum; while other inconveniences arise from the tension of the ligaments, destined to retain the organ in its natural position. These last grievances are chiefly a sense of heaviness in the pelvis, and a dragging pain in the loins; symptoms, which are aggravated, when the patient sits up, or walks about; but diminish when she remains in bed, though, as the disease, when neglected, scarcely ever fails to grow worse, they rarely subside altogether. However, such amendment actually sometimes happens, in consequence of the parts becoming gradually habituated to their change of situation. When the disease comes on with great suddenness, the symptoms are remarked to be much more severe, than when it takes place slowly: in the first case, long continued syncope, pain over the whole abdomen, tenesmus, uterine hemorrhage, inflammation of the peritonæum, and severe febrile symptoms may be excited.

With regard to the effects, caused by the pressure of the tumor on the bladder and rectum, they consist of more or less difficulty in voiding the urine and feces. The dysury and constipation increase in proportion as the patient continues in an upright posture, and the uterus descends nearer to the inferior orifice of the vagina. Sometimes the irritation brings on a considerable mucous discharge, which, when the patient suffers little other inconvenience from the prolapsus, is apt to be mistaken for fluor albus, or gonorrhœa.

A woman may become pregnant, notwithstanding an incomplete prolapsus of the womb. The displacement may even take place at a more or less advanced period of gestation, (*Portal des Accouchemens,*) while, in other still more uncommon instances, the prolapsus has been remarked to disappear, when the period of labour drew near. Cases exemplifying both these facts, are related by Loder, (*Journ. für die Chir. B. 2. p.* 13,) by Saviard, Portal, (*Mém. de l'Acad. de Chir. T.* 3,) in the Journ. de Médecine, T. 45; and by Chopart. (*Traité des Maladies des Voies Urinaires.*) A prolapsus uteri may also happen during parturition. (*Garin, Journ. de Méd. continué, T.* 4, *p.* 265; *Ducreux, Mém. de l'Acad. de Chir. T.* 8, *p.* 393.)

When, in the course of time, a prolapsus uteri changes from the incomplete to the complete state, all the inconveniences, depending upon the pressure of the part upon the rectum and bladder subside; that is to say, the feces and urine are now freely voided. But, on the other hand, the symptoms, arising from the stretching of the peritonæum, become considerably worse. The uterus drags down with it the vagina, which becomes doubled on itself, and a part of the bladder, connected with the upper part of the latter tube, is also drawn down. Some of the abdominal viscera may even fall into the cul-de-sac, formed by the vagina, and considerably increase the size of the tumor. The swelling, protruding between the thighs, is of an oblong, nearly cylindrical form, and terminates below in a narrow extremity, in which a transverse opening, the os tincæ, may be discerned, from which the menses are discharged at the periods prescribed by nature. However, the cylindrical shape of the tumor may lead to mistakes, for the vagina, being doubled on itself, and exposed to the effects of the air, sometimes looks like skin. Hence, women thus afflicted have occasionally been supposed to be hermaphrodites, the tumor being mistaken for a penis. Such a case is recorded by Saviard.

The patient is generally troubled with tenesmus, and sometimes feels acute pain in the tumor itself, which is subject to inflame, and ulcerate, in consequence of its depending posture, the friction, to which it is exposed, and the irritation of the urine.

The direction both of the bladder and urethra becomes horizontal, so that the urine is thrown forwards, or even upwards, in which latter case, it wets the abdomen. Frequently the bladder cannot be emptied, without the assistance of the catheter; and sometimes the displaced uterus becomes affected with inflammation and swelling. In many cases, there are profuse hemorrhages. However, some women become so habituated to the disease, that they hardly seem to experience any annoyance from it; whenever they are in the erect posture, and walk about, the womb falls down, bringing with it the vagina; and, as soon as they lie down on their backs, the parts as readily return into their natural position again.

The incomplete prolapsus is alone subject to any obscurity, which, however, may be dispelled by manual examination. In this, however, some precautions are necessary. For instance, as the womb generally returns into its natural situation, when the patient lies down, the examination should always be made as she is standing up. For the same reason, if she is in the habit of lying long in bed, the morning is not the best period of the day for the examination. The practitioner may also be deceived, if he examine the parts, when the rectum and bladder are distended with their contents, in which state, the uterus may be hindered from descending as low as at other periods.

If attention be paid to these circumstances, an incomplete prolapsus may always be distinguished without risk of error. However, the records of surgery prove, that the case has sometimes been mistaken by the inexperienced, or ignorant, for a polypus, and the part extirpated under this supposition. So serious a blunder will be avoided, if care be taken to remember, that polypi are generally softer, and less sensible, than the uterus; that, in a case of prolapsus, the os tincæ is situated at the lower part of the swelling; and, that if by chance any resembling aperture should be met with upon the corresponding portion of a polypus, the prolapsus may still be known by the greater depth, to which a probe will enter such opening. A polypus of the uterus, I believe, is always broadest at that extremity, which is nearest the vulva; but the womb, in a state of incomplete prolapsus, forms a tumor, which is narrower below, than above. With very few exceptions, the womb is likewise reducible, and the patient directly afterwards feels great relief; whereas a polypus cannot be pushed back, and the attempt, instead of giving relief, only increases the patient's sufferings.

In a complete prolapsus, no doubt can ever prevail about the real nature of the case, for whatever uncertainty the feel of the parts may create, none can ever remain when the swelling is distinctly visible.

Although Mauriceau, Saviard, and Monro have recorded instances of prolapsus uteri in maidens, such cases are exceedingly rare. The disease is hardly ever met with, except in women who have had children, and generally in those who have borne a great many. This particularity is ascribed by writers to the elongation of the ligaments of the uterus in women, in whom this organ has been repeatedly gravid. The same consideration may also account for the frequency of prolapsus uteri during the first months subsequent to parturition, especially as the womb remains for some time after labour more enlarged and heavy, than natural. The disease is more common in thin, than fat women, and is said often to take place in females when they suddenly change from a fat to a very emaciated state. The displacement is facilitated by a capacious vagina, by a great width of the lesser cavity of the pelvis, and the effects of tedious and profuse attacks of fluor albus. Prolapsus uteri has also been brought on by violent concussions of the body; the protracted efforts of vomiting, coughing, or crying, hard labour, and lifting, or carrying heavy burdens. In what has been stated, one may discern the reason, why the affliction is so frequent amongst the lower classes of society, and why women, for a certain time after parturition, should avoid an erect posture, and every kind of exertion. In the treatment of prolapsus uteri, there are two indications; the first is to reduce the part; and the second is to keep it from falling down again.

In the incomplete prolapsus, the first indication is very easy of accomplishment; and, indeed, when the patient is placed on her back, with her pelvis raised somewhat higher than her chest, the uterus often returns of itself into its natural situation again. At all events, the reduction may be immediately effected by pushing the uterus up into the pelvis with the fingers.

More difficulty generally attends the reduction of a complete prolapsus. Here the same posture is to be chosen, as in the former case; but the legs and thighs should be bent. The rectum should also be first emptied with clysters. Sometimes, indeed, every attempt at reduction fails, notwithstanding the adoption of the most vigorous measures, the use of the warm bath, purgatives, venesection, low diet, fomentations, &c. Occasionally, the part is returned after a great deal of trouble; but, owing to the long altered state of parts, the reduction brings on worse symptoms, than resulted from the continuance of the prolapsus. Such a case is recorded by Richter. (*Bibl. der Chir. B.* 3, *p.* 141.) The patient's sufferings were so much increased by the reduction, and so obstinate a constipation came on, that it became absolutely necessary to let the uterus descend again. In any irreducible case, all that can be done, is to support the swelling, and prevent its increase with a suspensory bandage, and draw off the urine with a catheter whenever requisite. In these cases, the altered course of the meatus urinarius is to be remembered, and the catheter directed horizontally towards the rectum.

When the displaced uterus is inflamed and considerably swelled, the attempt at reduction should be preceded by antiphlogistic remedies, the patient should be kept in bed, be put on a low regimen, be bled, take purgative medicines, use the warm bath, and drink diluent beverages, while emollient applications are made to the part itself. This plan of treatment has often been attended with complete success, in cases of prolapsus uteri, of long standing and considerable size. Ruysch disapproved of making any attempt to reduce the uterus, while it was inflamed and swelled. He also thought, that the operation should be postponed when the uterus was in an ulcerated state. However, Sabatier rightly observes, that, as this complication is only accidental, and merely arises from the friction, to which the tumor is exposed, and the irritation of the urine, the plan of immediately replacing the part cannot be attended with any danger. On the contrary, since the cause, which produces and keeps up the ulceration, will cease, as soon as the reduction is accomplished, the sores will heal after the uterus is put into its natural situation again.

When a prolapsus uteri occurs in the early stage of pregnancy, this state should not let the practitioner neglect to reduce the part. Several instances are recorded, in which the reduction was successfully accomplished in pregnant women; and one case of this kind is reported by Giraud. (*Journ. de Médecine, T.* 45.) When pregnancy is far advanced, or the disease is of long standing, the reduction is difficult. Perhaps, says Sabatier, it may be more prudent, in these circumstances, to let the uterus continue protruded, than to disturb the mother and fœtus with reiterated attempts to reduce the part. The uterus, however, should not be left to itself: but, be well supported with a suitable bandage, and the patient kept in bed. When the prolapsus uteri occurs at the period of delivery, every attempt at reduction is both useless and dangerous. In this case, the delivery of the fœtus should be expedited, by gradually dilating the os tincæ, which, at the same time, should be carefully supported. The extraction of the placenta also requires a great deal of caution, and it should be accomplished by introducing one hand into the uterus, with the palm turned away from the cavity of this viscus, towards the outside of the placenta, which is to be gradually separated from its edges towards its centre.

In cases of complete prolapsus uteri, Ruysch was an advocate for leaving the expulsion of the fœtus, if alive, to be effected by nature; and the same writer advises us to be content with supporting the os tincæ. But, when the child is dead, he recommends extracting it with one hand, while the uterus is supported with the other. Sabatier, however, entertains different sentiments. The expulsion of the child, he says, is not less the effect of the contraction of the diaphragm and abdominal muscles, than of the womb itself. Hence, when either of these agents fails to cooperate, the delivery becomes either very difficult or impossible. This is exactly what happens in the present case; for the uterus having fallen down, cannot be compressed by the diaphragm and abdominal muscles. Nor can Sabatier discern the reason why Ruysch should recommend the line of conduct to differ, according to the different state of the child. This is quite passive in parturition, and contributes not in the least to its own expulsion.

The second indication, or that of keeping the uterus reduced, demands the employment of astringent injections and pessaries.

The uterus, in a state of prolapsus, is sometimes also affected with scirrhus and cancer. A case of this description was met with by Ruysch; and, very recently, a woman whose uterus was cancerous, and in a state of complete prolapsus, without any inversion, was attended by Langenbeck, who succeeded in removing the diseased organ with a knife, and the patient recovered. According to this author's description, after the vagina had been separated from the uterus, the latter organ was detached from the peritoneum, without the latter membrane being opened, a small portion of the fundus uteri being left, however, as it appeared quite sound. The bleeding was very profuse, and required the use of the needle and ligatures. The ovaries and divided ligamenta rotunda were found connected with the removed portion of the uterus. (*Bibl. für die Chir. B.* 1, *p.* 551, 12*mo. Hannover*, 1818. *Saviard, Observ. Chir.* 12*mo. Paris*, 1702. *J. G. Preund, De Novo artificio curandi procidentiam Uteri, Francof. ad Viadn.* 1710. *Levret, in Journ. de Méd. T.* 40, *et Obs. sur la Cure Radicale des plusieurs Polypes, &c. Morgagni, de Sedibus et Causis Morborum, Epist.* 45. *Kulmus, de Uteri Delapsu, Suppressionis Urinæ, et subsequentis Mortis Causa, Gedani*, 1732. *White, in Med. Obs. and Inq. Vol.* 2. *Shaw, in Mem. of the Medical Society of London, Vol.* 1. *Portal, Cours d'Anatomie Méd. T.* 5, *p.* 538, *et Mém.*

de l'Acad. de Chir. T. 3, *Sabatier in Mém. de l'Acad. de Chir. T.* 3, *p.* 361, *and Médecine Operatoire, T.* 2. *Ducreux, in Mém. de l'Acad. de Chir. T.* 8, *p.* 493. *Osiander, Annalen, B.* 1. *p.* 175. *Dict. des Sciences Méd. T.* 23, *art. Hysteroptose.*)

UTERUS, RETROVERSION OF. Retroversion of the uterus is said to happen, when its fundus is forced downward and backwards, between the sacrum and the posterior part of the vagina, while its cervix inclines towards the symphysis pubis. The ancients are thought to have had some imperfect notions of this case, and, in proof of this opinion, certain passages are referred to in Œtius, (*Tetrab.* 4, *Serm.* 4, *C.* 77,) Mercurialis, Mercatus, and others. (See *Dict. des Sciences Méd. T.* 23, *p.* 273.) Be this as it may, it is generally confessed, that the subject had fallen into oblivion, when Dr. Wm. Hunter called the attention of his pupils to the subject, in 1754, and afterwards drew up an interesting paper concerning it. (*Med. Obs. and Inquiries, Vol.* 4, *8vo. Lond.* 1771.) Subsequently, the knowledge of the subject was extended by the observations of Wlzezeck, (*De Utero retroflexo, Prag.* 1777,) the remarks of Richter, (*Chir. Bibl. B.* 5, *p.* 521, *& B.* 9, *p.* 182,) and those of Wall, (*Diss. de Uteri retroversione, Hal.* 1782,) and by the memoir of Desgranges, to which the prize of the Royal Academy of Surgery at Paris was adjudged, in the year 1785. According to Sabatier, retroversion of the womb was a case mentioned by Gregoire in his private lectures on midwifery, at Paris.

Walter Wall, an English surgeon, who had attended Gregoire, suspected, that he had met with a retroversio uteri in a woman, some months advanced in pregnancy, and he called in Dr. Hunter, in order to have the advantage of his advice. The woman was attacked with an obstinate constipation, and retention of urine, and died in about a week. A large tumor was found occupying the whole of the pelvis, and pushing the vagina against the os pubis. It had been found impracticable to push the swelling back into the abdomen, although the patient had been put on her knees and elbows, while one hand had been introduced into the vagina, and two fingers of the other hand into the rectum. Great curiosity existed about what information would be afforded by dissection. On opening the body, the bladder, which was exceedingly full of urine, filled almost the whole anterior part of the abdomen, in the same manner as the uterus does in the last month of pregnancy. When it had been emptied, that part of it, in which the ureters terminate, and which is connected with the vagina and cervix uteri, was found raised up, as high as the upper aperture of the pelvis, by a large tumor, which filled the whole cavity of the pelvis, and was found to be the uterus. A catheter, when passed into the vagina, could be made to lift up the latter viscus and the upper part of the tumor. This portion of the swelling, on which the bladder lay, consisted of the cervix uteri, while the fundus of this organ was situated downwards towards the os coccygis and anus. The uterus was so large that it could not be taken out of the pelvis, before the symphysis pubis was divided, and the two ossa innominata were pulled asunder. It was found impossible to assign any cause for the displacement of the uterus, as the patient had been making no exertion, and had met with no fall, though she is said to have been frightened at something just before the complaint commenced.

Dr. Hunter, struck with the singular nature of the case, thought it deserving of the attention of medical men, and he made it the subject of a lecture, which he delivered in 1754. He was afterwards consulted by several persons, who were afflicted with the retroversio uteri; but, not in so acute a way, as in the above instance. All the patients were in the third month of pregnancy, and first suffered a difficulty of making water, succeeded by retention of urine, and afterwards by constipation. Dr. Hunter always emptied the bladder and rectum by means of a catheter and clysters, which measures sometimes effected a cure, the uterus spontaneously resuming its natural position. In every instance, the accident disappeared, when pregnancy was more advanced, and the uterus had acquired larger dimensions. In some cases, in which Dr. Hunter was consulted too late, the trials to replace the uterus proved fruitless, and the women died. Dr Hunter was so firmly convinced of the impossibility of saving patients circumstanced in the above manner, unless extraordinary means were resorted to, that he thought one should endeavour to diminish the size of the uterus, by introducing a trocar into the body of this viscus, through the posterior parietes of the vagina, so as to let out the water of the amnios, the relative quantity of which is known to be greater in the early, than in the advanced, stage of pregnancy. (See *Jourel in Bulletin de la Faculté de Méd. p.*173, *an.* 1812.)

Such a puncture might certainly be the means of the uterus resuming its natural position; but there would be considerable danger of its exciting the contraction of the uterus, and causing abortion. No risk of this kind would be encountered by puncturing the bladder above the pubes. In this manner, a free passage would be afforded for the escape of the urine, and the reduction of the uterus might be effected.

Mr. Lynn, a surgeon in Suffolk, knew an instance of the bladder bursting, and the urine becoming fatally extravasated in the abdomen, in a case of retroversion of the uterus, in consequence of the patient's refusal to submit to the preceding operation.

Though Callisen met with a case after delivery, and Desault knew an instance in which the displacement was produced by a polypus, retroversio uteri scarcely ever occurs, except in the early months of pregnancy, and in women whose pelvis is very wide, while its brim is very contracted. If the uterus, in a pelvis of this conformation, be pushed back by a distended bladder, and pressed against the sacrum, while the soft parts yield, the womb becomes, as it were, wedged, and is incapable of changing its position. In this immoveable state, it presses upon the surrounding parts, and these upon it, so that a very serious train of bad symptoms are the consequence.

The first care of a practitioner, consulted in a case of retroversio uteri, should be to empty the bladder and large intestines, and to relax the parts by every possible means. Then he should immediately proceed to replace the uterus, by placing the patient in a suitable posture, and making methodical pressure in the rectum and vagina. Should he be so fortunate as to succeed, the patient is to be confined in bed, her bowels are to be kept open, and she is to be advised always to obey the calls of nature the first moment she feels any inclination to make water. She is also to be enjoined to avoid all kinds of exertion, and wait till the gradual enlargement of the uterus removes the possibility of this viscus descending into the pelvis. (*Sabatier, Médecine Opératoire, T.* 2.)

Some practitioners, of considerable eminence, rather discourage the manual interference to reduce the uterus, believing that drawing off the urine will generally render such interference unnecessary. (*Croft, in Lond. Med. Journ. Vol.* 9, *p.* 53. *Denman's Introduction to Midwifery, 4to. Lond.* 1801. *S. Merriman, on Retroversion of the Womb, 8vo. Lond.* 1810.)

(See *Lynn, W. Hunter, Garthshore, Bird, and Hooper, in Med. Obs. and Inq. Vols.* 4. 5, *and* 6. *Cheston and Cleghorn, in Med. Communications, Vol.* 2. *John Clarke, Practical Essays on the Management of Pregnancy and Labour, Lond.* 1793. *Murray, in Uteri Retroversionem Animadversiones, Upsal.* 1797. *Denman's Introduction to Midwifery, Lond.* 1801. *S. Merriman, on Retroversion of the Womb, &c. 8vo. Lond.* 1810. *Jahn, De Utero Retroverso, Jen.* 1787. *Desgranges, in Journ. de Méd. T.* 66, *p.* 85. *Klein, Chir. Bemerkungen, p.* 235. *Baudelocque sur le Renversement de la Matrice, &c. Paris,* 1803. *Cockell, Essay on Retroversion of the Uterus, Lond.* 1785. *Richter, Chir. Bibl. B.* 4, *p.* 61—70—235—555: *B.* 5, *p.* 132—548; *B.* 7, *p.* 292; *B.* 8, *p.* 715; *B* 9, *p.* 182; *B.* 11, *p.* 310—328; *B.* 12, *p.* 45—50.)

UVA URSI, which was first brought into notice by De Haen, was once considered a powerful remedy in calculus; but, though its virtue, in lessening the irritation of the bladder, is still acknowledged, its claim to utility on any other principle, is quite rejected. Dr. Austin recommended it for lessening the irritability of the bladder, and diminishing the secretion of diseased mucus, which, he supposed, greatly contributed to the augmentation of the stone.

Mr. B. Bell also strongly recommended it in gonorrhœa, where the irritability of the bladder was excited in a high degree, and where the urine was loaded with viscid matter. In these cases, he directed a scruple, or half a dram, of the powder three times a day.

Dr. Saunders used to order three drams of uva ursi to be macerated in a pint of hot water, and two or three ounces of the strained liquor to be given three times a day. (*Pharm. Chirurg.*)

UVULA, AMPUTATION OF. The uvula is subject to several kinds of enlargement, in which it becomes both longer and more bulky than natural, or is simply lengthened. In consequence of such changes, it becomes troublesome in deglutition and speaking, and causes a disagreeable tickling at the root of the tongue, frequent retchings, and an annoying cough.

When things have attained this state, medicines are often ineffectual, and the only plan of relief consists in amputating a portion of the uvula with a pair of scissors.

V.

VAGINA IMPERFORATE. Female infants are often born with different imperforations of the vagina. Sometimes this passage is not completely shut up, so that the usual evacuations happen in an uninterrupted manner, and it is a considerable time before the malformation is discovered. Some females are even stated to have become pregnant, notwithstanding such obstruction; and, in these cases, the membrane, which shut up a part of the mouth of the vagina, either was torn by the effects of labour, or divided as much as was necessary for delivery.

Two membranes, one placed beyond the other, and obstructing the vagina, have also been found. That which is commonly met with is only the hymen, thicker and stronger than natural. Ruysch describes the case of a woman, who had been in labour three days, and could not be delivered. The head presented itself, but was prevented from coming out by the hymen, which shut up the vagina, and was very tense. Ruysch made an incision into the membrane; but to no purpose, since there was another membrane, of a thicker texture, situated more deeply in the passage. As soon as this second membrane had been divided, the child was expelled, and the case ended well.

When the vagina is completely imperforate, and the time of the menses commences, many complaints occur, which afflict the patient with more severity, in proportion as the blood accumulates in the passage, and they may even lead to a fatal termination, when the cause is not understood, or not detected till it is too late. These complaints are very similar to those of pregnancy; for instance, rumbling noises in the bowels, loss of appetite, nausea, vomiting, enlargement of the mammæ, spasms, convulsions, swelling of the abdomen, &c. Hence girls, in this situation, have often been supposed to be pregnant, although they were not in a state even to become so; and some young women have been known to die, after dreadful sufferings.

When the malformation consists altogether in the orifice of the vagina being shut up by a membrane, the patient may be easily relieved by a crucial incision, or a single cut, the edges of which are kept apart by a tent of suitable shape and size. Instances of the success of such an operation are to be found in numerous writers. Fabricius ab Aquapendente informs us, that a female child was born with a membrane, which completely shut up the vagina. The girl experienced no inconvenience from it, till she was about thirteen, when the period of her menses began. As the blood was retained, she became afflicted with severe pains in the loins, the lower part of the abdomen, and about the upper part of the thighs. She was supposed to be attacked with sciatica, and treated accordingly. Medicines were prescribed, which did no good; and, at length, she became hectic, and reduced to a complete state of marasmus, in which she passed restless nights, lost her appetite, and was delirious. A painful, very elastic tumor afterwards presented itself in that part of the abdomen, which corresponds to the uterus. The pains were aggravated every month, at the period when the patient ought to have menstruated. She was in a dying condition, when Fabricius ab Aquapendente was consulted, who, after ascertaining the real nature of the case, performed the requisite operation. A prodigious quantity of black putrid blood was discharged from the vagina; the bad symptoms gradually subsided, and the patient recovered. (See also *J. C. Loder*, *Obs. Imperforationis Vaginæ*, *Icone illustrata*, *4to. Jenæ*, 1800; *and numerous other cases on record.*)

When the malformation is produced by an extensive accretion of the sides of this passage to each other, the cure is sometimes difficult. The result of the operation is doubtful, because it is impossible to reach the situation of the blood without cutting through a considerable thickness of parts, in doing which there is some danger of wounding the rectum, or bladder. A lady, twenty-four years of age, after having tried, for eight years, such remedies as seemed best calculated for exciting the menstrual discharge, became affected with a large hard swelling of the abdomen, and a kind of herpetic affection round the body near the navel. At length it was discovered, that the imperforation of the vagina was the sole cause of all the bad symptoms which the patient had long endured. An incision was made, which enabled the operator to introduce his finger into a large cavity, and which gave vent to a considerable quantity of blood. It was thought, that an opening had been made into the vagina; but, the patient having died three days afterwards, it was seen that a mistake had been made, as the cavity, in which the finger had been introduced, was that of the bladder. The vagina was closed below by a substance of an inch in diameter, and half an inch thick. The upper part of this passage, the uterus, and the Fallopian tubes, were exceedingly enlarged, and filled with a dark brown, sanious fluid. A similar fluid was found extravasated in the abdomen, and it was discovered to have passed there through a rupture which had taken place in the Fallopian tube. The ovaries were in a natural state. De Haen, who has related this case in the sixth part of his work, intitled *Ratio Medendi*, was of opinion that, in order to avoid opening the rectum, or bladder, only one oblique cut should be made in the membrane, which stops up the vagina, just as was advised by Méeckren. (*Sabatier de la Médecine Opératoire*, *T.* 1.)

VAGINA, PROLAPSUS, OR INVERSION OF. According to Sabatier and Levret, the lining of the vagina is alone displaced; but Richter describes the vagina as liable to two kinds of prolapsus: in one, all its tunics are included in the protrusion; in the other, only its relaxed lining.

Occasionally, a prolapsus of a very limited portion of the vagina is observed. This case is generally the consequence of an uncommon sort of rupture, termed the *vaginal hernia* (see *Hernia)*; but it should also be known that, in some cases of dropsy, a circumscribed protrusion of the vagina, in the form of a cyst, or pouch, filled with fluid, is sometimes noticed. (*Richter*, *Op. et loco citato.*)

When the prolapsus vaginæ is recent, the part may be easily reduced, and kept up with a pessary. The use of astringent lotions will then tend to prevent a relapse. But, when the case has been of long standing, it is neither easy to effect the reduction, nor to prevent a recurrence of the disorder. Softening, relaxing remedies, in this circumstance, are recommended, and the patient should, in particular, confine herself to her bed, and wear a T bandage, which should be made to press upon, and support, a piece of sponge in the orifice of the vagina.

It is reasonable to expect, that, after a prolapsus vaginæ has continued a long while, the reduction must be difficult; because the vagina in this state becomes affected with swelling and induration. According to the reports of Hoin and Levret, a large protrusion of this kind, ten inches in length, was so diminished by keeping the patient invariably confined in bed upon her back, that, in the course of a month, the rest of the tumor admitted of being reduced. Indeed, as Richter observes, there can be little doubt, that the treatment which has been advised by some authors, for the diminution of very old, enormous, omental ruptures, would here be equally applicable; viz. long confinement in bed upon the back, with the buttocks somewhat elevated; unremitting, well directed external pressure; a very low diet; and repeated mercurial purges.

During pregnancy, a prolapsus of the whole substance of the vagina may cause much embarrassment and even danger. In one case of this description, where the protrusion was five inches in length, it became necessary to turn the child, and the displaced vagina was lacerated. The woman, however, recovered. (*Pietsch*, *Journal de Méd T.* 34.) In another instance, where the prolapsus became, at each return of the labour-pains, as large as a man's head, the practitioner succeeded in holding the parts back, while delivery was effected with the aid of the forceps. (See *Loder's Journ.* 1, *B. p.* 490.) When this is impracticable, it is necessary, according to Richter, to make an incision through both sides of the prolapsus; a measure, says he, to which the practitioner may the more readily make up his mind, inasmuch as the parts have, in some cases, been lacerated, without any ill consequences.

A prolapsus of the inner membrane of the vagina, while small and recent, might perhaps be removed by astringent applications. When, however, it is of long standing, indurated, and of large size, much expectation of success from this treatment cannot be entertained. Richter sees no reason why, in such a case, the superfluous relaxed part should not be cut away, especially, if the disease be accompanied with ulceration, and other serious complaints. As he observes, there can be no doubt, that a prolapsus of the inner membrane of the vagina, when limited to one part of this canal, may always be safely extirpated, either with a knife, or a ligature. (*Anfangsgr. der Wundarzn. B.* 7, *Chap.* 4.)

VARICOCE'LE. (from *varix*, a distended vein, and κελε, a tumor.) Many writers mean by the term *varicocele*, a varicose enlargement of the spermatic veins, which latter affection, I have, with Celsus and Pott, treated of under the name of *Cirsocele*.

Pott remarks, that the varicocele (which is an enlargement and distention of the blood-vessels of the scrotum) is very seldom an original disease, independent of any other, and, when it is, is hardly an object of surgery. The original disease is what engages our attention, and not this simple effect of it. (*Pott's Chirurgical Works, Vol.* 2.)

VARICOSE VEINS. The term, *varix*, is applied by surgeons to the permanently dilated state of a vein, attended with an accumulation of dark-coloured blood, the circulation of which is materially retarded in the affected vessel. When veins are varicose, they are not only dilated, they are also evidently elongated; for, besides being irregular, and in several places studded with knots, they make a variety of windings, and, coiling themselves, form actual tumors.

Varices are most commonly observed in the lower extremities, reaching sometimes even as far up as the abdomen. They have however been noticed in the upper extremities, and, it is probable, that the whole venous system is susceptible of the affection. As a well informed writer observes; "The great venous trunks sometimes become varicose. When the disease is situated near the heart, it is attended with pulsation, which renders it liable to be mistaken for aneurism. Morgagni observed, that the jugular veins were occasionally very much dilated, and possessed a pulsation. (*Letter* 8, *art.* 9, 10, 11.) He also relates a case, in which the vena azygos, for the length of a span, was so much dilated, that it might be compared with the vena cava. The patient died suddenly in consequence of the rupture of this varix into the right side of the chest. (*Letter* 26, *art.* 29.) A similar case is related by Portal, who also mentions an instance, in which the right subclavian vein was excessively dilated and burst into the chest. (*Cours d'Anatomie Medicale, tom.* 3, *p.* 354, 373.) Mr. Cline described in his lectures the case of a woman, who had a large pulsating tumor in her neck, which burst and proved fatal by hemorrhage. A sac proceeded from the internal jugular vein; the carotid artery was lodged in a groove at the posterior part of this sac. The veins of the upper extremity very rarely become varicose. Excepting cases of aneurismal varix, the only instance of this disease, with which I am acquainted, is mentioned by Petit. (*Traité des Maladies Chir. Tom.* 2, *p.* 49.) In this case, a varix was situated at the bend of the arm: the patient was so fat, that no other vein could be found for the purpose of venesection, which operation Petit repeatedly performed by puncturing this varix. The superficial epigastric veins sometimes become varicose, but, the most frequent seats of this disease are the venæ saphenæ, the spermatic, and hemorrhoidal veins." (See *Hodgson's Treatise on the Diseases of Arteries and Veins, p.* 538, 539.) The deep seated veins of the extremities seldom become varicose. The disease rarely occurs before the adult period of life, and its progress is extremely slow. It is very frequently remarked in pregnant women, who have passed a certain age; but, it is particularly unusual for it to happen in young women, even during a series of repeated pregnancies. Surgeons have not hitherto made out any very precise information, respecting the kinds of constitution, which promote the occurrence of a varicose enlargement of the veins. Nor has it been well proved, that the disease often proceeds from swellings of the abdominal viscera. or any other species of tumor capable of mechanically obstructing the venous circulation. One or more veins of the same limb are at first most commonly affected with a slight degree of dilatation, without pain, or any sensation of uneasiness. This beginning change ordinarily advances with great slowness, except in cases, where it accompanies pregnancy, in which circumstance, one, or both the lower extremities, as early as the first months, are frequently seen covered with largely dilated veins, or even with tumors formed by an assemblage of varices. The veins gradually become more and more distended, lengthened, coiled up, and tortuous. The patient then begins to complain of a sense of heaviness, numbness, and sometimes of very acute wandering pain, through the whole of the affected limb. In a more advanced stage, in proportion as the varices increase, and especially when the dilated veins actually form tumors, the limb swells, and becomes more or less œdematous according to the extent of the disease, and the time which it has existed. Delpech thinks, however, that the œdema in this case is not such as to justify the conclusion, that the increased size of the veins, and the way in which they distend the integuments, produce a mechanical interruption of the function of the absorbent system. For, says he, enormous varices are sometimes, though not often, met with, which are not attended with any swelling of the cellular substance; and cases are still more frequently seen, in which there is a considerable degree of œdema, while the varices are scarcely remarkable. When the latter have prevailed a long while, and made much progress, the coats of the affected veins are not unfrequently thickened, swelled, and indurated, forming a sort of half-canal, or solid tube. As Mr.

Hodgson remarks, "the blood occasionally deposits strings of coagulum in varicose veins: when this is the case, the vessel is incapable of being emptied by pressure, and is firm to the touch. The deposition does not in general fill the vessel, but, by diminishing its calibre, it retards the flow of blood, and causes the dilatation to increase in the inferior portion of the vein, and in the branches which open into it." (*On the Diseases of Arteries and Veins, p.* 541.) This gentleman has seen four cases, in which the coagulum accumulated to such an extent, that the canals of the dilated vessels were obliterated, and a spontaneous cure was the consequence. The excessive distention of the coats of a superficial vein produces an inflammatory irritation, at first in the adjoining cellular membrane, and afterwards in the integuments. These organs become at first connected together by the adhesive inflammation; and, if the distention continue to operate, they may at length ulcerate, and burst, and hemorrhage be the consequence. In such cases, the effusion of blood is sometimes considerable; but, says Delpech, we have no example of its having proved dangerous. The syncope following it, or a moderate compression, suffices for its stoppage. A more common occurrence, than bleeding, is the coagulation of the blood in the cavity of a varicose vein. The vessel then becomes hard and incompressible, and it loses that elastic yielding softness, which renders it capable of being diminished by gentle pressure. If the parts be already inflamed, Delpech conceives that the clot in the diseased vein may act as an extraneous body, and bring on ulceration, by the effects of which it is at last brought into view. In this sort of case, it is extremely uncommon for hemorrhage to occur; for, in general, the vessel is already obliterated by the preceding inflammation. But, the ulcer itself is very difficult to heal, and may be kept up a long while by the œdematous swelling of the limb. Varices or rather the œdema, which is the consequence of them, has the same effect upon every other species of ulcer, and even upon the most simple solution of continuity. While the swelling of the limb cannot be dispersed; while the edges of a solution of continuity are kept asunder by the tense state of the skin; and while the divided parts are irritated by this painful tension; every thing is unfavourable to cicatrization. Thus, we see the most simple wounds, which have been allowed to suppurate, and ulcers which should have healed rapidly, continue uncured a great many years, merely because the limbs, on which they are situated, are affected with an œdematous swelling, the consequence of varices. Such is the condition of things in the case, which has been improperly named the *varicose ulcer.* (*Delpech, Precis des Maladies Chir. T.* 3, *sect.* 8, *art.* 3.)

In the investigation of the causes of varices, it is usual to dwell very much upon the mechanical obstructions, which may effect the circulation of the blood in the veins. Surgeons have thought themselves justified in regarding this as the only cause, because a circular moderate compression incontestably retards the course of the blood in these vessels, and produces a temporary dilatation of them. The opinion seems also to derive confirmation from the knotty appearance of varicose veins, a circumstance, which has been accounted for by supposing, that the distention is greatest in the situation of the valves. Lastly, the idea is further supported by the well known fact of the frequent occurrence of varices during the state of pregnancy. But, it has not been remembered, that the use of garters, for example, is extremely common; yet varices of the legs are infinitely less frequent; that very large varices are met with in persons, who have never employed any kind of ligatures, to which the origin of the complaint can be imputed; that when the dilatation of the veins extends to the thighs and parietes of the abdomen, no causes of this description even admit of suspicion; that varicose veins are observable round several kinds of tumors, especially scirrhi, when there is no possibility of pointing out any mechanical obstruction to the circulation of the blood; that varices sometimes make their appearance at the commencement of pregnancy, and long before the enlargement of the womb can impede the free return of the blood through the veins in the pelvis; that nothing is more unusual, than a varicose dilatation of the veins of the lower extremities in consequence of swellings of the abdominal viscera; and, lastly, it has been forgotten, that the knots of the dilated veins are far too numerous to admit of being ascribed to the resistance of the valves. It cannot be denied, that pressure, applied in the tract of the vessels, tends to promote their dilatation: but, it can neither be considered as the only cause, nor as the principal one. The foregoing observations, made by Delpech, render it probable, that some unknown general cause is concerned in producing varices, the formation of which may also be facilitated by the impediments to the free return of the blood, occasioned by certain attitudes, and particular articles of clothing.

Mr. Hodgson conceives it probable, that, in some instances, the valves are ruptured, in consequence of muscular exertions, or external violence, in which cases, the pressure of the column of blood is the first cause of the dilatation of the veins. Sometimes also the disease appears to arise from preternatural weakness in the coats of the veins, as, in those instances, in which, without any evident cause, it exists in various parts of the same person. (*Treatise on the Diseases of Arteries and Veins, p.* 537.)

Experience proves, says Delpech, that there is no certain mode of curing *varices*, strictly so called, which he thinks cannot be wondered at, since the nature and causes of the disease are completely unknown. The same source of knowledge, however, also proves, that the increase in the dilatation of varicose veins may be retarded, and that the œdematous swelling, attendant on the complaint, may be beneficially opposed by methodical and permanent compression. When the whole of a lim affected with varices is subjected to this last mode of treatment, the dilated veins subside, the circulation is more regularly performed, and the œdema and pain cease. There is not (says Delpech) any better method of healing the solutions of continuity in the soft parts, produced, or kept up, by the varicose state of the limb, and its consequences. But, sometimes, as soon as the compression is discontinued, the varices make their appearance again, the pain recurs, and œdema returns, and the ulcers, which were healed, break out afresh.

Inflammation of the integuments covering a varix, or varicose tumor, cannot invariably be prevented by compression; nor will this treatment always succeed even in removing the intolerable pain, which sometimes attends numerous clusters of varicose veins. In the first case, rest and relaxing applications will often succeed; and in the second, the topical use of sedatives frequently gives relief. It has been proposed to puncture and empty varicose veins; but, if a temporary emptiness and relaxation of these vessels were to remove the pain for a time, things would fall into the old state again in the course of a few days. If the plan were adopted, it would be necessary to make a very free opening in the dilated vein, and extract the coagulum. The vessel would then need no ligature above and below the opening, for the slightest compression would afterwards stop the bleeding, and the vessel be obliterated by the subsequent inflammation.

We learn from Celsus, that the ancients were accustomed to remove varices by excision, or destroy them with the cautery. (*De Re Medica, lib.* 7, *cap.* 3.) When the vein was much convoluted, extirpation with the knife was preferred; but, in other cases, the dilated vessel was exposed by an incision, and then cauterized. Petit, Boyer, and many British surgeons have also sometimes cut out clusters of varicose veins.

Delpech remarks, that the extirpation of tumors, composed of numerous varices, has been practised, either for the purpose of removing the pain in the situation of the disease, or other inconveniences. This operation has been successfully performed; but it appears not to have constantly had the effect of preventing the formation of new varices, and it has sometimes proved tedious, difficult, and severely painful in its execution. In fact, an erroneous judgment must necessarily be formed of the extent of these swellings, when they are judged of only from the appearance which they present under the skin. Varices are not always confined to the superficial veins, and when they extend deeply, the operation must be ineffectual. The opinion of Delpech is, that it should never be undertaken, unless the disease be accompanied with perilous symptoms, or the patient nearly deprived of the use of his limb.

It has been thought, that one of the established principles in the treatment of aneurisms might be advantageously extended to the cure of varicose veins. By tying the principal venous trunk above the point to which the varicose affection reaches, it is said, that the course of the blood in the morbid vessels may be totally stopped; the column of this fluid made to coagulate; and the consequent obliteration of the vessels themselves accomplished.

The practice of tying veins for the cure of varices appears to have been employed in the days of Paré and Dionis (*Cours d'Operations de Chirurgie, p.* 610,) who accurately describe the operation of tying and dividing the vein between the two ligatures. Sir Everard Home has related many cases of varicose veins in the leg, some of them accompanied with tedious ulcers, which, after the vena saphena major had been tied, as it passes over the inside of the knee, were readily healed, and the dilatation of the veins of the leg relieved.

This practice has sometimes answered; but it has also had its failures.

Amongst other evils, an inflammation of the tied vein has been observed, extending very far in the vessel, and succeeded by great constitutional disorder, symptoms very analogous to those of typhus fever, and death.—Sir A. Cooper in his lectures strongly deprecates it: he says that he has seen it twice prove fatal in the Borough hospitals; and refers to at least a dozen other examples, which had a similar end. In some of these cases, previously to their termination, abscesses form in the direction of the vessel below or above the ligature; in others such collections of matter are not observed. (See *Travers on Wounds and Ligatures of Veins. Surgical Essays, Part* 1, *p.* 216, *and Oldknow, in Edinb. Med. and Surg. Journ. Vol.* 5, *R. Carmichael, in Trans. of the King's and Queen's College of Physicians, Vol.* 2, *p.* 345, *&c.*) Indeed, the dangers, arising from an inflammation of the internal coat of the veins, are now generally acknowledged, and every endeavour should be made to avoid them. A case which happened in Guy's hospital, in 1816, fully proves them: the femoral vein happened to be pricked in an operation for aneurism, and a ligature was applied round the aperture. Inflammation of its internal coat took place, extending up into the vena cava, and the patient is supposed to have died of the indisposition resulting from it. (See *Travers's Surgical Essays, Part* 1, *p.* 222.)

Hence arises one of the most weighty objections to the practice of tying the trunks of varicose veins, with the view of curing their morbid dilatation, and its effects upon the limb.

As Mr. Brodie observes, it seems to be now established by the experience of modern surgeons, that a mechanical injury, inflicted on the trunk of one of the larger veins, is liable to be followed by inflammation of its internal membrane, and a fever of a very serious nature; and the occasional occurrence of these symptoms, after the ligature, or even the simple division of the vena saphæna, has made surgeons less confident, than formerly, of the propriety of attempting such operations for the relief of a varicose state of that vessel in the leg. Certain reflections, however, induced Mr. Brodie to think, that the same ill effects would not follow a similar operation performed on the branches themselves. "Where the whole of the veins of the leg are in a state of morbid dilatation, and the distress produced by the disease is not referred to any particular part, there seem to be no reasonable expectations of benefit, except from the uniform pressure of a well applied bandage. But, not unfrequently, we find an ulcer, which is irritable, and difficult to heal on account of its connexion with some varicose vessels; or without being accompanied by an ulcer, there is a varix in one part of the leg, painful, and perhaps liable to bleed, while the veins in other parts are nearly in a natural state, or, at any rate, are not the source of particular uneasiness. In some of these cases, I formerly applied the caustic potash, so as to make a slough of the skin and veins beneath it; but I found the relief, which the patient experienced from the cure of the varix, to afford but an inadequate compensation for the pain to which he was subjected by the use of the caustic, and the inconvenience arising from the tedious healing of the ulcer, which remained after the separation of the slough.

"In other cases, I made an incision with a scalpel through the varix and skin over it. This destroyed the varix as completely as it was destroyed by the caustic, and I found it to be preferable to the use of the caustic, as the operation occasioned less pain, and as, in consequence of there being no loss of substance, the wound was cicatrized in a much shorter space of time. I employed the operation, such as I have described it, with advantage in several instances; but, some months ago, I made an improvement in the method of performing it, by which it is much simplified; rendered less formidable not only in appearance, but also in reality; and followed by an equally certain, but more speedy cure.

"It is evident (says Mr. Brodie), that the extensive division of the skin over a varix can be attended with no advantage. On the contrary, there must be a disadvantage in it, as a certain time will necessarily be required for the cicatrization of the external wound. The improvement, to which I allude, consists in this: the varicose vessels are completely divided, while the skin over them is preserved entire, with the exception of a moderate puncture, which is necessary for the introduction of the instrument with which the incision of the veins is affected. Thus the wound of the internal parts is placed under the most favourable circumstances for being healed, and the patient avoids the more tedious process which is necessary for the cicatrization of a wound in the skin above.

"For this operation, I have generally employed a narrow, sharp-pointed bistoury, slightly curved, with its cutting edge on the convex side. Having ascertained the precise situation of the vein, or cluster of veins, from which the distress of the patient appears principally to arise, I introduce the point of the bistoury through the skin on one side of the varix, and pass it on between the skin and the vein, with one of the flat surfaces turned forwards, and the other backwards, until it reaches the opposite side. I then turn the cutting edge of the bistoury backwards, and, in withdrawing the instrument, the division of the varix is affected. The patient experiences pain, which is occasionally severe, but subsides in the course of a short time. There is always hemorrhage, which would be often profuse if neglected, but which is readily stopped by a moderate pressure, made by means of a compress and bandage carefully applied."

Mr. Brodie particularly enjoins the necessity of keeping the patient quietly in bed for four or five days after the operation, and removing the bandage and first dressings with the utmost care and gentleness. He also cautions surgeons not to make the incision more deep than absolutely necessary. Inflammation of the coats of the veins has not occurred in any of the cases, in which Mr. Brodie has adopted this method of treatment. This gentlemen wishes it to be understood, however, that he does not recommend the practice indiscriminately, but with a due attention to the circumstances of each individual case. "The cases, for which it is fitted, are not those in which the veins of the leg generally are varicose, or in which the patient has little or no inconvenience from the complaint; but those in which there is considerable pain referred to a particular varix; or in which hemorrhage is liable to take place from the giving way of the dilated vessels; or in which they occasion an irritable and obstinate varicose ulcer." (See *Méd. Chir. Trans. Vol. 7, p.* 195, *et seq.*)

On the subject of cutting through veins affected with varix, it is proper to observe, that even this plan has been known to bring on severe and fatal symptoms. Cases, confirming this fact, are recorded in a valuable modern work, which should be in the hands of every practical surgeon. (See *Hodgson's Treatise on the Diseases of Arteries and Veins, p*, 555, *et seq.*) It is but justice to state, however, that, in these examples, Mr. Brodie's manner of doing the operation was not adopted. On the contrary, his method, as far as I have yet heard, receives very general approbation. Some cases and observations highly in favour of it, are detailed by Mr. Carmichael. (See *Trans. of the King's and Queen's College of Physicians, Vol.* 2, *p.* 369. *&c.*)

Cases of spontaneous varix in the veins of the arm are rarely observed. When these vessels become varicose, it is almost always in consequence of a communication being formed, in the operation of venesection, between the brachial artery and one of the veins at the bend of the arm. The superficial veins in this situation then become more or less dilated, by the impulse of the stream of arterial blood which is thrown into them. There is, however, a good deal of difference between these accidental varices, actually induced by a mechanical cause, and those which originate spontaneously, or from causes not very clearly understood. The former never acquire the size which the latter often attain; they never exceed a certain magnitude, whether pressure be employed or not; they never form tumours composed of an assemblage of varicose veins; they are never filled with tough coagula of blood; their coats are never thickened, nor constitute the solid half canal remarked in the other species of varices; the skin, which covers them, is not disposed to inflame and ulcerate; they are not subject to occasional hemorrhage; and the limb is not affected with any œdematous swelling. (*Delpech, Traité des Maladies Chir. T.* 3, *p.* 261.) These circumstances render it evident, that here all surgical interference would be unnecessary.

See *Aneurism*, where the aneurismal varix is described; *Cirsocele*, where the varix of the spermatic chord is treated of; *Hemorrhoids*, where the diseased and enlarged veins of the rectum are considered; *Varicocele*, where those of the scrotum are noticed.

VARIX, (from *varius*, unequal.) The term *varices* is applied to a kind of knotty, unequal dark-coloured swelling, arising from a morbid dilatation of veins. (See *Varicose Veins.*)

VEINS, DISEASES OF. To the observations and references made in the preceding article (*Varicose Veins,*) I here annex a few remarks on the principal diseases of the venous system, in order to render what has been already stated, in other parts of the work, more complete.

It is justly observed by Mr. Hodgson, that "the veins are liable to all those morbid changes which are common to soft parts in general; but the membranous lining of these vessels is peculiarly susceptible of inflammation. When a vein is wounded, the inflammation, which is the effect of the injury, sometimes extends along the lining of the vessel into the principal venous trunks, and in some instances even to the membrane, which lines the cavities of the heart. This inflammation sometimes produces an effusion of coagulating lymph, by which the opposite sides of the vein are united, so as to obliterate the tube; in this manner a great extent of the vessel is occasionally converted into a solid cord. In some instances, the secretion of pus into the cavity of the vessel is the consequence of inflammation of the membranous lining of a vein: under these circumstances, the matter is either mixed with the circulating blood, or, the inflammation having produced adhesion of the sides of the vessel at certain intervals, boundaries are formed to the collection of pus, which in this manner form a chain of abscesses in the course of the vessel.

"When the inflammation of veins is not very extensive, its symptoms are the same as those of local inflammation in general: but when the inflammation extends into the principal venous trunks, and pus is secreted into the vessel, it is accompanied with a high degree of constitutional irritation, and with symptoms which bear a striking resemblance to those of typhus fever." (*On the Diseases of Arteries and Veins, p.* 511—512.)

Besides the example of inflammation of femoral and other large veins, brought on by a ligature round a small aperture, accidentally made in the femoral vein, in the operation for popliteal aneurism, as mentioned in a foregoing article (*Varicose Veins*), Mr. Travers reports another case, in which a fatal inflammation of the femoral and external iliac veins, with marks of diffused inflammation up to the right auricle, was apparently caused by the application of a ligature to the mouth of the femoral vein, after an amputation. (*P.* 227.) And the same catastrophe would appear to be occasionally the result of venous inflammation after amputation, even where the femoral vein is not tied. (See *Carmichael, in Trans. of King's and Queen's College of Physicians, Vol.* 2, *p.* 365.) In short, Mr. Travers's observations, as well as those of Mr. Hodgson and Mr. Carmichael, tend to prove, "that the inflammation of the interior tunic of a vein sometimes follows a puncture, sometimes a division, a ligature encircling the tube, or including only a part of it, or arises spontaneously from an inflamed surface, of which the vein forms a part." (*P.* 238.) Mr. Carmichael relates an instance, in which the appearances after death seem to evince that the patient died, subsequently to an operation for femoral aneurism, of inflammation and suppuration within the femoral vein, and extending both down the saphena, and upwards through the common iliac vein. The femoral vein had been pricked in the operation, but not tied. (*Trans. of the King's and Queen's College of Physicians, Ireland, Vol.* 2, *p.* 350, *&c.*) In order to avoid the danger of wounding the femoral vein, above the edge of the sartorius, Mr. Carmichael recommends, "introducing the needle on the pubal side of the artery;" (*P.* 357) a direction, which I have noticed in the article *Aneurism.* With respect to the danger of tying a large vein, Sir A. Cooper is so convinced of it, that he says in his lectures, that, if he were the subject of operation, he would rather let his femoral artery be tied, than the vena saphena major.

Inflammation frequently produces a thickening of the coats of the veins, as well as adhesion of their sides, and obliteration of their cavities. Indeed, in some instances, these vessels have been found to resemble arteries in the thickness of their coats, and in retaining a circular form when cut across. (*Hodgson, op. cit. p.* 513.)

Ulceration sometimes extends to the coats of veins, and, by exposing their cavities, gives rise to hemorrhage. In certain examples, it commences in the membranous lining, and destroys the other coats. In general, however, the adhesive inflammation precedes the ulcerative, and by obliterating the cavities of these vessels, prevents the occurrence of hemorrhage. When sphacelation takes place in the vicinity of veins, their cavities, like those of arteries under similar circumstances, are filled with extensive plugs of coagulum, which prevent hemorrhage upon the separation of the mortified part.

Veins are sometimes ruptured, without any previous morbid alteration in their structure, and the accident may be induced by muscular exertions, external violence, the sudden effects of the cold bath, &c.

Although a deposition of calcareous matter almost invariably takes place in the arteries of persons advanced in life, it is an extremely rare occurrence in the coats of veins.

Loose calculi have been found in the cavities of veins; and tumours sometimes grow from their lining. In a case of scirrhous pylorus, Mr. Hodgson found a tumour, larger than a hazel nut, growing from the lining of the splenic vein, and resembling in its appearance and consistence the disease which existed at the pylorus. (*P.* 524.)

The venous, like the arterial system, appears to be capable of carrying on a collateral circulation, when any part of it is impervious. Even after the obliteration of the vena cava inferior, the blood has been known to be conveyed with facility to the heart through the lumbar veins and vena azygos. In the case, recorded by Dr. Baillie (*Trans. for the Improvement of Medical and Chir. Knowledge, Vol.* 1, *p.* 127,) it is remarkable, that the vena inferior was obliterated at the point where the venæ cavæ hepaticæ opened into it, so that not only the blood from the lower extremities, but also that from the liver, must have passed through collateral channels to the heart.

Want of room having prevented me from introducing further observations on the diseases of veins, I must refer to the following works for additional information. *J. Hunter, in Trans. for the Improvement of Med. and Chir. Knowledge, Vol.* 1. *Abernethy's Works. J. Hodgson, on the Diseases of Arteries and Veins. Longuet, Dis. sur l'Inflammation des Veines, Paris*, 1815. *B. Travers, in Surgical Essays, Part* 1, *8vo. Lond.* 1818. *F. A. B. Puchelt, Das Venensystem in Seinen Krankhaften Verhältnissen. 8vo. Leipz.* 1818. *R. Carmichael, in Trans. of the Association of Fellows, &c. of the King's ond Queen's College of Physicians in Ireland, Vol.* 2, *8vo. Dublin*, 1818.

VENEREAL DISEASE. (*Lues Venerea. Morbus Gallicus. Syphilis.*) About the year 1494, or 1495, the veneral disease is said to have made its first appearance in Europe. Some writers believe, that it originally broke out at the seige of Naples; but most of them suppose that, as Columbus returned from his first expedition to the West Indies, on March 13th, 1493, his followers brought the disorder with them from the new to the old world. Other authors, however, among whom are Mr. B. Bell and Dr. Swediaur, maintain the opinion, that the venereal disease was well known upon the old continent, and that it prevailed among the Jews, Greeks, and Romans, and their descendants, long before the discovery of America. Another doctrine, not entirely destitute of ingenious arguments, and even containing many valuable truths, is, that the venereal disease, as it is considered in modern times, has no real existence as a distinct affection, arising from any particular virus, but is a name given to an assemblage of disorders of different kinds, to which the human race has always been subject from time immemorial. (See a tract entitled, "*Sur la Non-existence de la Maladie Vénérienne*," *8vo. Paris*, 1811.)

Although many considerations lead me to reject the common history of syphilis as fabulous, I mean that account which refers its origin to America, or the French army in Italy, it does not appear to me, that any utility would be likely to result from agitating this question in modern times, because, if it be true, as the most candid and intelligent surgeons of the present day generally acknowledge, that they cannot precisely define what the venereal disease is, nor always point out the exact circumstances, in which it differs from some other anomalous complaints, even when the cases are before their eyes, how can such discrimination be attempted from a mere review of old descriptions, not accompanied with the advantage of a view of the living patients themselves? But, as far as the nature of the venereal disease has been unravelled, and it is allowable to judge from such comparisons, I may be permitted to remark, that, in degree of severity, acuteness of symptoms, rapidity of propagation, and extent and quickness of fatality, no forms of disease, now ever conjectured to be venereal, bear the least resemblance to the destructive malady, with which the army before Naples was afflicted, at the close of the fifteenth century: nor will any ignorance of the uses of mercury, as will be presently noticed, explain differences so strongly marked. With reference to the contagious disorder, which scourged a great part of Europe at the close of the fifteenth century, there is a decree of the Parliament of Paris, dated 1496, in which the disease is mentioned to have been then prevalent in that city, two years: consequently, it was known there in 1494: yet, the conquest of Naples by Charles the 8th was not affected till 1495. It is clear, therefore, that the disease, here alluded to, could not have been derived from America. It appears to have been communicated from one person to another by the mere touch, residence in the same chamber, &c., and, in fact, unless some other mode of propagation, besides coition, be supposed, its extension throughout Europe in two years would imply a depravity of manners quite extraordinary, and beyond all credibility. Another fact is, that whatever the disorder might be, it was not of long continuance; and Guaccardini, the historian, who wrote a few years after its breaking out, assures us, that it had already become much milder, and undergone, of itself, a change into kinds different from the first.

The veneral disease is supposed to arise from a specific morbid poison, which, when applied to the human body, has the power of propagating or multiplying itself, and is capable of acting both locally and constitutionally.

Mr. Hunter was of opinion, that the effects, produced by the poison, arise from its peculiar or specific irritation, joined with the aptness of the living principle to be irritated by such a cause, and the parts so irritated acting accordingly. Hence, he considered, that the venereal virus irritated the living parts in a manner peculiar to itself, and produced an inflamma tion, peculiar to that irritation, from which a matter is produced, peculiar to the inflammation.

The venereal poison is capable of affecting the human body in two different ways: locally, that is, in those parts only to which it is first applied; and, constitutionally, that is, in consequence of its absorption.

In whatever manner the venereal disease was first produced, it began, says Mr. Hunter, in the human race, as no other animal seems capable of being affected by it. He conceives also, that the parts of generation were those first affected; for, if the disease had taken place on any other part, it would not have gone further than the person in whom it first arose. On the contrary, if the disease, in the first instance of its formation, be presumed to have attacked the parts of generation, where the only natural connexion takes place, between one human being and another, except that between the mother and child, it was in the most favourable situation for being propagated; and Mr. Hunter infers, also, that the first effects of the disease must have been local, in consequence of the fact, now well established, that none of the constitutional effects are communicable to other persons, that is to say, infectious.

Thus, the numberless cases of the venereal disease, afflicting generation after generation, and observable in all the known parts of the world, are supposed to be originally derived from the amours of some unfortunate individual, in whom the poison was first formed, from causes beyond the reach of human investigation. But, that any statement of this kind is more valuable than unsupported conjecture, is a proposition to which my mind is not prepared to assent, particularly when it is considered, that sores on the genitals, giving rise to such constitutional symptoms as puzzle the most discerning practitioners, are often of a very diversified character, so as hardly to admit of reference to one common origin. And, as I have already hinted, every modern speculation, about the origin of the distemper, promises but little instruction or success, because the question relates to a disease, the diagnosis of which is still very unsettled, and the complete definition of which has hitherto baffled men of the greatest genius and experience.

According to Mr. Hunter, the venereal poison is commonly in the form of pus, or some other secretion. In most cases, it excites an inflammation, which (to use the same author's language), is attended with a specific mode of action, different from all other actions attending inflammation, and accounting for the specific quality in the matter.

The formation of matter, though a general, is not a constant attendant on this disease; for inflammation, produced by the venereal poison, sometimes does not terminate in suppuration. But, if Mr. Hunter's sentiments are correct, it is the matter produced, whether with or without inflammation, which alone contains the poison. Hence a person, having the venereal irritation in any form, not attended with a discharge, cannot communicate the disease to another. In proof of this doctrine, he states, that though married men often contract the disease, and continue to cohabit with their wives, even for weeks, yet, in the whole of his practice, he never once found, that the complaint was communicated under such circumstances, except when connexion had been continued after the appearance of the discharge.

The late Mr. Hey, of Leeds, however, gave it as his opinion, that a man might communicate lues venerea, after all the symptoms of the disease had been removed, and he was apparently in perfect health. (See *Med. Chir. Trans. Vol. 7, p.* 547.) This sentiment is not only repugnant to the authority of Mr. Hunter, but to common observation and all sound reasoning. The very case, which Mr. Hey adduced, in proof of the occurrence, is decidedly inadequate to the purpose, in consequence of the impossibility of trusting to the accounts which patients, under circumstances involving their honour, are apt to give of themselves. In the case, recited by him, the patient might have had some venereal affection at the period of, or subsequently to, his marriage; and yet his feelings, and a sense of the disgrace of infecting a virtuous woman, might compel him to conceal the real truth from his surgeon. Again, it is to be remembered, that the lady herself might have deviated from the path of chastity, and exposed herself to infection; and, if she had done so, she would neither have informed her husband, nor Mr. Hey. I confess, that it is at all times painful to suspect the veracity of individuals, whose situations in life are respectable; but, whenever an occurrence takes place, decidedly contrary to the evidence of general experience, every possibility is to be recollected, in order to avoid the necessity of admitting doctrines not founded upon truth.

Mr. Hey, with much more reason, joins in the belief of the possibility of the venereal disease being communicated to the fœtus in utero, though in what manner the infection is transmitted is a question not yet elucidated. An universal desquamation of the cuticle; a hoarse squeaking voice; copper-coloured blotches; a scaly eruption upon the chin; and an unnatural redness of the anus; are the common symptoms which he sets down as proofs of syphilis in very young infants. As these complaints yield to small doses of the submuriate of mercury, or the hydrargyrus cum creta, and either the nurse or parent has had some venereal or syphiloid disease at no very distant period, the cases are often regarded as decided specimens of one of these disorders.

The venereal poison would appear to be very irregular in its effects, different persons being variously affected by it; and hence, probably, one cause of a great deal of the uncertainty yet prevailing about its distinguishing characters. Thus, as Mr. Hunter mentions, two men sometimes have connexion with the same woman; both catch the disease; but one may have very severe, the other exceedingly mild, symptoms. He knew of an instance, in which one man gave the disease to different women, some of whom had it with great severity, while the others suffered but slightly. On the same point, I find an interesting statement, made by Dr. Hennen, in his Report of Observations on Syphilis in the Military Hospitals in Scotland:—"We have had (says he) frequent opportunities of remarking two or more sores, of different kinds, existing at the same time: an irregularly-shaped diffused sore; an elevated sore, covered with a light coloured slough, as if a bit of shamoy leather had been stuck on by some tenacious substance; a groove, or streak along the glans, as if made by a scraping instrument, filled with purulent matter; and the true and perfect chancre, according to Mr. Hunter's definition; or the true syphilitic ulcer, according to Mr. Carmichael. This last has, in some cases, occupied the glans; in some, the prepuce; while the sores of another description have been on the same part close beside it, or on another part at a distance. Three of these cases I particularly selected for examination and public demonstration, at the Castle Hospital; in one, the

Hunterian chancre was on the glans, and a sore, without any hardness on the prepuce; in another, it was on the prepuce, and a simple ulcer on the glans; in the third, a most perfect specimen of Hunterian chancre occupied the internal prepuce, close to the corona glandis; and, at about half an inch from it, nearer the frænum, but farther from the glans, was an elevated ulcer. In all these cases, the Hunterian chancre healed (without mercury) several days before the others.

"Soldiers (says Dr. Hennen) are gregarious in their amours, and we have frequently several men at the same time in hospital infected by the same woman, with whom they have had connexion in very rapid succession; *some of them have had one kind of sore, some another, and some both.* (*Principles of Military Surgery, Ed.* 2, *p.* 525.) But, if these facts, which agree with my own observations, be rather adverse to the theory of a plurality of venereal poisons (See *Carmichael's Essays on the Venereal Disease, &c.*), they still leave difficulties, which cannot be entirely solved by reference to peculiarities of constitution and different states of the health, because no explanation, on this principle, would account for a man having, at the same time, upon the penis, two or three different kinds of ulcers, apparently excited by one cause. Neither will any difference of texture afford the needed explanation, though the utmost latitude be given to the doctrine, that the appearance and progress of sores are considerably modified by the nature of the parts. It is only necessary to consider the above passage from Dr. Hennen's work, to perceive, that the particular texture, whether prepuce, skin, glans, or corona glandis, does not always communicate to sores one invariable character, even when they arise, as the evidence would dispose one to suppose, as nearly as possible under the same circumstances, and from the same source of infection.

But, though in such examples, no data, with which I am acquainted, lead to any safe inference, respecting the exact cause of the diversity of effect, produced in different persons, and even on different parts of the same individual, by one kind of virus, not a doubt can be entertained, that generally climate and constitution have vast influence over the venereal disease. In all warm countries, the disorder, as far as regards the natives, and those who have been long settled there, is not only much milder in its symptoms, but much more easy of cure. In the West Indies, the Brazils, &c. it has for a long period of time been very commonly cured by means of sarsaparilla, guaiacum, mezereon, &c. without a grain of mercury. It is alleged, however, that this mildness of syphilitic complaints, and their facility of cure, in warm climates, do not extend to strangers recently arrived there, who are said even to suffer more from the virulence of the disease, than in their native climate. In Portugal, during the late war, the dreadful ravages of the venereal disease among the British soldiers, and its comparatively milder phenomena amongst the inhabitants of the country, were particularly noticed. "In the British army, (says Mr. Fergusson) it is probable, that more men have sustained the most melancholy of all mutilations, during the four years that it has been in Portugal, through the disease, than the registers of all the hospitals in England could produce for the last century; while venereal ulceration has not only been more intractable to the operation of mercury, than under similar circumstances at home; but the constitution, while strongly under the influence of the remedy, has become affected with the secondary symptoms in a proportion that could not have been expected. With the natives, on the contrary, the disease is very mild; curable, for the most part, by topical treatment alone, or wearing itself out when received into the constitution, after running a certain course, not always a very destructive one, without the use of any adequate mercurial remedy, &c. The bulk of the people, and of all the military at the hospitals, even though a general order has been given out, enjoining the use of mercury, cure themselves, or get cured, by other means. I have now been upwards of two years at the head of their hospital department, and I can declare, that it never occurred to me amongst all the venereal patients, whom in that time I have seen pass through the hospitals, to meet a single one under the influence of mercury, excepting those cases, wherein I myself have personally superintended its administration. They go out cured by topical remedies alone: and I have lived long enough amongst them to ascertain, that their return to hospital under such circumstances for secondary symptoms, is far from being an universal, or even a frequent occurrence." (*Fergusson, in Med. and Chir. Trans. Vol.* 4, *p.* 1—2.)

The inference, at which Mr. Fergusson arrives, is, that, in Portugal, the disease is exhausted, and has lost much of its virulence, in the same manner as the natural small pox, unresisted by inoculation appears to have changed, in the same country, into a very mild disease, which does well under any mode of treatment.

"Yet (says Mr. Fergusson) I have no doubt, that were this mild disease, or the mildest that was ever produced from the improved inoculation of England, communicated to a tribe of Indians, or to a plantation of negroes, or any other class of people, who had never before known the small pox, it would desolate with all the fury of pestilence, destroying wherever it could find victims, and never ceasing until it had destroyed the whole." And, on the same principles, Mr. Fergusson attempts to explain the severe effects of the inoculation of the exhausted symphilitic virus of Portugal into the constitution of the British, or other stranger, and the impossibility of curing the disease by the same treatment, which answers for the natives themselves. (*Med. Chir. Trans. Vol.* 4, *p.* 7, 10.) On the other hand, Mr. Guthrie does not admit, that the disease which the troops contracted in Portugal was more violent, than the same complaint in England; or rather he admits the fact, but gives a different explanation of it from that of Mr. Fergusson; and refers the severe effect of the disease upon the soldiers in Portugal to the operation of the climate upon their northern constitutions, and their irregularity and intemperance, vices to which the natives are not addicted. (See *Med. Chir. Trans. Vol.* 8. *p.* 563.)

The opinion that the venereal disease was continually changing in its nature, and that in the end it would entirely cease, is one that has been brought forward at various periods ever since its supposed importation into Europe. Peyrilhe, in particular, has denied its correctness: he treats of two sorts of change, or degeneration, as it was termed; one general; the other particular. He denies the first, and maintains that the venereal disease is as destructive now, as in past times. As for the degeneration of the poison in an individual, he admits it: "perhaps, (says he) *spontaneous cures* will be doubted: *numerous facts attest them* to those who know how to see, and we have tried to demonstrate them to others. For our own part, we cannot doubt, that the venereal poison becomes weaker and weaker in the infected person, becomes milder, and, as it gets older, loses its principal character, its property of communicating the disease." (See *Remède Nouveau, &c. Montp.* 1786.)

It has been a contested question, whether the venereal disease and gonorrhœa arise from the same poison? Mr. Hunter acknowledges, that the opinion, of their originating from two distinct poisons, seems to have some foundation, when the difference, in the symptoms, and method of cure, is considered. But, he asserts, that, if this question be taken up upon other grounds, and experiments be made, the result of which can be safely depended upon, this notion will be found to be erroneous. As the arguments of Mr. Hunter, in support of the doctrine, that both diseases are produced by the same virus, are noticed in the article *Gonorrhœa*, I shall not here repeat them.

On the other hand, Mr. B. Bell relates some experiments, from which the conclusion is made, that the poisons of the venereal disease, and gonorhœa, are entirely different and distinct.

Matter was taken upon the point of a probe, from a chancre on the glans penis, before any application was made to it, and completely introduced into the urethra. For the first eight days, the gentleman who made this experiment, felt no kind of uneasiness; but, about this period, he was attacked with pain in making water. On dilating the urethra, as much as possible, nearly the whole of a large chancre was discovered, and, in a few days a bubo formed in each groin. No discharge took place from the urethra, during the whole course of the disease; but another chancre was soon perceived in the opposite side of the urethra, and red precipitate was applied to it, as well as to the other, by means of a probe previously moistened for the purpose. Mercurial ointment was at the same time rubbed on the outside of each thigh, by which a profuse salivation was excited. The buboes, which, till then, had continued to increase, became stationary, and, at last, disappeared entirely; the chancres became clean, and by a due continuance of mercury, a complete cure was at last obtained. If this case, and another, to which I shall presently advert, could be entirely depended upon, they would tend to disprove the part of Mr. Hunter's theory, accounting for the different effects of the same poison by its application in the case of chancre to a non-secreting surface, covered with cuticle, and in that of gonorrhœa to a secreting mucous membrane. However this may be, I have never seen a chancre within the urethra.

The next experiment was made with the matter of gonorrhœa, a portion of which was introduced between the prepuce and glans, and allowed to remain there without being disturbed. In the course of the second day, a slight degree of inflammation was produced, succeeded by a discharge of matter, which, in the course of two or three days, disappeared.

The same experiment was repeated: but no chancre ever ensued from it.

Two medical students were anxious to ascertain the point in question; and with this view, they made the following experiments, at a time, when neither of them had ever laboured under either gonorrhœa, or syphilis, and both in these and in the preceding experiments, the matter of infection was taken from patients, who had never made use of mercury.

A small dossil of lint, soaked in the matter of gonorrhœa, was by each of them inserted between the perpuce and the glans, and allowed to remain on the same spot for the space of twenty-four hours. From this it was expected, that chancres would be produced; but, in one, a very severe degree of inflammation ensued over the whole glans and præputium, giving all the appearance of, what is usually termed *gonorrhœa spuria*. A considerable quantity of fetid matter was discharged from the surface of the inflamed parts, and for several days, there was reason to fear, that an operation would be necessary for the removal of a paraphymosis. By the use of saturnine poultices, laxatives, and low diet, however, the inflammation abated, the discharge ceased, no chancre took place, and the case got entirely well. In the other gentleman, says Mr. B. Bell, the external inflammation was slight, but in consequence of the matter finding access to the urethra, he was attacked, on the second day, with a severe gonorrhœa, with which he was troubled for more than a year.

The next experiment was made by the friend of the latter student; he inserted the matter of gonorrhœa, with a lancet, beneath the skin of the præputium, and, likewise, into the substance of the glans; but, although this was repeated three different times, no chancres ensued. A slight degree of inflammation was excited: but it soon disappeared, without any thing being done for it. His last experiment was attended with more serious consequences. The matter of a chancre was inserted on the point of a probe to the depth of a quarter of an inch, or more, in the urethra. No symptoms of gonorrhœa ensued; but in the course of five, or six days, a painful inflammatory chancre was perceived on the spot, to which the matter was applied. To this succeeded a bubo, which ended in suppuration, notwithstanding the immediate application of mercury: and the sore, that was produced, proved both painful and tedious. Ulcers were at last perceived in the throat, nor was a cure obtained, till a very large quantity of mercury had been given and the patient kept in close confinement for thirteen weeks. (*On Gonorrhœa Virulenta and Lues Venerea, Vol.* 1, *Edit.* 2, *p.* 438, *&c.*) Mr. Evans, it appears, has also several times inoculated with the matter of gonorrhœa, but, *in every case*, it *failed* to produce any effect. (*On Ulceration of the Genital Organs, p.* 81, *8vo. Lond.* 1819.)

Some other facts on record, however, tend rather to support Mr. Hunter's inference, if any conclusion can be ventured upon without the aid of the most minute details. Thus, Vigarous mentions an instance in which six young Frenchmen had connexion with the same woman, one after the other. The first and fourth, in the order of connexion, had chancres and buboes, the second and third gonorrhœa, the fifth chancre, and the sixth bubo. (*Œuvres de Chir. Practique Montp.* 1812, *p.* 8.) And Dr. Hennen, who refers to this case, mentions a similar one, in which the first person escaped, the second had true chancres and elevated sores, and the third gonorrhœa. The connexion took place within an hour. (*Military Surgery, Edit.* 2, *p.* 526.) These facts would indeed be much more interesting, if the disease, with which the women were affected, had been ascertained, and one could securely calculate upon the men not having exposed themselves, within a given time, to any other sources of infection. In short, without a perfect history and description of cases of this kind, from their beginning to their end, no light is thrown by them on the question about the venereal and gonorrhœal poisons. Nor does Dr. Hennen quote them with this view; but for the purpose of exemplifying the variety of effects, produced on different individuals *apparently* by the same infection, though the same consideration, which prevents any certain inference from such observations, in regard to the identity of the venereal and gonorrhœal poisons, seems also to interfere with the other conclusion. In the experiments, detailed both by Hunter and B. Bell, there is also one point assumed by both parties, though it is far from being determined; viz. that the matter discharged from the urethra is always of one kind, in respect to its infectious principle whatever this may be, and that the secretion from every chancre contains one, and only one species of infectious matter. From the candid and very practical work of Mr. Evans, it would appear, that some ulcerations on the penis, such as would usually be called chancres, though they have of late years been sometimes named elevated ulcers, *arise from an altered secretion, without any breach of surface, or discernible disease in the female organs.* The same gentleman was also frequently present at the examinations of the public women in Valenciennes, and always surprised at the small portion of disease to be found amongst them: "At one which I attended (says he), no less than 200 women of the lowest description, and, of course, the most frequented by soldiers, were examined, and *not one* case of disease was found among them: nevertheless the Military Hospitals had, and continued to have, their *usual number* of venereal cases (ulcerations).

"At an inspection, I have since attended, where 100 women were examined, *only two* were found with ulcerations: I noticed several with increased secretions, and one with purulent discharge, but these were taken no notice of by the attending surgeons, as they did not come sufficiently under the head of virulent gonorrhœa.

"That the *two women*, above mentioned as having ulcers, infected the whole of the men diseased in garrison, during the preceding fifteen days, no one can for a moment admit even as likely; but, if it be allowed, that an altered secretion be sufficient for the production of this disease, (the ulcus elevatum) we shall at once have an explanation of how it happened, that the military hospitals continued to have their usual number of venereal cases, &c." (*Evans on Ulcerations of the Genital Organs, p.* 72, 73, *&c.*) From the investigations of the same author, the ulcus elevatum is the most frequent of all the sores met with on the genitals, and besides being excited by diseased secretions, and gonorrhœal matter, is *capable of being transferred by inoculation*, and even of originating spontaneously. (*P.* 67—81, *&c.*)

Lagneau admits, that gonorrhœa may not always proceed from the same poison, as the venereal disease; but, he believes, that in the greater number of instances, the virus is of the same quality. He is led to this opinion by the consideration of several women having been infected by the same man with *both* complaints, and of the two diseases having been communicated to several men who had cohabited with one woman, and *as is presumed with her alone*, at least, inasmuch as may relate to the possibility of any other infection weakening the conclusion attempted to be drawn from the case; a point, which has only been assumed, and by no means ascertained. However, be this and other similar narrations true, or not, in every particular, I agree with Mr. Guthrie in believing, that the evidence, adduced on the point under consideration, justifies the opinion, "that ulcers will arise on the penis from the matter of gonorrhœa; that gonorrhœa will in its turn be caused by the matter of these same ulcers, and that both occur in consequence of promiscuous, or uncleanly intercourse. *That many of the ulcers, produced in this manner, will occasionally assume every character of chancre, and cannot be distinguished from it,* I am perfectly satisfied of from repeated observation; but, I am equally certain, that a gonorrhœa in men, with the worst appearances and symptoms, can, and often does, arise from irritating causes common to parts free from any specific disease, or poison, is not distinguishable from one that has arisen from promiscuous intercourse, and that both complaints are curable in the same way, and without mercury." On the question, whether gonorrhœa, or the ulcers resulting from the matter of gonorrhœa, can produce constitutional symptoms, Mr. Guthrie believes, that they generally do not, although he does not affirm, that they cannot under particular circumstances of constitution; and he is further of opinion, that if such symptoms ever really arise, they become serious only in consequence of the exhibition of mercury. (See *Med. Chir.*

Trans. Vol. 8, *p.* 554.) Delpech considers the possibility of a general infection from the effect, of what he terms, a *syphilitic* gonorrhœa, completely proved; though he admits, that there are numerous instances, in which this consequence does not happen. He owns, that the distinction of one class of cases from the other is *à priori*, extremely difficult, and most frequently quite impossible. Yet widely dissenting from established modern practice, he inclines to ancient maxims, and considers it prudent to destroy the first effect of the infection, without delay, his aim being to shorten the duration of the discharge with cubebs, or copaiva, and then to introduce mercury into the system, through the same channel as conveys the virus into it, by rubbing the ointment on the integuments of the penis. (*Chir. Clinique, p.* 292.)

From what has been already observed, it must be evident, that one of the greatest obstacles to our arrival at a satisfactory knowledge of the nature of lues venerea, is the fact, that under this denomination, many various diseases are comprised and confounded, and the particular distinctions of each of which are not yet sufficiently made out, to enable surgeons to form a well-founded, and practical classification of them, satisfactory to every impartial observer, and agreeing with general experience. But though such progress has not yet been made, the attention of modern practitioners, and especially that of Mr. Carmichael, has been directed to the subject. In fact, notwithstanding some mysterious circumstances in particular syphilitic cases may not admit of complete and satisfactory explanation by the doctrine of a plurality of poisons, no intelligent surgeons, I believe, now suppose that the diseases, frequently communicated by sexual intercourse, always proceed from one peculiar poison. As Mr. Rose has observed, long before syphilis is supposed to have commenced its career in the world, some of these diseases were frequently met with, and Mr. Pearson thinks that, in addition to those formerly known, new forms of disease have occasionally arisen, "which are succeeded by a regular series of symptoms nearly resembling the progress of lues venerea." (*Obs. on the Effects of various articles of the Materia Medica in the Cure of Lues Venerea, 2d Ed. Introd. p.* 53; *and Rose in Med. Chir. Trans. Vol.* 8, *p.* 418.) Mr. Hunter also, in the seventh chapter of his Treatise on the Venereal Disease, speaks of many examples of new formed diseases, arising from peculiar poisons, quite different, he supposes, from every other virus previously known, or judged of by its effects. But, though Mr. Rose appears to join in the belief of a plurality of poisons, he is very far from considering it settled, how far the variety in the symptoms of venereal cases is to be attributed to different poisons, or how far the symptoms of the same poison may be modified and altered by constitution, climate, and habits of life. He remarks, that we seldom have an opportunity of tracing different cases to the same source of infection, and of comparing their progress with each other. (*Vol. cit. p.* 419.) And, I may add, that as far as observations of this nature have been made, and can be trusted, they rather tend to prove, as already noticed in the foregoing columns, that different individuals, when infected nearly at the same time and by the same woman, are very far from having any uniformity in their complaints; some having one kind of sore; some another; and others claps, &c. And, the tenor of the remarks, made likewise by Mr. Evans, as far as he has yet entered into the subject, lead equally to the conclusion, that one primary complaint, when it produces another, does not always occasion one resembling itself. Thus, the ulcus elevatum on the penis, though capable of being communicated by inoculation, appeared sometimes to be the effect of one kind of infection, sometimes of another, and sometimes even to have a spontaneous origin. Who shall unravel all these intricacies, I know not, whether he bring to his assistance plurality of poisons, or states of the parts and constitution, climate, neglect, wrong treatment, or any other circumstance, which can possibly be conceived to have influence over the appearances, progress, and consequences of the disease? Nay, it would appear from some of the curious and perplexing histories, mentioned in the preceding pages, that one kind of primary complaint in an individual may impart to other persons primary complaints of a different nature, so that even the hope of elucidating parts of this abstruse subject, by adverting to a plurality of infections, and a vigilant observation of their characteristic effects, meets with discouragement almost at its very birth; and though the doctrine of several kinds of poisons being concerned in the production of syphilis and syphiloid diseases still maintains its ground, an absolute proof of its correctness can hardly be said to have been yet afforded; nor indeed, could it be obtained, unless the inoculation of healthy individuals with the matter of the different forms of disease were justifiable for the elucidation of the question. And, as this is not the case, I think, with Mr. Carmichael, that it might be a benefit to society, if criminals were sometimes permitted to commute a heavier punishment by submitting to such experiments, without which the inquiry into the reality, number, nature, and effects of the morbid poisons under consideration, can perhaps never be brought to a satisfactory termination. "I am perfectly aware (says Mr. Carmichael), how much the state of the human constitution will modify local diseases, and am willing to attribute to a certain extent, the great variety of appearances we witness daily in venereal complaints, to this cause alone. But, we observe, that many of those primary ulcers evince, from their very commencement, such peculiar and distinct characters, that it would be quite an absurdity to believe, that the virus is always the same, and the variety of characters dependent alone upon constitution. Thus, nothing can be more opposite, from the commencement, than the common chancre, with its hardened base, like a piece of cartilage under the skin, and the sloughing ulcer. The first is slow and chronic; the latter begins with a mortified spot, extends by alternate sloughing and phagedenic ulceration, and makes more progress in three days, than the former in as many weeks.

"The phagedenic ulcer is equally distinct from chancre, as it does not evince, at any period, a hardened base, but gradually creeps from one part to another of the penis, leaving those parts to heal, which in the first instance, it attacked; so that, when the disease has existed for some months, the glans is seen to exhibit its entire surface, furrowed over with ulcerations and cicatrices.

"There is a raised ulcer, also, with elevated edges, approaching the nature of the phagedenic ulcer, yet, whose characters are sufficiently distinct to be considered as a separate species. But, the most common venereal primary ulceration presents such various appearances in different individuals, that, until a more exact knowledge is obtained, it is better described by its negative, than its positive qualities, and it may be designated an ulcer without induration, raised edges, or phagedenic surface.

"If (continues Mr. Carmichael) the plurality of venereal poisons is supported by the variety of primary ulcers, it is equally so by the multiplicity of constitutional eruptions. A primary ulcer, which was not phagedenic, or sloughing, at first, may afterwards, like any other ulcer, become so by irritation, neglect, or inflammation. But, I do not conceive that we have grounds for supposing, that the state of the constitution can so modify morbid poisons, as to cause the same virus to produce in one person the chronic scaly lepra and psoriasis, and to assume in another a decided pustular form, each pustule spreading rapidly into a deep ulcer." (*On the Symptoms and Specific Distinctions of Venereal Diseases*, p. 6, *&c.* 8*vo. Lond.* 1818.)

The same gentleman, in his Essays on this subject, published some years previously to the above date, gives his reasons for believing, that certain primary appearances are followed by a corresponding train of constitutional symptoms. 1st. That the syphilitic chancre gives rise to scaly eruptions, lepra, and psoriasis, an excavated ulcer of the tonsils, and pains and nodes of the bones. 2dly. That the ulcer, without induration, raised edges or phagedenic surface, gonorrhœa virulenta, an excoriation of the glans, and prepuce, are followed by a papular eruption, which ends in desquamation, pains in the joints resembling those of rheumatism, soreness of the fauces, and frequently swelling of the lymphatic glands of the neck; but without any nodes of the bones. 3dly. That the ulcer, with elevated edges, in the few instances in which it was traced by Mr. Carmichael to its constitutional symptoms, was followed by a pustular eruption, which terminated in mild ulcers, pains in the joints, and ulcers in the throat, but no appearance of nodes. 4thly. That the phagedenic and sloughing ulcers are generally attended with constitutional symptoms of peculiar obstinacy and malignity: viz. pustular spots and tubercles, which form ulcers, generally spreading with a phagedenic edge, and healing from the centre. Extensive ulceration of the fauces, particularly of the back of the pharynx, obstinate pains of the knees, and other joints, while nodes are frequently present, and the bones of the nose are occasionally affected. (See *Carmichael's Essays and his Obs. on the Symptoms, &c. of Ven. Diseases*, p. 9.)

The observations of other modern writers seem generally to coincide with those of Mr. Carmichael, respecting the great variety of character in primary venereal sores, and partly also with regard to the hypothesis of there being various kinds of poisons, or infectious matter. But, on some other great questions, immediately connected with these points, little similarity of opinion prevails between him and other gentlemen, who have laudably and impartially entered into the disquisition. And, in the first place, without adverting again to certain statements, already premised, which render it probable that differences of the virus, or, at all events, differences in the forms of the primary complaints in the contaminating individuals, would not always explain the reason of the diversified appearances and nature of the primary forms of disease in the contaminated, I shall lay before the reader other evidence, having an immediate relation to Mr. Carmichael's sentiment, that each kind of primary venereal sore is followed by a peculiar and corresponding train of constitutional symptoms. In the cases recited by Mr. Rose, "most of the papular eruptions followed ulcers, which were not very deep, and which healed without much difficulty. Several of them had a thickened, but not a particularly indurated margin. This corresponds with the observations of Mr. Carmichael:—*I could not, however, discover any decidedly uniform character in such sores;* and the 16th case I should have considered as a well-marked instance of chancre." (*Med. Chir. Trans. Vol.* 8. *p.* 399.) In another place, it is stated, that the appearances of sores can seldom be relied on in parts of such vascular structure, and in the midst of sebaceous glands. (*P.* 419.) With respect to the phagedenic ulcer, Mr. Rose expresses his belief, that it is rarely followed by secondary symptoms, though he inclines to the opinion, that it arises from the application of some morbific matter, acknowledging, however, the great difficulty of deciding, "whether the great degree of erethismus, excited by the local affection, should be attributed to any peculiarity in that matter, or is owing to the peculiar state of the constitution." (*Med. Chir. Trans. Vol.* 8, *p.* 372.) And he then refers to the case reported by Mr. Fergusson, where "the infection was communicated by an opera dancer at Lisbon, apparently in perfect health, who continued on the stage for several months afterwards, occasionally infecting others, without any thing extraordinary, as far as he could learn, in the nature of the symptoms." *Op.*) *cit. Vol.* 4, *p.* 12.) And, on the same subject, Mr. Guthrie does not think "that Mr. Carmichael's opinion, as to the secondary symptoms, peculiar to the phagedenic and sloughing ulcer, receives any support from what occurred to the troops in Portugal; because it did not appear, that either of them, following sexual intercourse, were dependent on the cause which produced the ulcer. Where many men have had intercourse with the same woman (and with no others?), they have not all had the same complaint, although one of the ulcers, so originating, has become phagedenic or sloughed; neither has the same woman herself suffered from this distemper: indeed, the nature of an ulcer of either kind must, after a short time, effectually prevent any intercourse; and we often find, that their peculiar characters only appear after the ulcer has existed for several days. I firmly believe also, that, in the greater number of cases of sloughing ulcer, *where mercury is not given, no secondary symptoms would appear:* and, in those cases in which they did appear, I apprehend, they would be equally dependent on the state of the constitution, as to the mode of cure, and their destructive characters. In other words, my observations lead me to conclude that *these ulcers do not depend upon a specific poison*, but *on the state of the constitution*, under particular excitement; and that, *when secondary symptoms occur, they are not dependent on the state of the ulcer;* although I am ready to admit, that, in a constitution where an ulcer will readily become phagedenic, the secondary symptoms, when they occur, may be different to a certain extent from those that follow more simple ulcers, in a healthier habit of body." (*Guthrie in Med. Chir. Trans. Vol.* 8, *p.* 564.) My observations lead me to believe, with Mr. Guthrie, that, primary *sloughing* ulcers do not depend upon any peculiar poison, and I am also disposed to join him in the opinion, that, when hurtful local treatment is out of the question, they are chiefly owing to the state of the constitution. According to my experience, all kinds of ulcers on the genitals, may, from particularity of constitution, impairment of health, and sometimes from the pernicious effects of the immoderate and indiscriminate employment of mercury, assume in their progress a sloughing disposition, and even have it from their very commencement. Mr. Rose mentions a case, in which a *healthy* young man was affected with a sloughing sore on the penis, in consequence of a suspicious connexion. It was not attended with any constitutional disturbance, and yielded readily to mercury. The same patient, twice afterwards, at a very considerable interval, had a fresh infection, and the sores each time had precisely the same character as the first. This, says Mr. Rose, is no uncommon occurrence, and it is not probable that the sloughing and appearance of the sores arose from the peculiarity of the poison. (*Med. Chir. Trans. Vol.* 8, *p.* 420.) And another intelligent and experienced surgeon, who has particularly attended to this investigation, declares his conviction, that "many varieties of sore, independently of the sloughy chancre, mentioned by Mr. Carmichael, lead to constitutional symptoms, differing in no respect from those he has described, and admitting of the same mode of cure." Nor does he believe, with Mr. Carmichael, that only one particular species of sore is capable of producing the true secondary symptoms of lues. (*J. Bacot, on Syphilis*, *p.* 51.)

From these observations, I think, we may safely infer, that, with respect to the *sloughing ulcer*, it neither arises from the application of any one specific poison to the part, nor is it connected with any regular train of secondary symptoms.

Dr. Hennen assures us, that he has frequently had occasion to observe, that eruptions of the same nature and character have succeeded to the foul indurated, excavated ulcer, and to the simple excoriation. "In fifteen cases of eruptions, unaccompanied by any other symptoms, which succeeded the Hunterian sore, six were tubercular, five exanthematous, two pustular, one tubercular and scaly, and one tubercular and vesicular.

"In four cases, following the same sore, but in which the eruptions were complicated, with sore throat, two were tubercular, one was tubercular and scaly, and one was tubercular and exanthematous.

"In twelve cases, following the *non* Hunterian sore, and in which eruptions were the only symptoms, six were pustular, three were exanthematous, and one was tubercular and scaly.

"In seven cases, where the eruption was accompanied with sore throat, three were exanthematous, two were tubercular, one was papular, scaly, and tubercular, and one was pustular and tubercular." Dr. Hennen also recites an instance, in which a Hunterian chancre was, at the distance of ten weeks, succeeded by a *papular eruption*, which, in the course of a month, was removed by low diet, purgatives, and the decoction of sarsaparilla. In two months afterwards, an eruption of a similar nature appeared without any fresh infection. This was treated with mercury, which was administered five weeks, so as to excite a moderate salivation. Under this treatment, the eruption faded, having, during its progress, assumed the appearance of *vesicles* and *pustules*, and at length falling off in amber-coloured *scales* with livid bases. Notwithstanding this mercurial course, the patient was a third time admitted, ten weeks afterwards, (without any intervening primary affection,) with a *pustular* eruption, which was finally cured without mercury, and the pustules falling off in squamulæ. In another month, without any fresh infection, he was a fourth time taken into hospital with a very thickly dispersed *pustular* eruption, somewhat different from the former, the pustules being more numerous, smaller, and acuminated. They yielded to non-mercurial treatment. During all these attacks there was aphthous sore throat, and occasional flying pains in the joints. The inference drawn from this case is, that even a full and judiciously conducted mercurial course does not prevent the reappearance of venereal eruptions, and that they assume at different times, different characters, notwithstanding the interruption they receive in their natural progress by the use of that remedy. (*On Military Surgery, Ed.* 2, *p.* 528—530.) After these accounts, I can have no hesitation in coming to another conclusion, which is, that, with the exception of the partial confirmation of Mr. Carmichael's doctrine by Mr. Rose, as far as relates to the frequency of papular eruptions after superficial primary ulcers, the regular connexion of particular forms, of secondary symptoms with any given descriptions of primary sores, is so far from being supported by the testimony of other observers, that one kind of primary ulcer may lead, in the same patient, to eruptions of several different sorts, either existing together on various parts of the body, or breaking out in succession; and no regular connexion can be traced between any one species of primary sore, and any determinate class of secondary symptoms. These truths, I believe, must be admitted, disadvantageous as they are to the prospect of bringing the diagnosis of syphilis to a final settlement, so as to enable the writer to describe the disease with accuracy, and the practitioner to recognise and treat it with certainty. The first essential step to the elucidation of this subject, however, is undoubtedly the subversion of every doctrine relative to it, which is repugnant to general experience. The same facts, which may render it necessary for Mr. Carmichael to retract some of his inferences, and which have now been established beyond all doubt or possibility of successful contradiction, by the very impartial, disinterested, and extensive investigations, made in the army hospitals, would have obliged even Hunter himself, had he been alive, to confess the mistaken views which he sometimes took of the nature of the venereal disease.

Amongst other doctrines, Mr. Hunter inculcates, that "the venereal matter, when taken into the constitution, produces an irritation, which is capable of being continued, independent of a continuance of absorption, *and the constitution has no power of relief*; therefore *a lues venerea continues to increase.*" The same criterion was proposed by Mr. Abernethy, who states, that the "constitutional symptoms of the venereal disease are generally progressive, and never disappear, unless medicine be employed." (*Surgical Observations, p.* 137.) And, notwithstanding some dissent may be traced in both old and modern writers from the belief, that mercury was absolutely essential to the cure of the venereal disease, and an opposite conclusion might easily have been drawn from the whole history of this subject, including the practice of former and present times, the contrary hypothesis was that always taught in all the great medical schools of this country, even down to so late a period as eight or ten years ago. But the error no longer prevails; and no facts are more completely established, than that mercury, however useful it may frequently be in the treatment of the venereal disease, is not absolutely necessary for the cure either of the primary or secondary symptoms; and that the disease, so far from always growing worse, unless mercury be administered, ultimately gets well, without the aid of this, or any other medicine. If any man yet doubt the general truth of this statement, let him impartially consider the many facts and arguments brought forward in proof of it in the anonymous tract "*Sur la non-existence de la Maladie Venerienne*," and in the writings of Mr. Fergusson, Mr. Rose, Dr. Hennen, Dr. Thomson, Mr. Guthrie, Mr. Bacot, and other modern practitioners. Perilhe, as I have already noticed, distinctly admitted the frequency of spontaneous cures, and so does Delpech. "Observation seems to prove (says he) that there are some individuals, in whom the lymphatic system appears to be endued with the fortunate property of extinguishing the syphilitic principle, so that merely primary symptoms occur." (*Chir. Chimique T.* 1, *p.* 341.) In short, if there be such a sceptic now living in this country, let him peruse the returns made by the surgeons of the whole British army, documents which will be noticed in the sequel of this article; let him consider the evidence of the surgeons of other countries, especially that of Cullerier, who annually demonstrates to his class of pupils the cure of venereal ulcers, without mercury; and the testimony and practice of the German surgeons, who were attached, during the war, to regiments of their countrymen in the British service. The fact is therefore indisputable, that the venereal disease, in all its ordinary and diversified forms, is capable of a spontaneous cure, and consequently, that the question whether the disease is syphilitic, or not, can never be determined by the circumstance of the complaint yielding, and being permanently cured, without the aid of mercury. Yet, as Mr. Rose has observed, the supposition, that syphilis did not admit of a natural cure, and that mercury was the only remedy that had the power of destroying its virus, was of late so much relied upon, that where a disease had been cured without the use of that medicine, and did not afterwards return, such fact alone, whatever might have been the symptoms, was regarded as sufficient proof that it was not a case of syphilis. And as the same writer very judiciously remarks, the refutation of these notions is of considerable importance, "not so much in reference to the treatment of syphilis, under common circumstances, for the strikingly good effects of mercury will probably not render it advisable in general to give up the use of that remedy, but from *the change it will produce in our views of the diagnosis of the disease.* The distinction which has engaged such a share of attention of late years, and which is evidently so important between syphilis and syphiloid diseases, has been made to depend so much on the former admitting of no cure, except by mercury, that, if this principle should be found to be erroneous, the difficulties which have attended it will in a great measure be explained." (*Med. Chir. Trans. Vol.* 8, *p.* 350, 351.) That it is erroneous, will appear more clearly when the treatment of syphilis falls under consideration.

Excluding from present attention, works of ancient date, it is curious to find, how very near several writers, within the last twenty or thirty years, arrived at the same point to which recent investigations have led. Thus, Mr. B. Bell observes, a chancre might frequently be cured with external applications alone, and as we know from experience, that the virus is not always absorbed, *the cure would in a few instances prove permanent*; but, as we can never with certainty know whether this would happen or not, while, in a great proportion of cases, there would be reason to think that absorption would take place, we ought not in any case to trust to it." (*On Gonorrhœa Virulenta, &c. Vol.* 2, *Ed.* 2, *p.* 325, *8vo. Edinb.* 1797.) And, in some reflections upon a case of doubtful nature, Dr. Clutterbuck long ago remarked: "Supposing even that the diseased appearances had after a time got well of themselves, *I should deem even this no absolute proof of their not being of a venereal nature.* I have seen cases, which induce me to believe, that *the venereal disease*, in some of its stages, and in certain circumstances, *may get well without mercury or any other remedy.* But this is contrary to the doctrine of Mr. Hunter, who supposed, that venereal actions go on increasing, without any tendency to wear themselves out. That lues venerea is much modified by climate, and other circumstances, is generally allowed; that it has been cured by other means than mercury, we have also very sufficient evidence, in the older writers on the subject: not to mention the late successful trials with acids, and other substances. *Many of the appearances on the skin go off spontaneously.* "When purple spots appear on the skin," (Mr. Hunter observes, *p.* 319,) "giving it a mottled appearance in this disease, many of the spots disappear, whilst others continue and increase." (*H. Clutterbuck, Remarks on some of the Opinions of the late Mr. John Hunter, p.* 27, *8vo. Lond.* 1799.) If Dr. Clutterbuck had advanced one step further, and declared that the venereal disease might be cured without mercury, or any other remedy, in all or nearly all its forms, and not merely in some of them, he would actually have anticipated the most important fact, recently established chiefly by the meritorious labours of the army surgeons, whose opportunities of making the investigation were better, on several accounts, than those of private practitioners, who generally soon lose sight of their patients, and never have them sufficiently under their control and observation to render a full perseverance in any method a matter of certainty. At all events, Dr. Clutterbuck may justly claim the merit of having distinctly marked the fact, that *the circumstance of a disease giving way, and being cured without mercury, is no proof that the case is not venereal.*

One of the most ingenious theories ever devised for explaining all the perplexities and irregularities of syphilis, is unquestionably that of the late Mr. Hunter; for it accommodated itself almost to every thing, and every believer in it fancied he could account satisfactorily for many puzzling occurrences, which admitted of no good explanation on other principles. Mr. Hunter inculcated, that the parts contaminated by the absorption of the venereal poison, do not immediately begin to be palpably diseased, but only acquire *a disposition to take on the venereal action*. He further believed, that when this *disposition* was once formed in a part, it necessarily changed into *action*, or manifest disease, at some future period. That mercury can cure the disease, when positively formed, but not the *disposition* to it. That although mercury cannot destroy the *disposition* already contracted, yet that it can prevent it from being formed at all. That the *disposition* never becomes the real disease, or, in Mr. Hunter's language, goes into action during the use of mercury. That the action having once taken place, always increases, never wearing itself out. That parts, once cured, never become again contaminated from the same stock of infection. And, that the matter of secondary ulcers, or those which break out in consequence of absorption, is not infectious. What Mr. Hunter meant by the term *disposition*, I think is better explained, than the grounds for the adoption of the theories connected with it: viz. the presumption of its being formed in all the parts, capable of contamination; the certainty of its future change into actual disease; the impossibility of curing it by mercury, previously to such change; but the possibility of preventing its formation at all by the timely use of that remedy.

Dr. Clutterbuck has well observed, that the only foundation for all these hypotheses, connected with the phrase *disposition*, is the fact, that *secondary symptoms sometimes arise, notwithstanding a full use of mercury.* If, says this gentleman, we were to suppose, with Mr. Hunter, that all the parts, which are susceptible, become at once contaminated, and mercury has no influence over them in this state, the constitution should become affected in almost all cases, for absorption probably always precedes the application of remedies. Either, therefore, mercury does prevent the future action, or a more frequent absence of susceptibility to the disease must be supposed, than there are grounds for imagining. (*Remarks on the Opinions of Mr. Hunter, p.* 9—12.) But surgeons of the present day, enlightened by many new facts unequivocally determined since Mr. Hunter's time, know very well, that a *disposition* to the disease is in many instances not produced at all, even though the matter of a chancre be supposed to be absorbed; since in a large proportion of cases of chancres, which had all the characteristic appearances of such ulcers, according to Mr. Hunter's own description, no secondary symptoms followed, though the patients were treated and cured without any mercury. Yet, if Mr. Hunter's theory were true, the disposition must have been produced, the action or disease itself in the form of secondary symptoms must have ensued, sooner or later, and no cure could have been ultimately effected without mercury. Fortunately for mankind, unsound as some of the theories seem, which are attached by Mr. Hunter to the supposed *disposition of the venereal disease*, or its latent form, there was one piece of advice given by him, which may be said to have had a beneficial effect in practice, though founded upon these very doctrines; and it was this: "that we should push our medicine no farther than the cure of the visible effects of the poison, and allow whatever parts may be contaminated to come into action afterwards." (*On the Venereal Disease, p.* 334.) This maxim, I know, has been regarded by some admirers of long salivations, as the cause of many relapses, and imperfect cures; but when I advert to the dreadful mischief, which formerly attended protracted courses of mercury for latent and imaginary complaints, my mind regrets, that Mr. Hunter himself should not have strictly adhered in practice to his own principle, from which he undoubtedly deviated with his patients, and even in certain other parts of his writings. However, the effect has been to discourage long courses of mercury; and perhaps, in this way, the world has been benefited by the counsel, though not rigorously adopted by him who gave it. Confessing my own inability to reconcile the various theories, about the nature and effects of the venereal poison, to many facts, which are disclosed in practice, I shall now proceed to offer a few remarks on each of the primary and secondary symptoms.

Chancres. The penis, as Mr. Hunter has observed, which in men is the common seat of a chancre, is, like every other part of the body, liable to diseases of the ulcerative kind, and, on some accounts, is rather more so than other parts. When attention is not paid to cleanliness, excoriations, or superficial ulcers often originate. The genitals, also, like almost every other part that has been injured, when once they have suffered from the venereal disease, are very liable to ulcerate again. Since, therefore, the penis is not exempted from common diseases, every judgment of the nature of ulcers upon it, as Mr. Hunter truly remarks, should be formed with great attention, particularly, as all diseases upon this part are suspected to be venereal. But, for a particular description of the many ordinary complaints which are apt to occur on the genitals, either preceded, or unpreceded, by sexual intercourse, I refer to Mr. Evans's treatise. (See *Pathological and Practical Remarks on Ulcerations of the Genital Organs, 8vo. Lond.* 1819.) From the facts already mentioned in this article, however, it would appear, that primary syphilitic ulcers, or chancres, by which I imply sores, capable of giving rise to the secondary symptoms of the venereal disease, have no determinate external character, are extremely diversified in their appearance, and absolutely cannot be distinguished by their mere look from sores, which are of a common, or at least a very different nature. This is another important fact, for which every man in the profession who seeks only truth, and the expulsion of errors from the doctrines of surgery, must feel obliged to the army surgeons. Nor is their merit lessened by the consideration, that the detection of mistake on this point, like the discovery of the error, concerning the invariable progress of the venereal disease from bad to worse, unless medicine be given, has taken place in opposition to the tenets of Mr. Hunter. "*Venereal ulcers* (says he) *commonly have one character*, which, however, is not entirely peculiar to them; for many sores, that have no disposition to heal, (*which is the case with a chancre,*) have so far the same character. *A chancre has commonly a thickened base*, and, although in some the common inflammation spreads much further, yet the specific is confined to this base." (*P.* 215.) And elsewhere, he observes, a chancre first begins with an itching in the part. When the inflammation is on the glans penis, a small pimple, full of matter, generally arises, without much hardness, or seeming inflammation, and with very little tumefaction; for the glans penis is not so apt to swell, in consequence of inflammation, as many other parts are, especially the prepuce. Mr. Hunter also explains, that chancres, situated on the glans, are not attended with so much pain and inconvenience, as sores of this nature on the prepuce. When chancres occur on the frænum, or particularly on the prepuce, a much more considerable degree of inflammation soon follows, attended with effects more extensive and visible. These latter parts, being composed of very loose cellular membrane, afford a ready passage for the extravasated fluids. The itching is gradually converted into pain; in some cases, the surface of the prepuce is excoriated, and afterwards ulcerates; while, in other examples, a small pimple or abcess appears on the glans, and then turns into an ulcer. *The parts become affected with a thickening, which at first, while of the true venereal kind, is very circumscribed;* not diffusing itself, as Mr. Hunter observes, gradually and imperceptibly into the surrounding parts; but *terminating rather abruptly. Its base is hard, and the edges a little prominent.* When it begins on the frænum, or near it, that part is very commonly wholly destroyed, or a hole is often made through it by ulceration. Mr. Hunter thought it better in general, under the latter circumstance, to divide the part at once.

When the venereal matter is applied to the body of the penis, or front of the scrotum, where the cuticle is thicker than that of the glans penis and prepuce, the chancre generally makes its appearance in the form of a pimple, which commonly forms a scab, in consequence of evaporation. The first scab is generally rubbed off; after which, a second, still larger one, is produced.

When the disease is more advanced, it is often attended with inflammation peculiar to the habit, becoming in many instances more diffused, and often producing phymosis, and paraphymosis. However, says Mr. Hunter, *there is yet a hardness around the sores, which is peculiar to such as are caused by the venereal virus*, particularly those on the prepuce.

Mr. Carmichael, also, in his arrangement of primary ulcers on the penis, considers the true chancre as being particularly distinguished by its hardened base, which he compares to a piece of cartilage under the skin. It is to be observed, however, that Mr. Carmichael, by the true chancre, or primary syphilitic ulcer, does not signify that it is the only sore from which secondary symptoms may arise; but his observations lead him to regard it as the cause of such constitutional effects, as belong to what he deems the true form of syphilis, or that in which the use of mercury is the most decidedly indicated. It would give me sincere pleasure to find any agreement on this part of the subject, amongst other observers. The reader, indeed, must already know, that the hardened base, which both Hunter and Carmichael have regarded as a distinguishing character of a true chancre, is not found to be so by other gentlemen, who have most impartially investigated this point. Thus Dr. Hennen observes, "we are not in possession of the knowledge of any invariable characteristic symptoms, by which to discriminate the real nature of the primary sore, and we are equally at a loss in many of the secondary symptoms. I am well aware, that some practitioners have assumed to themselves the possession of a 'tactus eruditus,' by which they can at once distinguish a chancre, or a venereal ulcer, or eruption, in which mercury is indispensable, from one of a different nature; but I have seen too many instances of self-deception to give them all the credit that they lay claim to. It would be by no means difficult to show, that the high round edge, the scooped or excavated sore, the preceding pimple, the loss of substance, *the hardened base and edge, whether circumscribed or diffused*, and the tenaciously adhesive discharge of a very fetid odour, are all observable in certain states and varieties of sores, unconnected with a venereal origin. The hardened edge and base, particularly, can be produced artificially by the application of escharotics to the glans, or penis, of a sound person, and, if any ulceration, or warty excrescence, previously exists on these parts, this effect is still more easily produced." (*On Military Surgery, Ed.* 2, *p.* 517.) Now, if it be asked, whether the chancre with a hardened base, and prominent edge, is distinguished by its not admitting of cure, without mercury? and by any regularity or peculiarity in the nature of secondary symptoms, when they originate from such an ulcer? modern experience denies the validity of both these criteria. If Mr. Rose's excellent paper be consulted, the reader will see, that this gentleman has certainly cured, without the aid of mercury, ulcers, which had a decidedly marked induration of the margins and bases, by which the syphilitic chancre, according to Mr. Carmichael, is easily distinguished. (*Med. Chir. Trans. Vol.* 8, *p.* 421, *&c.*; also, *Guthrie, Vol. cit. p.* 576.) And, as for the other points, sufficient evidence has already been detailed in the foregoing columns to satisfy any impartial mind, that, as far as the eye can teach us, no kind of primary sore has yet been satisfactorily proved to be the cause of only one set of peculiar constitutional symptoms; but, on the contrary, that a great variety of appearances in the skin, throat, &c. may follow sores, which, as far as external characters are concerned, seem exactly alike. The only partial exceptions to this remark, is the great frequency of papular eruptions after superficial sores; a point, on which both Mr. Carmichael and Mr. Rose agree, though the latter gentleman does not represent even this connexion as constant. Mr. Hunter computed, that claps occur more frequently than chancres, in the proportion of four or five to one: I am not prepared to offer any opinion on this calculation, in reference either to chancres, as defined by that interesting writer, or under the more comprehensive view of them, to which the results of modern investigations would lead. One intelligent writer, however, has observed, that present experience does not justify Mr. Hunter's conclusion respecting the infrequency of chancre compared with gonorrhœa. (*J. Bacot, Obs. on Syphilis, p.* 54.) Yet, in Dublin, if Mr. Carmichael's statement be correct, the frequency of gonorrhœa, as compared with that of what is sometimes termed the true venereal chancre, must be so great as to defy all computation; for he informs us, that since the descriptions of the success of the non-mercurial practice fell into his hands, he has been anxious to ascertain, by personal observation, whether true syphilitic chancres did really admit of being cured without mercury; but, says he, "this disease, as described by Hunter, has diminished in so extraordinary a degree in this country, that, strange to say, I have from that period met with only one case of true chancre." (*Observations on the Symptoms, &c. of Venereal Diseases, p.* 14.) As this chancre remained stationary a month, it was thought proper to employ mercurial frictions, and it then soon healed, leaving a callosity which continued two months longer. However, after the above passage was written, Mr. Carmichael met with two cases of "well marked chancre," each of which was attended with psoriasis syphilitica, scaly from its commencement. No mercury was given. For five weeks, the disease gained ground; but, in the end, both cases were cured, merely saraspilla having been administered. The following observations, contained in the appendix to Mr. Carmichael's work, do him infinite credit: "Although, (says he,) these two cases cannot fail to make a due impression, yet, if they stood alone, their evidence could not be deemed sufficient to establish a belief, that true syphilis, like the papular disease, is capable of yielding to the powers of the constitution, or to remedies in which mercury does not form an ingredient. But this deficiency seems to be in a great measure supplied by the testimony of Mr. Rose, Dr. Hennen, and other equally intelligent surgeons, who had the advantage of serving with our army on the continent; and, if in the preceding pages, I appear to be sceptical, with respect to the accuracy of their observations, and doubted that it was true chancre, and true syphilitic eruption, which yielded to their prescriptions unaided by mercury, these two cases have satisfied me, that every attention is due to the exactness and discernment of these respectable individuals; and, if I hesitated until I saw with my own eyes, and judged with my own understanding, I claim for my own observations no larger a measure of faith from others." And, he afterwards adds, "In thus relinquishing my opinion, that true syphilis differs from other venereal complaints, by always requiring mercury for its cure, it is necessary to reduce the doctrine I hold to this proposition: that, with respect to the use of that medicine, it differs from them only in not being injured, but decidedly benefited by it in all its symptoms and stages." (*P.* 218, 219.)

According to Mr. Hunter, there are three ways in which chancres may be produced: first, by the poison being inserted into a wound; secondly, by being applied to a non-secreting surface; and, thirdly, by being applied to a common sore. A wound, it seems, is much more readily infected, than a sore. To whichever of these three different surfaces the pus is applied, it produces its specific inflammation and ulceration, attended with a secretion of pus. The matter, produced in consequence of these different modes of application, he says, partakes of the same nature as the matter which was applied; because, he observes, the irritations are alike. How the alleged examples of very different primary sores being sometimes communicated by the application of the matter of chancre, are to be reconciled with the Hunterian doctrines, it is difficult to suggest, unless Mr. Carmichael's observation about the present excessive rarity of the true syphilitic chancre can furnish the explanation. However, as far as I can believe my own eyes and judgment, I now see in London the same forms of chancre which used to prevail during my apprenticeship at St. Bartholomew's Hospital, more than twenty years ago. And, if any difference can be particularized, it is only that which depends upon their being less rarely converted into worse diseases than mere syphilitic ulceration, by the dreadful effects of immoderate courses of mercury.

With respect to the three modes, in which Mr. Hunter speaks of the venereal poison being applied and taking effect, I know not why he should have altogether excluded secreting surfaces; for of this nature (as a late writer remarks) are the glans penis and corona glandis, (*Bacot on Syphilis, p.* 55,) and, of a similar kind are the insides of the labia, the surfaces of the nymphæ, &c., where sores are common enough. Whatever may be the truth of the impossibility of the formation of chancres within the urethra, the latter considerations certainly tend to prove, that the secreting nature of its membrane is not the only reason for the alleged fact.

I shall not here detain the reader with descriptions of the primary ulcer with elevated edges, the phagedenic, and the sloughing chancre. Such descriptions I have embodied, in the last edition of the First Lines of Surgery, with the sentiments of Mr. Carmichael, respecting the train of constitutional symptoms, appertaining, as he believes, to each form of ulcer. It is an interesting disquisition, but, as far as my observations and inquiries go, it has not yet reached any degree of certainty or precision; and, as I have already explained, the reports published by other gentlemen, engaged in this investigation, do not by any means confirm the much desired intelligence, that such progress has been made in the knowledge of all the diversified symptoms of the venereal disease, that its varieties can now be classed, both in regard to the primary ulcers, and the secondary symptoms connected with each description of chancre.

I firmly believe, that, with respect to all the appearances of this disease, both in its primary and secondary forms, a vast deal depends upon constitution, independently of the nature of the virus. And I adopt this opinion, at the same time that many reflections, already hinted at in this article, lead me to join in the belief, that syphilitic diseases may depend upon a variety of poisons, whereby some of the perplexity of these cases may be explained.

The local, or immediate effects of the venereal disease are seldom wholly specific; but, are usually attended both with the specific and constitutional inflammation. Hence, Mr. Hunter advises particular attention to be paid to the manner in which a chancre first appears, and to its progress. If the inflammation spreads in a quick and considerable way, the constitution must be more disposed to inflammation than natural. When the pain is severe, Mr. Hunter remarks, there is a strong disposition to irritation. Chancres, also, sometimes, soon begin to slough, there being a strong tendency to mortification.

It is also observed by Mr. Hunter, that when there is a considerable loss of substance, either from sloughing or ulceration, a profuse bleeding is no uncommon circumstance, more especially when the ulcer is on the glans. The adhesive inflammation does not appear to take place sufficiently to unite the veins of this part of the penis, so as to prevent their cavity from being exposed, and the blood escapes from the corpus spongiosum urethræ. The ulcers, or sloughs, often extend as deeply as the corpus cavernosum penis, and similar bleedings are the consequence.

With respect to chancres in women, the labia and nymphæ, like the glans penis in men, are subject to ulceration, and the ulcerations are generally more numerous in females than males, in consequence of the surface, on which the sores are liable to form, being much larger. As Mr. Hunter observes, chancres are occasionally situated on the edge of the labia; sometimes on the outside of these parts; and even on the perinæum. When the sores are formed on the inside of the labia or nymphæ, they can never dry, or scab; but, when they are externally situated, the matter may dry on them, and produce a scab, just as happens with respect to chancres situated on the scrotum, or body of the penis.

Mr. Hunter remarks, that the venereal matter from these sores is apt to run down the perinæum to the anus, and excoriate the parts, especially about the anus, where the skin is thin, and where chancres may be thus occasioned.

Chancres have been noticed in the vagina; but Mr. Hunter suspected that they were not original ones, but that they had spread to this situation from the inside of the labia.

Before any of the virus has been taken up by the absorbents, and conveyed into the circulation, a chancre is entirely a local affection. From the Hunterian doctrines, however, it would appear, that absorption must generally soon follow the occurrence of the sore; and all the modern opinions, concerning the nature of ulceration itself, would lead to the same inference. When no secondary symptoms take place after the cure of chancre without mercury, I believe few surgeons of the present day would attempt to account for the fact by the hypothesis of the matter not having been absorbed; and this observation is made, with every disposition on my part to express my assent to the truth of another circumstance, viz. that some persons appear much more susceptible of the effects of the venereal disease than other individuals. It is remarked by Mr. Hunter, that the interval, between the application of the poison, and its effects upon the parts, is uncertain; but that, on the whole, a chancre is longer in appearing than a gonorrhœa. However, the nature of the parts affected makes some difference. When a chancre occurs on the frænum, or at the termination of the prepuce, in the glans, the disease in general comes on earlier; these parts being more easily affected than either the glans penis, common skin of this organ, or the scrotum. He adds, that, in some cases, in which both the glans and prepuce were contaminated from the same application of the poison, the chancre made its appearance earlier on the latter part. Mr. Hunter knew of some instances, in which chancres appeared twenty-four hours after the application of the matter; and others, in which an interval of seven weeks, and even two months elapsed, between the time of contamination and that when the chancre commenced. However here, as in almost all other statements about this perplexing subject, we never know with certainty that the writer has sufficient grounds for the assumed fact, that it is only one kind of poison which is spoken of.

It was one of Mr. Hunter's opinions, that the ulceration, arising from venereal inflammation generally, if not always, continues till cured by art, and his theoretical reason for this circumstance was, that, as the inflammation in the chancre spreads, it is always attacking new ground, so as to produce a succession of irritations, and hinder the disease from curing itself.

It was, no doubt, the foregoing opinion of Mr. Hunter, which formed the authority for the position, which was always forcibly insisted upon in the surgical lectures which I attended some years ago in London, viz. that all venereal complaints, when not counteracted by remedies, invariably grow progressively worse and worse. But modern experience apprises us, that this doctrine is far from being correct. As I have noticed in the foregoing pages, Mr. Ferguson assures us, that, in Portugal, the disease in its primary state amongst the natives is curable without mercury, and by simple topical treatment; that the antisyphilitic woods, combined with sudorifics, are an adequate remedy for constitutional symptoms; and that the virulence of the disease has there been so much mitigated, that, after running a certain course (commonly a mild one) through the respective orders of parts, according to the known laws of its progress, *it exhausts itself, and ceases spontaneously.* (See *Med. and Chir. Trans. Vol.* 4, *p.* 2—5.) In the third edition of the *First Lines of the Practice of Surgery*, it was sufficiently proved from several conclusions drawn from the writings of Mr. Pearson, (*Obs. on the Effects of Various Articles in the Cure of Lues Venerea*,) that venereal sores might be benefited, and even healed, under the use of several inert insignificant medicines. And, as I have previously explained, the possibility of curing chancres and other venereal complaints, without mercury, was long since remarked by Dr. Clutterbuck, who thence very justly inferred, that the healing of a sore without this remedy was no test that it was not venereal. (See *Remarks on the Opinions of the late John Hunter*, 1799.)

But, although the whole history of the venereal disease, and of the various articles of the materia medica, if carefully reflected upon, must have led to the same conclusion, the truth was never placed in such a view as to command the general belief of all the most experienced surgeons in this and other countries of Europe. I do not mean to say, that the truth was not seen and remarked by several of the older writers; for, that it was so any man may convince himself by referring to several works quoted in the course of this article. But, it is to be understood, all indecision could never be renounced, as long as prejudices interfered with the only rational plan which could be adopted, with the view of bringing the question to a final settlement; I mean experiments on a large and impartial scale, open to the observation of numerous judges, yet under such control as insured the rigorous trial of the practice. Nor could such investigation be so well made by any class of practitioners as the army surgeons, whose patients are numerous, obliged to follow strictly the treatment prescribed, without any power of going from hospital to hospital, or from one surgeon to another, as caprice may dictate, or of eluding the observation of the medical attendants after a seeming recovery. And here I must take the opportunity of stating, that, as far as my judgment extends, the most important and cautious document yet extant, on the two questions of the *possibility* and *expediency* of curing the venereal disease without mercury, is the paper of Mr. Rose. For let it not be presumed, that because the army surgeons find the venereal disease curable without mercury, they mean to recommend the total abandonment of that remedy for the distemper, any more than they would argue that *possibility* and *expediency* are synonymous terms. At the time when Mr. Rose published his observations, he had tried the non-mercurial treatment in the Coldstream Regiment of Guards, during a year and three quarters, and had thus succeeded *in curing all the ulcers on the parts of generation, which he met with in that period, together with the constitutional symptoms to which they gave rise.* "I may not be warranted in asserting, (says this gentleman,) that many of these were venereal, but, undoubtedly a considerable number of them had all the appearances of primary sores, produced by the venereal virus, and arose under circumstances, where there had been at least a possibility of that virus having been applied. *Admitting that there is nothing so characteristic in a chancre as to furnish incontrovertible proof of its nature*, it will yet be allowed, that there are many symptoms common to such sores, although not entirely peculiar to them, and whenever these are met with, there are strong grounds to suspect, that they are the effects of the syphilitic virus. In a sore, for instance, appearing shortly after suspicious connexion, where there is loss of substance, a want of disposition to granulate, and an indurated margin and base, there is certainly a probability of that poison being present. Amongst a number of cases of such a description, taken indiscriminately, the probability of some being venereal is materially increased, and must at last approach nearly to a certainty. On this principle, some of the sores, here referred to, must have been venereal. They were also seen by different surgeons, on whose judgment

I would rely, who agreed in considering many of them as well marked cases of true chancre." (*Rose in Med. Chir. Trans. Vol.* 8, *p.* 357, *&c.*) The men, thus treated, were examined, almost every week, for a considerable time after their apparent cure, "both that the first approach of constitutional symptoms might be observed, and that any deception from an underhand use of mercury might be guarded against." (*P.* 359.) Sixty cases of ulcers on the penis were also cured by Mr. Dease, in the York Hospital, by means of simple dressings, the only general remedy being occasional purgatives. The practice was likewise extensively tried by Mr. Whymper and Mr. Good, surgeons of the Guards, with the same kind of success. In Mr. Rose's practice, all idea of specific remedies were entirely laid aside. The patients were usually confined to their beds, and such local applications were employed as the appearances of the sores seemed to indicate. Aperient medicines, antimony, bark, vitriolic acid, and occasionally sarsaparilla were administered. (*P.* 363.) "*Upon an average* (says Mr. Rose) *one out of every three of the sores, thus treated, was followed by some form or other of constitutional affection:* this was in most instances mild, and sometimes so slight, that it would have escaped notice, if it had not been carefully sought for. The constitutional symptoms were evidently not such as could be regarded as venereal, if we give credit to the commonly received ideas on the subject. *Caries of the bones*, and some of the least equivocal symptoms, *did not occur*. In no instance was there that uniform progress, with unrelenting fury, from one order of symptoms and parts affected to another, which is considered as an essential characteristic of true syphilis." (*Med. Chir. Trans. Vol.* 8, *p.* 422.) The constitutional symptoms also yielded, without the aid of mercury, and frequently primary sores, corresponding to what had been called the true chancre, with indurated base, were cured in this manner, yet were followed by no secondary symptoms. We are also informed, that "several cases occurred of a cluster of ill-conditioned sores over the whole inner surface of the prepuce; and behind the corona glandis; and also of a circle of small irritable sores, situated on the thickened and contracted ring at the extreme margin of the prepuce. These occasionally produced buboes." *None of the sores of this description, met with by Mr. Rose, were followed by any constitutional affection.* (*Vol. cit. p.* 370.) He bears testimony to the ill effects of mercury and stimulants in cases of phagedenic ulcers, and confirms a not uncommon opinion, that they are seldom followed by secondary symptoms, which opinion should be qualified with the condition mentioned by Mr. Guthrie, (*Med. Chir. Trans. Vol.* 8, *p.*565.) that no mercury be given. Lastly, as I have already stated, Mr. Rose observed, that most of the cases of papular eruptions followed ulcers, which were not very deep, and healed without much difficulty. (*P.* 399.)

Although the fact of the *possibility* of curing every kind of ulcer on the genitals, without mercury, is now so fully confirmed by the statements of Mr. Guthrie, (*Med. Chir. Trans. Vol.* 8, *p.* 558 and 576.); Dr. I. Thomson, (*Edinb. Med. and Surg. Journ. for January*, 1818); Dr. Hennen, (*Op. cit. Nos.* 54 *and* 55, *and Principles of Military Surgery, Ed.* 2.); Mr. Bacot, (*On Syphilis, p.* 26, *&c.*); and many other careful observers, and it is of great importance in relation to the removal of an erroneous doctrine concerning the diagnosis, the *expediency* of the practice must evidently be determined by other considerations, the principal of which are the comparative quickness of the cures effected with and without mercury; the comparative severity and frequency of secondary symptoms; and the generally acknowledged fact, that a syphilitic primary sore is not indicated with any degree of certainty by its mere external character, or indeed any other criterion that I know of.

Respecting the comparative quickness of the cures of chancres, or reputed chancres, without the aid of mercury, much disagreement prevails in the different reports, even those collected by the same individuals, whose statements must therefore be deemed perfectly impartial, though inconclusive. (See *Hennen's Military Surgery, Ed.* 2, *p.* 536, *&c.*) Some of Mr. Rose's best marked cases of chancre, that is to say, such as were distinguished by the indurated base and circumference, healed in a very short time. But, even respecting these or any other kinds of chancre, no regularity on this point can be found. Mr. Guthrie observes, if the "ulcers were not without any marked appearance, and did not amend in the first fortnight, or three weeks, they generally remained for five, or seven weeks longer; and the only difference, in this respect, between them and the raised ulcer of the prepuce was, that this often remained for a longer period, and that ulcers, possessing the true character of chancre, required in general a still longer period for their cure, that is, from six, eight, to ten, and, in one case, even twenty-six weeks, healing up and ulcerating again on a hardened base. Those that required the greatest length of time had nothing particular in their appearance that would lead us to distinguish them from others of the same kind, that were healed in a shorter time." *Med. Chir. Trans. Vol.* 8, *p.* 558.) The same writer afterwards expresses his belief, that almost all the protracted cases would have been cured in one half, or even one third of the time, if a moderate course of mercury had been resorted to.

In relation to the question before us, one of the most important documents, which I have met with, is an official circular, signed by Sir James M'Grigor and Sir Wm. Franklin, from which it appears, that, in 1940 cases of primary venereal ulcerations on the penis, *cured without mercury*, between December, 1816, and December, 1818, (including not only the more simple sores, but also a regular proportion of those with the most marked characters of syphilitic chancre) the average period taken up by the treatment, when bubo did not exist, was 21 days; with bubo 45 days. (See *Hennen's Military Surgery, Ed.* 2, *p.* 545.) And it further appears, that, during the period above specified, 2827 chancres, a more considerable proportion of which were probably Hunterian chancres, were treated with mercury, and that the average period, required for the cure when there was no bubo, was 33 days; with bubo, 50. As far therefore as a judgment can be formed from this official estimate, and no calculation is ever likely to be furnished on a larger or more impartial scale, the evidence tends to prove, that primary sores may generally be cured rather sooner without, than with, the administration of mercury. But, as practitioners are not obliged to restrict themselves either to the mercurial, or non-mercurial practice, I am of opinion, that the total rejection of mercury is by no means justified by any facts yet before the public, concerning the time requisite for the cure on either plan, because, as it is universally admitted that *some* cases are very tedious, unless mercury be given, neither reason nor experience will sanction the exclusive adoption of only one mode of practice, whether the backwardness to heal exist or not. On the contrary, as far as the consideration of time has weight, prudence and common sense teach us to diversify the treatment according to circumstances. But, it may be inquired, since the backward disposition of a sore to heal cannot be known at first by its mere appearance, should the treatment begin with mercury or not? Now, although late writers dwell very much on the impossibility of judging of the nature of a sore by its look alone, one fact is certain, that some ulcers on the penis have a clean appearance from their very commencement; some cases are simple excoriations; and others, though ill-conditioned, are so small, that a fair chance offers itself of destroying every part of the disease with caustic. In all such cases, I should never commence with mercury. With respect to phagedenic and sloughing chancres, repeated experience has convinced me, that they are cases, in the first stage of which, at all events, mercury should always be avoided; and I believe, with Mr. Guthrie, that when this is strictly done, secondary symptoms are rare. One sore of this kind was long ago pointed out by Mr. Pearson, as not requiring mercury, and the attention of surgeons has been of late particularly directed to it by Mr. Bacot. "It is characterized by a great derangement of the general health, by a high state of inflammation of the part, by great local pain, and proceeds rapidly to the destruction of the parts. The situation of this sore is most commonly in the angle between the prepuce and glans penis; and those of a full habit of body, the young and the vigorous, are most liable to its attack. The most prompt and vigorous antiphlogistic means are necessary to arrest the progress of this sore; and the blood taken away in these cases presents the usual inflammatory appearances, frequently in a very high degree. The exhibition of mercury, in this species of sore, is highly mischievous, and productive of the worst consequences; nor does it often happen, that secondary symptoms succeed, &c. (*On Syphilis, p.* 57.) Here, according to Mr. Pearson's observations, made many years ago, mercury is not perhaps necessary for the security of the constitution; but, I conceive, it might be more correct to say, that the safety of the constitution actually requires, that mercury should be strictly avoided, because there is some ground for believing, that, in these instances, it is not only injurious to the local disease, but conducive to secondary symptoms. However, if the latter symptoms should arise, notwithstanding mercury has not been administered during the cure of the ulcer, alterative doses of that medicine may still be useful, as Mr. Carmichael observes, when the disease is in the wane, but, not until then, previously to which period, the best internal remedies are antimonials, sarsaparilla, guaiacum, compound powder of ipecacuanha, arseniate of kali, the nitrous acid, and nitro-muriatic bath. (See *Obs. on the Symptoms, &c. of the Venereal Disease, p.* 209.)

With respect to chancres, with a hardened base and margin, it certainly appears that, many of them have healed tolerably fast without mercury; but a large proportion of them seem to be tedious, when that medicine is not employed. (See three cases recorded in the work last quoted.) It may be thought, however, that the official document, circulated by Sir James M'Grigor and Sir Wm. Franklin, tends to prove, that, at all events, these sores heal sooner without than with mercury. But this conclusion seems hardly allowable, because, as these faithful and impartial reporters have sensibly remarked, the 2827 sores, treated with mercury, may be fairly presumed to have partaken of the character of Hunter's chancre in a greater proportion than the 1940 primary sores treated without mercury. (See *Hennen's Military Surgery, p.* 545.) Consequently, though the sores, treated with mercury, seem, on the average, to have healed more slowly than others treated without it; yet it is to be taken into the account, that a larger number of the first cases were ulcers with a hardened base and margin, and that if they had not had the mercurial treatment extended to them, it is possible their complete cure might generally have been still more tedious. As the evidence now stands, therefore, I conceive it right to employ mercury with moderation, for all sores on the penis, having the characters of the Hunterian chancre, and appearing after a suspicious connexion.

A consideration, however, which ought to have greater influence than the slowness or quickness of the cure of primary sores with and without mercury, is the question whether, upon the average, secondary symptoms are more frequent after the non-mercurial practice, than the other? On this most interesting point, the reports vary, as indeed they do on almost every matter in the investigation, excepting the facts of the possibility of curing all forms of the venereal disease without mercury, the great rarity of any affection of the bones, and the general mildness of the secondary symptoms, when that medicine is not employed. On all these points, the testimonies are strong and convincing. But, while Mr. Rose found secondary symptoms take place in one third of his cases treated without mercury, (*Med. Chir. Trans. Vol.* 8. *p.* 422.) the proportion in the York, and some other hospitals, was only about one-tenth. (*Vol. cit. p.* 559.) In the 1940 cases of primary sores on the penis, treated without mercury, in the army hospitals, between Dec. 1816, and Dec. 1818, there were only 96 instances of secondary symptoms of different sorts, or not more than $\frac{1}{20}$. But the proportion of cases of secondary symptoms in the cases of primary ulcers, treated with mercury, was still smaller, and this in an important degree, being only 51 out of 2827 cases, or about $\frac{1}{55}$. Were it not necessary here to make a considerable allowance for the probable circumstance of the Hunterian chancre prevailing most in the cases treated with mercury, a point admitted by Sir James M'Grigor and Dr. Franklin, we should here have a powerful and decisive evidence in favour of the general superiority of mercury for the prevention of secondary symptoms. Nor am I certain, that the conclusion can be much weakened by the probability of the difference here alluded to, because from the evidence of late brought to light, respecting the nature of the class of diseases which go under the name of syphilis, we have no right to infer, that what has been called the true, or Hunterian chancre, is more disposed, than some other primary sores, to occasion secondary symptoms. Indeed, Mr. Guthrie declares, in the cases referred to in his paper, that where mercury was not used, these symptoms more frequently followed the raised ulcer of the prepuce, than the true characteristic chancre of syphilis affecting the glans penis. (*Med. Chir. Trans. Vol.* 8. *p.* 577.) On the whole, as the reports now stand, and as far as I can judge from cases which I have seen myself, the secondary symptoms are more frequent when primary ulcers are promiscuously treated without mercury. But it by no means follows, from this fact, that the way to have the smallest possible number of cases of secondary symptoms is to employ mercury in all instances of sores on the genitals. This both reason and experience contradict, inasmuch as mercury, given in cases which do not require it for the security of the constitution, is frequently itself a source of cutaneous diseases, sore-throats and nodes, which, without its baneful influence, would never have occurred. The prudent course seems here to be to exercise our judgment and discretion, and to be guided, in some measure, by the appearance and progress of the sore, according to principles already suggested; for, though the look of a sore may not, in the present state of our knowledge, always enable us to form a certain inference respecting the risk of secondary symptoms, if mercury be omitted, it cannot be said that the danger would be positively obviated by having recourse at once to mercury in every kind of primary sore; and, notwithstanding every thing which has been lately published, I still flatter myself, that surgeons, accustomed to see much of venereal cases, can yet distinguish excoriations, boils, simple healthy sores, and some other similar ailments, (see *Evans on Ulcerations of the Genital Organs*, 8*vo. Lond.* 1819,) from ulcers, by which the constitution is liable to be affected. Until further data exist, I cannot venture to lay down other directions about the treatment of primary sores. It is with pleasure, however, that I subjoin the advice of other gentlemen, whose sentiments and talents deserve respect, though their opinions may not exactly agree with my own. "In every primary ulcer (says Dr. Hennen), I would give up the idea of using mercury at first, treating it as if it were a simple ulceration, by cleanliness, rest, and abstinence, and applying to it the most simple and mildest dressings. If the sore did not put on a healing appearance in a reasonable time, the extent of which must depend upon the circumstances of the patient, I should make use of more active dressings. But if, beyond all calculation, it remained open, I should certainly not sacrifice every consideration to a dislike of mercury, knowing how many persons have been seriously benefited by a judicious and mild administration of that remedy." (*On Military Surgery, Ed.* 2. *p.* 518.) When primary ulcers resist common means a certain time, Mr. Bacot would also have recourse to mercury. (*On Syphilis, p.* 69.) Like me, however, the latter author does not approve of invariably postponing that remedy, until the latter criterion, viz. the backwardness of the sore to be healed by other methods, is afforded.

Whenever the employment of mercury in this work is recommended, I am very far from wishing to be thought an advocate for *pushing* that medicine, as the phrase is. On the contrary, experience has fully convinced me, that in no forms of chancre, nor in any other stages of the venereal disease, is it proper to exhibit mercury in the unmerciful quantity, and for the prodigious length of time, which custom, ignorance, and prejudice, used to sanction in former days. Violent salivations, at all events, ought to be for ever exploded.

When I was an apprentice at St. Bartholomew's Hospital, most of the venereal patients in that establishment were seen with their ulcerated tongues hanging out of their mouths; their faces prodigiously swelled; and their saliva flowing out in streams. The wards were not sufficiently ventilated, and the stench was so great, that the places well deserved the appellation of *foul.* Yet, notwithstanding mercury was thus *pushed*, (as the favourite expression was,) it was then common to see many patients suffer the most dreadful of mutilations, in consequence of sloughing ulcers of the penis; other patients, whose noses and palates were lost; others, who were covered with nodes and dreadful phagedenic sores.

Happily, at the present day, this attachment to violent salivations no longer prevails; simple excoriations and common ulcers are more attentively discriminated; and, even in what are reputed to be true syphilitic chancres, mercury is seldom given, except in very moderate doses, or such quantities as only gently affect the gums and salivary glands. The surgeon, now no longer blinded with the continual fear of the rapid and furious progress of syphilis when not duly unresisted by mercury, avoids the very mode of practice, which was itself the cause of all the aggravated forms of the disease. The consequence is, that very bad instances of the ravages of lues venerea are now hardly ever observed in the above hospital, and the few aggrevated cases, which are met with, are generally in that state previously to their admission. Another benefit also resulting from modern investigations, which prove that chancres, and all other varieties of the venereal disease, do not *absolutely* require mercury for their cure, is the safety, with which it is now known, that the use of such medicine may be postponed, where the patient's present state of health would not well bear its exhibition. And, I know, that an ignorance of this fact formerly caused the death of many poor sufferers.

The greater present mildness of syphilitic diseases in England, I ascribe chiefly to the more judicious treatment now adopted, and not to any change or modification in the nature of the disorder. There are others, however, who may think, as Mr. Fergusson does with regard to syphilis in Portugal, that the disease has exhausted a great deal of its virulence from long continuance amongst us. But before we are altogether justified in drawing such a conclusion, we must forget all the bad practice, which prevailed in former days, and which, in my opinion, is sufficient to account for the more severe forms, in which syphilis then presented itself.

According to Mr. Hunter's ideas, the most simple method of treating a chancre is to extirpate it with caustic, or the knife, whereby it is reduced to the state of a common sore, or wound, and heals up as such. However, he sanctions this practice only on the first appearance of the chancre, when the surrounding parts are not yet contaminated; for, he says, it is absolutely necessary to remove the whole of the diseased part, and this object is exceedingly difficult of accomplishment, when the disease has spread considerably. When the chancre is situated on the glans penis, he thought touching the sore with the lunar caustic preferable to cutting it away, because the hemorrhage from the cells of the glans would be considerable after the use of the knife.

The caustic should be pointed at the end, like a pencil, in order that it may only touch such parts as are really diseased; and its application should be repeated till the surface of the sore, after the separation of the last sloughs, assumes a red and healthy appearance, when it will heal like any other sore made with caustic.

When the sore is on the prepuce, or the common skin of the penis, and in an incipient state, the same practice may be adopted with success. When the chancre is large, however, it cannot be destroyed with the argentum nitratum, which does not extirpate the increasing sore deeply enough. In such cases, Mr. Hunter thought, that the potassa cum calce might answer better. When the caustic could not be conveniently employed, this author sometimes recommended the excision of chancres, a plan which he had adopted himself, and the part afterwards healed with common dressings. However, says he, as our knowledge of the extent of the disease is not always certain; and as this uncertainty increases with the size of the chancre, the cure must be in some measure promoted by proper dressings, and it will be prudent to dress the sore with mercurial ointment. When a chancre is destroyed almost immediately on its first appearance, Mr. Hunter believes, that there is little danger of the constitution being infected, as it is reasonable to conclude, that there has not been time for absorption to take place. However, on account of the impossibility of being certain on this point, he recommends mercury to be given, from motives of prudence, the quantity of which medicine, he says, should be proportioned to the duration and progress of the sore. When the chancre is large, Mr. Hunter deems mercury *absolutely necessary*, and he conceives, that very little good is to be done by the extirpation.

Amongst modern advocates for the application of caustic to chancres, Delpech is one of the most zealous: and the nitrate of mercury is that which he commonly employs: he abstains from the practice however, when much inflammation is present. (*Chir. Clinique T.* I.)

With respect to dressings for chancres, Mr. Hunter seems to have placed a good deal of confidence in those which contain mercury; but, I do not believe, that the same attachment to them prevails now, which existed twenty years ago. And the established fact of mercury not being *absolutely* necessary in any way for the cure of different venereal sores, must have the effect of removing some prejudices on this part of the subject. As common mercurial ointment is always more or less rancid, I have found it in many cases a bad kind of dressing; and now never apply it to ulcerated surfaces. In ordinary cases, I believe, astringent lotions, made with the sulphate of copper, acetate of lead, alum, &c. answer the best. Some chancres are indolent, and require stimulants, like the hydrargyri nitrico-oxydum blended with ointment, the unguentum hydrargyri nitrati more or less weakened, or a solution of the nitrate of silver. Mr. Hunter, always partial, even in cases of indolent chancres, to mercurial dressings, expresses his preference to a salve, containing calomel, as being more active, than common mercurial ointment. In phagedenic and sloughing chancres, the carrot and fermenting poultices, solutions of the extracts of hemlock and opium; but, particularly, bread and water poultices with opium, and lotions of the arseniate of kali, nitrous acid, and nitrate of silver, merit trial.

In general Mr. Hunter was an advocate for changing the dressings very often, because the matter separates them from the sore, so as to diminish their effect. He states, that changing the applications thrice a day, will not be found too often, particularly when they are in the form of an ointment.

When the venereal nature of a chancre is removed, the sore frequently becomes stationary, in which case Mr. Hunter observes, that new dispositions have been acquired, and the quantity of disease in the part has been increased. When chancres are only stationary, Mr. Hunter says, they may often be cured, by touching them slightly with the lunar caustic.

In these cases, no cicatrization, seems possible, till the contaminated surface, or the new flesh which grows on that surface, has either been destroyed or altered. When sores are situated under the prepuce, where they are concealed by a phymosis, some emollient, or gently astringent lotion, should frequently be injected under the fore-skin, so as to wash out any matter, which might otherwise lodge there, and cause additional irritation.

Contrary to the doctrines which the facts of modern experience have now fully established, Mr. Hunter believed, that *mercury should be given in every case of chancre*, however slight, and even when it has been destroyed by caustic, or other means, on its very first appearance. *The remedy*, he says, *should be continued for some time after the chancre has healed, in order to hinder the venereal disposition from forming.* Here we find even Hunter himself falling into some inconsistencies; for, in other parts of his work, he seems to approve of the principle of giving mercury only when actual and visible disease exists, because it cannot cure the disposition to it even if it exists. Now, though the chancre is cured, no further absorption of the virus from it is possible, and whatever *disposition* to the disease can arise from absorption, must have already been formed, and, therefore, cannot be prevented, and, according to Mr. Hunter's own theory, the virus has been long ago expelled from the system, together with some of the excretions, mercury is recommended with the view of protecting the constitution. However, if Mr. Hunter's explanations are not altogether satisfactory on this part of the subject, I believe the fault is in his theory, because, in cases where mercury is deemed advisable, general experience appears to sanction the practice of continuing its use for some time after the chancre is perfectly healed. Yet many exceptions to this rule present themselves; for, if a chancre is large, and very long in healing, its syphilitic character is generally extinct a good while before cicatrization is completed, and perseverance in mercury, under these circumstances, would be both an absurd and a dangerous practice.

Hence, in a great measure, the cause of the numerous instances of the *mercurial* disease, as Mr. Mathias has named it, and which, in former days, did far more mischief than syphilis itself. (See *An Inquiry into the History and Nature of the Disease produced in the Human Constitution by the Use of Mercury, 3d Ed. 8vo. Lond.* 1816.) This part of the subject is noticed by Mr. Hunter, who states, that, in very large chancres, it may not always be necessary to continue either the external or internal administration of mercury till the sore is healed; for the venereal action is just as soon destroyed in a large chancre, as it is in a small one, since every part of the sore is equally affected by the medicine, and, of course, cured with equal expedition. But in regard to cicatrization, circumstances are different, because a large sore is longer than a small one in becoming covered with skin. Hence, according to Mr. Hunter, a large chancre may be deprived of its venereal action, long before it has healed; while, on the other hand, a small one may heal before the syphilitic affection has been destroyed. In the latter case, he represents it as most prudent, both on account of the chancre and constitution, *to continue the employment of mercury a little while after the sore is healed*; advice which, as I have already stated, is at variance with certain parts of his own theory, however well justified it may be by experience.

As Mr. Hunter has explained, chancres, both in men and women, often acquire, during the treatment, new dispositions, which are of various kinds, some retarding the cure, and leaving the parts in an indolent thickened state, after the cure is accomplished. In other instances, a new disposition arises, which utterly prevents the parts from healing, and often produces a much worse disease than that from which it originated. Such new dispositions may lead to the growth of tumours. They are more frequent in men than women, and generally occur only when the inflammation has been violent from some peculiarity of the parts, or constitution. They have sometimes been considered as cancerous.

Among the diseases in question, Mr. Hunter notices those continued, and often increased inflammations, suppurations, and ulcerations, which become diffused through the whole prepuce, and, also, along the common skin of the penis, which becomes of a purple hue, attended with such a general thickening of the cellular membrane, as makes the whole organ appear considerably enlarged. The same writer observes, that the ulceration on the inside of the prepuce will sometimes increase, and run between the skin and the body of the penis, and eat holes through different places, till the whole is reduced to a number of ragged sores. The glans often shares the same fate, till more or less of it is gone. Frequently, the urethra in this situation is wholly destroyed by ulceration, and the urine is discharged some way farther back. The ulceration, if unchecked, at length destroys all the parts. In this acute case, prompt relief is demanded; but often the proper mode of treatment cannot be at once determined, owing to our ignorance, with respect to the exact nature of the peculiar cause of the disease. Mr. Hunter states, that the decoction of sarsaparilla is often of service, when given in large quantities; and that the extract of hemlock and sea-bathing are sometimes capable of effecting a cure. According to my own experience, the omission of mercury is here the most essential.

Sometimes after a chancre has healed, the cicatrix breaks out again, and puts on the appearances of the preceding sore. Occasionally, similar diseases break out in different places from that of the cicatrix. Mr. Hunter believes, that they differ from a chancre in generally not spreading so fast, nor so far; in not being so painful, nor so much inflamed; in not having such hard bases as venereal sores have; and in not producing buboes. This writer is of opinion, that they are not venereal, and he states, that they are very apt to recur.

Mr. Hunter does not specify any particular mode of cure for all these cases; but he mentions one instance, which seemed to be cured by giving forty drops of the liquor potassæ, every evening and morning, in a basin of broth; and he adverts to another case, which was permanently cured by sea-bathing.

In some instances, after a chancre has healed, the parts, as Mr. Hunter remarks, do not ulcerate; but appear to become thickened, and indurated. Both the glans and prepuce seem to swell, so as to form on the end of the penis a tumour, or excrescence, shaped very much like a cauliflower, and, when cut into, showing radii, running from its base, or origin, towards the external surface. It it extremely indolent, and not always a consequence of the venereal disease; for Mr. Hunter has seen it arise spontaneously.

No medicine seems to be at all likely to cure the disease; the only successful means is to amputate a considerable part of the penis, and then to keep a proper catheter introduced in the urethra.

Another disposition, induced by the previous occurrence of chancres, is that to excrescences, or cutaneous tumors, called warts. These are frequently considered not simply as a consequence of the venereal poison, but, as possessed of its specific disposition, and therefore, says, Mr. Hunter, surgeons have recourse to mercury for the cure of them; and it is said that such treatment often removes them. This eminent practitioner never saw mercury produce this effect, although the medicine was given in sufficient quantity to cure recent chancres, and a lues venerea, in the same person. (See *Wart.*)

Mr. Hunter takes notice of sloughs, which occur in the tonsils, from the effect of mercury on the throat, and are apt to be mistaken for venereal complaints. He also mentions, that, sometimes, when the original chancre has been doing well, and been nearly healed, he has seen new sores break out on the prepuce, near the first, and assume all the appearance of chancres.

When, in the treatment of chancres, a bubo arises, while the constitution is under the influence of a sufficient quantity of mercury to cure such sores, which medicine has also been rubbed into the lower extremity, on the same side as the bubo, Mr. Hunter suspects, that the swelling in the groin is not venereal, but is produced by the mercury. In these cases, he always preferred conveying mercury into the system in some other manner.

With respect to the treatment of chancres in women, since it is difficult to keep dressings on the parts, Mr. Hunter advises the sores to be frequently washed with some mercurial solution, and speaks of one, made with oxymuriate of mercury, as perhaps being the best, since it will act as a specific, and stimulant also, when this is requisite. When the chancres, however, are irritable, they are to be treated in the same manner as similar complaints in men. When the sores extend into the vagina, this passage must be kept from becoming constricted, or closed, by the introduction of lint.

Sometimes, after a chancre and all venereal disease are cured, the prepuce continues thickened and elongated, so that the glans cannot be uncovered. Perhaps, the case is often without remedy. Mr. Hunter, however, very properly recommends trying every possible means, and he informs us, that the steam of warm water, hemlock fomentations, and cinnabar fumigations, are frequently of singular service.

When the thickening and enlargement of the prepuce cannot be removed by applications, all the portion, anterior to the glans penis, may be cut away. (See *Phymosis.*)

Bubo. The immediate consequence of a chancre, which is called a bubo, and also the remote effects, implied by the *constitutional, or secondary symptoms*, arise from the absorption of recent venereal matter from some surface, where it has either been applied or formed.

We are already aware, that Mr. Hunter believed the matter of gonorrhœa to be capable of communicating the venereal disease. Hence, he explains in the following terms, the three ways in which he thought a bubo might arise in consequence of absorption. He observes, that the first and most simple manner is when the matter, either of a gonorrhœa, or chancre, has only been applied to some sound surface, without having produced any local effect on the part; but, has been absorbed, immediately after its application. Mr. Hunter affirms, that he has seen instances of this kind, though he confesses that they are very rare, and that in most cases, apparently of this nature, a small chancre may be found to have existed.

The second mode of absorption, or that taking place in a gonorrhœa, Mr. Hunter represents as more frequent. That secondary symptoms do occasionally follow gonorrhœa is now commonly admitted, though whether they differ essentially from those which follow true chancres, is a point not yet completely settled. Delpech describes them as of the same nature, (*Chir. Clinique T.* 1.) but his facility of belief in the multiplied effects of syphilis and gonorrhœa is almost unbounded. On a point of this kind, therefore, I should not attach much importance to his opinion. However, as far as Mr. Carmichael's experience goes, there is a difference, a part of which consists in the eruption being of the papular kind, as it is also after many instances of simple primary ulcers. (See *Obs. on the Symptoms, &c. of Venereal Diseases*, 8vo. *Lond.* 1818.

The third mode is the absorption of matter from an ulcer, which may either be a chancre, or a bubo. This mode is by far the most common, and it proves, with many other circumstances, that a sore, or ulcer, is the most favourable for absorption. Mr. Hunter believed, that absorption was more apt to take place from sores on the prepuce, than those on the glans.

A fourth mode of absorption is from a wound, a case, which according to Delpech, is almost constantly followed by an eruption on the face, soon extending all over the body, and very quickly followed by sore throat, periostoses, and pains in the bones. In short, his idea is, that when the poison is absorbed from a wound, especially one that has not suppurated, its operation is peculiarly rapid and violent. (*Chir. Clinique. T.* 1. *p.* 334.)

Mr. Hunter notices, that, what is now commonly understood by a bubo, is a swelling, taking place in the absorbing system, especially in the glands, and arising from the absorption of some poison, or other irritating matter. When such swellings take place in the groin they are called buboes, whether they proceed from absorption, or not.

Mr. Hunter regards every abscess in the absorbing system as a bubo, whether in the vessels, or the glands, when it originates from the absorption of venereal matter.

The matter is taken up by the absorbent vessels, and is conveyed by them into the circulation. In its passage through these vessels, it often affects them with the specific inflammation. The consequence is the formation of buboes, which are venereal abscesses. These are exactly similar to a chancre in their nature and effects, the only difference being in regard to size. As the lymphatic vessels and glands are irritated by the specific matter, before it has undergone any change in its passage, the inflammation produced, and the matter secreted, partake of the specific quality.

Inflammation of the absorbent vessels themselves is not nearly so frequent as that of the glands. In men, such inflammations, in consequence of chancres upon the glans, or prepuce, generally appear like a cord, leading along the back of the penis from the sores. Sometimes, the absorbents inflame, in consequence of the thickening and excoriation of the prepuce in gonorrhœa. The indurated lymphatics often terminate insensibly near the root of the penis, or near the pubes; while, in other instances, they extend further to a lymphatic gland in the groin. Mr. Hunter believed, that this affection of the absorbent vessels is truly venereal. The formation of a hard cord, he conceived, arose from a thickening of the coats of the absorbents, and from an extravasation of coagulable lymph on their inner surface.

A cord, of the above kind, often suppurates, sometimes in more places than one, so as to form one, two, or three buboes, or small abscesses in the body of the penis.

Inflammation much more frequently affects the absorbent glands, than the vessels. The structure of the former parts appears to consist of the ramifications and reunion of the absorbent vessels. From this structure, observes Mr. Hunter, we may reasonably suppose, that the fluid absorbed is in some measure detained in the glands, and thus has a greater opportunity of communicating the disease to them, than to the distinct vessels.

Swellings of the absorbent glands may originate from other diseases, and should be carefully discriminated from those which arise from the venereal poison. With this view, Mr. Hunter advises us first to inquire into the cause, in order to ascertain, whether there is any venereal complaint at some greater distance from the heart, such as chancres on the penis, or any preceding disease in this situation. He recommends us to inquire, whether any mercurial ointment has been at all applied to the leg and thigh on the diseased side; for mercury, applied to those parts for the cure of a chancre, will sometimes cause glandular enlargements, which are occasionally mistaken for venereal buboes. This irritation of the inguinal glands by the mechanical action of mercurial ointment, has also been particularly noticed by Professor Assalini, who states, that he has had frequent opportunities of convincing himself of the fact. (See *Manuale di Chirurgia, p.* 67.) Mr. Hunter reminds us to observe, whether there has been any preceding disease in the constitution, such as a cold, fever, &c. The quick or slow progress of the swelling is likewise to be marked, and the tumour must be distinguished from femoral hernia, lumbar abscesses, and aneurisms of the crural artery. In particular cases, it would appear, that some time elapses before the venereal matter produces its effects on the absorbent glands after its absorption. Mr. Hunter notices, that, sometimes, at least, six days transpire first; a circumstance, which can only be known by the chancres having healed six days before the bubo began to appear. However, as the last matter of a chancre is probably not venereal, he infers, that, in cases of this kind, absorption must have taken place earlier than other considerations would lead one to suppose. According to Mr. Hunter, in general, only the glands nearest to the seat of absorption are attacked. Thus, when the matter is taken up from the penis in men, the inguinal glands are affected; and, when from the vulva in woman, those glands swell, which are situated between the labium and thigh, and the round ligaments.

It was one of Mr. Hunter's opinions, that only one gland at a time is commonly affected by the absorption of venereal matter. If this sentiment be correct, the circumstance may be considered as a kind of criterion between venereal and other buboes. The second *order* of lymphatic vessels and glands are never affected; as, for instance, those along the iliac vessels, or back. Mr. Hunter informs us, that he also observed, that when the disease was contracted by a sore, or cut upon the finger, the bubo occurred a little above the bend of the arm, by the side of the biceps muscle, and no swelling of this sort formed in the arm-pit. However, he had heard of a few rare cases, in which a swelling in the axilla was also produced.

When buboes arise from a venereal disease on the penis, they are situated in the glands of the groin. When a bubo arises from a gonorrhœa, either groin may be attacked. But when the disease originates from a chancre, the bubo most frequently takes place in the nearest groin.

The situation of the absorbent glands, however, is not always exactly the same, and the course of the lymphatics therefore is subject to some variety. Hence, Mr. Hunter has seen a venereal bubo, produced by a chancre on the penis, situated a considerable way down the thigh; he has also often seen buboes as high as the lower part of the belly, before Poupart's ligament; and sometimes near the pubes. At the present day, swellings of the femoral glands are never considered venereal.

The seat of absorption is more extensive in the female sex, and the course of some of the absorbents is also different. Hence, buboes in women may occur in three situations, two of which are totally different from those in men.

When chancres are situated forwards, near the meatus urinarius, nymphæ, clitoris, labia, or mons veneris, the absorbed matter is generally conveyed along one, or both of the round ligaments; and the buboes are formed in those ligaments, just before they enter the abdomen. Mr. Hunter suspected such buboes not to be glandular ones; but only inflamed absorbents.

When chancres are situated far back, near or on the perinæum, the absorbed matter is carried forward along the angle, between the labium and the thigh, to the glands in the groin, and often, in this course, small buboes are formed in the absorbents similar to those *abscesses* which occur on the penis in men.

When the effects of the poison do not rest here, a bubo in the groin may be occasioned in the same manner as in men.

Owing to the difficulty of being sure that women are quite free from infection, it is often more difficult to decide in them, than in men, whether a bubo is venereal or not. In men, who have had no local complaint, the bubo can only be venereal when direct absorption from the surface of the skin has taken place.

A bubo, says Mr. Hunter, commonly begins with a sense of pain, which leads the patient to examine the part, where a small hard tumour is to be felt. This increases, like every other inflammation that has a tendency to suppuration, and unless checked, pus forms, and ulceration follows, the matter making its way to the skin very fast.

The above celebrated writer remarks, however, that there are some cases, which are slow in their progress. This circumstance he imputes either to the inflammatory process being kept back by mercury; or other means, or to its being retarded by a scrofulous tendency.

The inflammation, he says, is at first confined to the gland, which may be moved about in the cellular membrane; but, when the part has enlarged, or when the inflammation and suppuration are more advanced, the surrounding parts become more inflamed, and the tumor is more diffused. Some buboes become complicated with an erysipelatous and œdematous affection, by which they are rendered more diffused, and less disposed to suppurate.

Mr. Hunter allows, that to distinguish, with certainty, the true venereal bubo from other swellings of the glands in the groin, may be very difficult. He represents the true venereal bubo, in consequence of a chancre, as being most commonly confined to one gland. It preserves its specific distance till suppuration has taken place, and then becomes more diffused. It is rapid in its progress from inflammation to suppuration and ulceration. The suppuration is commonly large, considering the size of the gland, and there is only one abscess. The pain is very acute, and the inflamed part of the skin is of a florid red colour.

Mr. Hunter describes such buboes, as arise without any visible cause, as being of two kinds. One sort inflame and suppurate briskly. These he always suspected to be venereal, although he allows there was no proof of it, and only a presumption deduced from the quick progress of the disease.

The second kind are generally preceded and attended with slight fever, or the common symptoms of a cold, and they are generally indolent and slow in their progress. If they are quicker than ordinary, they become more diffused than venereal buboes, and they are often not confined to one gland. When very slow, they give but little sensation; but, when quicker, the sensation is more acute, though not so much so as in venereal cases. They usually do not suppurate, and often become stationary. When they do suppurate, it is in a slow manner, and, frequently, in more glands than one, while the inflammation is more diffused and not considerable, in relation to the swelling. The matter makes its way to the skin slowly, and the part affected is of a more purple colour. Sometimes, the abscesses are very large, yet not painful.

In considering whether the swellings of the inguinal glands are or are not venereal, the first thing to be attended to is, whether or not there are any venereal complaints. If there are none, Mr. Hunter observes, that there is a strong presumptive proof, that the swellings are not venereal. When the swelling is only in one gland, very slow in its progress, and gives but little or no pain, it is probably merely scrofulous. However, when the swelling is considerable, diffused, and attended with some inflammation and pain, the constitution is most probably affected with slight fever, the symptoms of which are lassitude, loss of appetite, want of sleep, small quick pulse, and an appearance of approaching hectic. Such swellings are long in getting well, and do not seem to be affected by mercury, even when very early applied.

Mr. Hunter mentions his having seen the above affection of the groin, together with the constitutional indisposition, take place, where there were chancres; and he was puzzled to determine, whether the disease in the groin was sympathetic, from derangement of the constitution, or whether it arose from the absorption of matter. He had long suspected, that there was a mixed case, and was at last certain, that such a case might prevail. He had seen instances, in which the venereal matter, like a cold, or fever, only irritated the glands to disease, producing in them scrofula, to which they were disposed.

In such cases, says Mr. Hunter, the swellings commonly arise slowly, give but little pain, and if mercury be given to destroy the venereal disposition, their progress is accelerated. Some suppurate while under this resolving course; and others, which probably had a venereal taint at first, become so indolent, that mercury has no effect upon them, and, in the end, they either get well of themselves, or by other means.

According to Mr. Hunter, buboes are local complaints.

When a bubo is judged to be venereal, and only in an inflamed state, an attempt is to be made to resolve the swelling. The propriety of the attempt, however, depends on the progress which the disease has made. If the bubo be very large, and suppuration appears to be near at hand, resolution is not likely to be effected. When suppuration has already taken place, Mr. Hunter much doubted the probability of any success attending the endeavour, which now may only retard the suppuration, and protract the cure.

The resolution of these inflammations, says Mr. Hunter, depends *principally on mercury, and almost absolutely on the quantity, which can be made to pass through them. When suppura-*

tion has taken place, the cure also depends on the same circumstances. Hence, he recommended the mercury to be applied to such surfaces, as allow the remedy, when absorbed, to pass through the diseased gland. In this manner, he conceived, that the disease in the groin might be subdued, and that the constitution would be less likely to be contaminated. At the same time, he admitted, that the situation of many buboes is such, as not to have much surface for absorption beyond them; for instance, the buboes on the body of the penis, arising from chancres on the glans, or prepuce. This principle has been much insisted upon by Delpech in his late work. (*Chir. Clinique, T.* I. *p.* 301.)

As venereal buboes are in effect, a consequence of chancres, or venereal sores, and glandular swellings in the groin may take place from other kinds of sores, or local irritations, and even from various constitutional causes, while modern surgeons profess their incapacity always to pronounce the character either of a primary sore, or a bubo, by its first appearance and progress, it is evident, that the same difficulties present themselves here, as in cases of primary sores, respecting the principles by which the treatment should be guided. It is likewise to be remembered, that *buboes,* when supposed to be decidedly syphilitic, *are not,* as Mr. Hunter imagined, *absolutely incurable without mercury.* The firm confidence also, which Mr. Hunter had, and Delpech still has, in the doctrine of the benefit derived from the practice of rubbing mercury into surfaces, from which it would be conveyed directly to the diseased glands, so as both to resolve the swelling and preserve the constitution, is not now regarded as an unquestionable subject. As Mr. Bacot has judiciously remarked, there is some inconsistence in Mr. Hunter's own statements upon this point; for, in one place he affirms, that mercury, applied to the legs and thighs for the cure of a chancre, will sometimes cause, instead of dispersing, a bubo. (*P.* 404.) And, Mr. Bacot believes himself, that mercury as frequently promotes the suppuration of buboes, as their dispersion. (*On Syphilis, p.* 74.) And, respecting the practice of trying to make the mercury pass through the diseased glands, Mr. Hunter rather contradicts himself in another page, where he confesses his own doubts of its utility in suppurated buboes. However, Mr. Hunter admits, that mercury alone is not always capable of effecting the cure of such buboes as are deemed venereal; and when the inflammation rises very high, he approves of bleeding, purging, and fomentations. When the inflammation is erysipelatous, he has a high opinion of bark; and, when it is scrofulous, he praises hemlock, and poultices made with sea water. He was also aware of the fact of emetics sometimes occasioning the absorption of the matter of buboes, after it is distinctly formed.

If there is generally great difficulty in pronouncing at first the nature of a primary sore, as to the question of its being syphilitic or not, the same difficulty must occur with respect to judging of the glandular swellings, excited by it: And, on this account, and from the encouraging circumstances, that all buboes may be cured without mercury, and that the course of the venereal disease, unresisted by that mineral, is not so terrible and incurable, as used to be supposed, some surgeons, instead of having immediate recourse to mercury, prefer a little delay, in order to see, whether the swelling will subside, or not, under the use of common antiphlogistic means: Thus Dr. Hennen disapproves of using mercury immediately a bubo presents itself; and he states, that the same principles, which guide him in the primary ulcers, would have the same if not greater force, in the case of buboes. "In their irritable state (says he) I consider mercury altogether inadmissible." (*On Military Surgery, Ed.* 2, *p.* 518.)

Although the correctness of some of the principles, by which Mr. Hunter regulated his practice in buboes, must now be questionable, inasmuch as he calculates too much on the absolute necessity for mercury, and on the usefulness of making it pass through the diseased glands, I conceive, that some of his directions are yet too important to be excluded from this work. He says, the quantity of mercury, necessary for the resolution of a bubo, must be proportioned to the obstinacy of the complaint; but that *care must be taken not to extend the employment of the medicine so far as to produce certain effects on the constitution.* When the bubo is in a situation, which admits of a large quantity of mercury being rubbed in, so as to pass through the swelling, and when the complaint readily yields to the use of half a drachm of mercurial ointment, every night, the mouth not be coming sore, or at most, only tender, Mr. Hunter thinks it sufficient to pursue this course, till the gland is reduced to its natural size. In this manner, the constitution will probably be safe, provided the chancre, which may have caused the bubo, heal at the same time. When the mouth is not affected in six or eight days, and the gland does not readily resolve, then two scruples, or a drachm, may be applied every night; and, continues Mr. Hunter, if there should still be no amendment, even more must be rubbed in. In short (says he) if the reduction is obstinate, the mercury must be pushed as far as can be done *without a salivation.*

When there is a bubo on each side, so much mercury cannot be made to pass through each, as the constitution in general will not bear this method. However, Mr. Hunter sanctions the plan of minding the soreness of the mouth less in this kind of case; though, he adds, that *it is better to let the buboes proceed to suppuration, than to load the system with too much mercury.*

When the situation of buboes will not allow an adequate quantity of absorbed mercury to pass through them, the frictions must be continued in order to affect the constitution; but, according to Mr. Hunter in this case, more mercury will be requisite, than when the remedy can be made to pass directly through the diseased gland; an assertion which may now be doubted.

Many buboes remain, without either coming to resolution or suppuration; and notwithstanding every attempt to promote these changes, the glands become hard and scirrhous, Mr. Hunter conceived, that these cases are either scrofulous at first, or become so as soon as the venereal disposition is removed. He advises the use of hemlock, sea-water, poultices, and sea-bathing.

According to a modern surgeon, of judgment and considerable experience, when buboes are in a chronic stationary state, the application of blisters to the swelling is attended with the most beneficial effects. And, he rightly observes, that when such tumors are extremely hard and indolent, it is more advantageous to let the patient have the benefit of the open air, excercise, and his accustomed mode of living, than to confine him in an hospital. (*Assalini, in Manuale di Chirurgia, p.* 64; *Milano*, 1812.) Stimulating the skin with the antimonial ointment is also sometimes a good practice.

The suppuration of buboes frequently cannot be prevented by any known means. They are then to be treated, in some respects, like any other abscess. Before opening buboes, Mr. Hunter conceived it advantageous to let the skin become as thin as possible, because a large opening would then be unnecessary, and no measures requisite for keeping the skin from closing, before the bottom of the sore had healed.

Mr. Hunter was doubtful, whether the application of mercury should be continued through the whole suppuration. He was inclined to continue it; but, in a smaller quantity.

There has been much dispute, whether a bubo should be opened, or allowed to burst of itself, and whether the opening should be made with a cutting instrument, or caustic. On this subject, Mr. Hunter remarks, that there is no peculiarity in a venereal abscess to make one practice more eligible than another. The surgeon, he says, should be guided in some degree by the patient. Some patients are afraid of caustics; others of cutting instruments. But, when the surgeon has the choice, Mr. Hunter expresses a preference to opening the bubo with a lancet, in which method, no skin is lost. But, he observes, that when a bubo is very large, and there will be a great deal of loose skin, after the discharge of the matter, he thinks, that caustic may, perhaps, be better, as it will destroy some of the redundant skin, and occasion less inflammation, than what is caused by an incision. The potassa cum calce is the caustic commonly employed.

After the bubo has been opened, surgeons usually poultice it, as long as the discharge and inflammation are considerable, and then they employ dressings, which must be of a quality, adapted to circumstances. In the mean while, mercury is continued, both to make the bubo heal, and prevent the bad effects, which might otherwise arise from the matter being continually absorbed.

The mercurial course is to be pursued, till the sore is no longer venereal. But, in general, since this point is difficult to ascertain, Mr. Hunter advises the continuance of mercury till the part has healed, and even somewhat longer, if the bubo has healed very quickly; for the constitution is apt to become contaminated. However, he did not approve of this long use of mercury in all cases; because buboes often assume, besides the venereal, other dispositions, which mercury cannot cure, and will even exasperate.

Sometimes the sores, when they are losing, or entirely deprived of the venereal disposition, become changed into ulcers of another kind, and, most probably, of various kinds. How far it is a disease arising from a venereal taint, and the effects of a mercurial course jointly, says Mr. Hunter, is not certain. He suspected, however, that the nature of the part, or constitution, had a principal share in the case, and I believe, few surgeons of the present time entertain any doubt of the abuse of mercury being a very frequent cause, independently of any other circumstance. (See *Mathias on the Mercurial Disease, Ed.* 8.)

Mr. Hunter observes, that such diseases make the cure of the venereal affection much more uncertain, because, when the sore becomes stationary, or the mercury begins to disagree, we are ready to suspect, that the virus is gone; but this (he supposes) is not always the case. He had seen some buboes exceedingly painful and tender to almost every thing that touched them, and the more mild the dressings were, the more painful the parts became.

In some instances, the skin alone becomes diseased. The ulceration spreads to the surrounding integuments, while a new skin forms in the centre, and keeps pace with the ulceration, so that an irregular sore, which Mr. Hunter compares with a worm-eaten groove, is formed all round. It appears only to have the power of contaminating the parts which have not yet been affected; and those which have, readily heal. According to the same author, when buboes become stationary, and are little inclined to spread, attended with a sinus, or two, hemlock, joined with bark, is the medicine most frequently serviceable. It is to be used both externally and internally. Mr. Hunter also speaks favourably of sarsaparilla, sea-bathing, and sea-water poultices. He states, that at the Lock Hospital, gold refiners' water has been found an useful application; and that in some cases, benefit has arisen from drinking large quantities of orange-juice, and from the use of mezereon.

Lues Venerea. Surgeons imply, that a *lues venerea* has taken place, when the venereal virus has been absorbed into the circulation. Mr. Hunter does not think the epithet *constitutional* strictly proper in its application to this form of the venereal disease. By *constitutional* disease, he observes, he should understand that, in which every part of the body is acting in one way, as in fevers of all kinds; but, the venereal poison seems to be only diffused through the circulating fluids, and, as it were, to force certain parts of the body to assume the venereal action, which action is perfectly local. To use Mr. Hunter's phrase, it takes place in different parts in a regular succession of susceptibilities. Only a few parts are acting at the same time; and a person may be constitutionally affected in this way, and yet almost every function may be perfect.

The venereal poison is generally conveyed into the system from a chancre. It may also, according to Mr. Hunter's doctrine, be absorbed from a gonorrhœa. There is likewise a possibility of its getting into the circulation from the surface of the body, without any previous ulceration. According to his doctrine, it may be absorbed from common ulcers, *without necessarily rendering them venereal;* and it may be taken up from wounds, in which cases, it generally first causes ulceration.

Venereal Ulcers. In consequence of the blood being contaminated with real venereal pus, it might be expected, that the local effects, thus produced, would be similar in their nature to those producing them. Mr. Hunter believed that this is not the case. He notices, that the local effects, from a constitutional contamination, are all of one kind, viz. ulcers, let the effects make their appearance on any surface whatever, either the throat, or common skin. But, Mr. Hunter conceived, that if the matter, when in the constitution, were to act upon the same specific principles as that which is externally applied, a gonorrhœa would arise, when it affected a canal, and only sores or chancres, when it attacked other surfaces.

Mr. Hunter found, that even the sores, which are caused in the throat, are very different from chancres. He says, that the true chancre produces considerable inflammation, often attended with a great deal of pain, and quickly followed by suppuration. But the local effects, arising from the virus in the constitution, are slow in their progress, attended with little inflammation, and are seldom or never painful, except in particular parts. However, Mr. Hunter allows, that this sluggishness in the effects of the poison depends on the nature of the parts diseased; and, he owns, that when the tonsils, uvula, or nose, are affected, the progress of the morbid mischief is rapid, and bears a greater resemblance to a chancre, than when it occurs on the skin. Even in those parts, Mr. Hunter thought that the ulcers were attended with less inflammation than chancres, which were spreading with equal celerity.

Before the time of Mr. Hunter, the matter secreted by sores, which arise from a constitutional infection, was always considered to be of a poisonous quality, like the matter of a chancre. At first, one would expect that this must actually be the case, because venereal matter is the cause, and mercury cures chancres, and also ulcers proceeding from a lues venerea. Mr. Hunter remarks, however, that the latter circumstance is not a decisive proof, since *mercury is capable of curing many diseases, besides the venereal.* He also takes notice, that when pus is absorbed from a chancre, it generally produces a bubo; but that a bubo is never occasioned by the absorption of matter from a venereal sore, arising from the virus diffused in the circulation. For instance, when there is a venereal ulcer in the throat, no buboes occur in the glands of the neck; when there are syphilitic sores on the arms, or even suppurating nodes of the ulna, no swellings form in the glands of the arm-pit, although these complaints occur when fresh venereal matter is applied to a common sore on the arm, hand, or fingers. No swelling is produced in the groin, in consequence of nodes, or blotches, on the legs and thighs.

Some very important experiments are related in Mr. Hunter's Treatise on the Venereal Disease, in order to prove, that the matter from a gonorrhœa, or chancre, is capable of affecting a man locally, who is already labouring under a lues venerea, and that the matter from secondary syphilitic sores has not the same power. The particulars, however, are too long to be inserted in this book.

Parts most susceptible of the Lues Venerea, &c. Some parts of body seem to be much less susceptible of lues venerea than others: indeed, Mr. Hunter observes that, as far as our knowledge extends, certain parts cannot be affected at all. The brain, heart, stomach, liver, kidneys, and several other viscera, have never been known to be attacked by syphilis.

The first order of parts, or those which become affected in the early stage of lues venerea, are the skin, tonsils, nose, throat, inside of the mouth, and sometimes the tongue.

The *second order of parts*, or those which are affected at a later period, are the periosteum, fasciæ, and bones.

Mr. Hunter conceived, that one great reason for the superficial parts of the body suffering the effects of the lues venerea sooner than the deep-seated ones, depends on the former being more exposed to external cold. He remarked, that even the second order of parts do not all become diseased at the same time, nor every where at once. But, on the contrary, such as are nearest the external surface of the body are first diseased, as for instance, the periosteum, bones of the head, the tibia, ulna, bones of the nose, &c. Neither does the disease affect these bones equally on all sides; but first on that side which is next to the external surface. It was Mr. Hunter's belief, however, that the susceptibility of particular bones did not altogether depend upon their nearness to the skin; but, upon this circumstance and their hardness together.

The foregoing account by no means agrees with the results of modern inquiries into the nature of the venereal disease; for, unless mercury be given, it appears, that the bones are very seldom affected by it. Thus, in the cases which were treated by Mr. Rose without mercury, he observes, that "the constitutional symptoms were evidently not such as could be regarded as venereal, if we give credit to the commonly received ideas on the subject. Caries of the bones, and some of the least equivocal symptoms, did not occur. In no instance was there that uniform progress, with unrelenting fury, from one order of symptoms and parts affected to another, which is considered as an essential characteristic of true syphilis." (*Med. Chir. Trans. Vol.* 8, *p.* 423.) We learn also from Mr. Guthrie, that the bones were not affected in any of the cases cured entirely without mercury in the York Hospital, though there were several other cases admitted, " in which a few mercurial pills had been taken, and the mouth not affected, and in which the primary symptoms were followed by eruptions, both papular and scaly, by ulcers in the throat, *by nodes*, and in one case, by inflammation of the periosteum covering the bones of the nose, and ulceration of the septum nasi, although mercury was resorted to for its cure." *Vol. cit. p.* 560.) Mr. M'Gregor, however, lately informed me of one or two cases, in which a node took place though no mercury had been used. The occurrence, at all events, seems rare.

In the examples, treated without mercury, under the superintendence of Dr. Hennen, this gentleman did not see "a single case *in which the bones of the nose were affected*: some cases of periostitis, and of pains and swellings of the bones of the cranium and extremities, were met with; but, except in two, he never remarked any nodes, which could be regarded as *unequivocally syphilitic*." One of these yielded to blisters and sarsaparilla; the other, after resisting guaiacum and sudorifics, was dispersed by mercury. (*On Military Surgery, Ed.* 2, *p.* 581.) Dr. Hennen's statement on this subject would have been more satisfactory, had it comprised his opinion of the characters of an unequivocally syphilitic node. On the whole, it appears tolerably certain, that mercury, especially when employed unmercifully, and even when employed in moderation, and the patient exposes himself to damp and cold, tends to promote the frequency of nodes, as a sequel of the venereal disease, though as the long and abundant use of the same mineral does not cause the same consequence after other complaints, and venereal ulcers, treated altogether without mercury, rarely lead to nodes, it would seem as if these swellings were the product of the combined action of syphilis and mercury together. The infrequency of nodes in the strictly non-mercurial practice, is one of the most important facts yet established in its favour, and it is curious to find from some quotations made by Dr. Hennen, that it was well known in former days. Fallopius, in his 96th chap. De Ossium Corruptione, speaking of the loss of the bones of the nose and palate, says, "et sciatis quod non in omni inveterato gallico hoc fit, sed *tantum in illis, in quibus inunctio facta est cum hydrargyro*." And Fernelius, in speaking of the injurious effects of mercury, observes, "recidiva raro similis est radici neque iisdem symptomatis exercet, sed fere distillatione, arthritide tophis, vel ossium carie." *Aphrodisiacus, Vol.* 3, *p.* 146.) And Palmarius, in considering the affection of the bones, as Dr. Hennen has noticed, uses the following remarkable words; "sed hoc iis duntaxat contingit, qui olim a lue venerea hydrargyrosi vindicati putarentur, non qui decocto guaiacino et alexipharmaco curati fuissent." (*De Morb. Contagiosis, Cap.* 7, *lib.* 2, *p.* 124; *Parisiis*, 1578.) Dr. Hennen expresses his own conviction, in which I entirely agree, that the carious affections of the bones, which are so common in persons treated by long mercurial courses, proceed, not from the disease, but from the remedy rapidly and irregularly thrown in while periostitis exists; and, he has not seen a single case of carious bone in the military hospitals, since the non-mercurial treatment was adopted, *except where mercury had formerly been used.* (*On Military Surgery, Ed.* 2, *pp.* 505, 506.)

Nor will the results of modern experience and inquiries, made on a very extensive and impartial scale, allow us to consider the venereal disease as regularly and unavoidably leading to any secondary symptoms, even though no medicine at all be employed for their prevention. This is fully exemplified in the official reports of the army hospitals. The particulars of 5000 cases, spoken of by Sir James M'Grigor and Sir W. Franklin, lead to the opinion, that "the frequency or rarity of secondary symptoms would seem to depend on circumstances not yet sufficiently understood, or explained, although the following fact would tend to the belief, that either the constitutions of the men, or the mode of conducting the treatment without mercury, are the causes that possess the greatest influence in their production. In one regiment four secondary cases, out of 24, treated without mercury supervened." In another regiment, 68 cases were treated without mercury, all bearing marks of the true venereal disease (and 28 of them especially selected for their decided characters of chancre), yet no secondary symptoms of any kind had taken place fifteen months after the treatment had ceased. The same document, founded on the above large number of cases, confirms another fact, that no peculiar secondary symptoms follow peculiar primary symptoms; a conclusion, which is directly adverse to Mr. Carmichael's opinions, of which I have taken more notice in another work. (See *First Lines of the Practice of Surgery, Vol.* 1, *Ed.* 4.)

According to Mr. Hunter, the time necessary for the appearance, or production of the local effects, in parts most susceptible of the disease, after the virus has passed into the constitution, is generally about six weeks; but, in many cases, the period is much longer; while, in other instances, it is shorter. Sometimes, the local effects make their appearance within a fortnight after the possibility of absorption.

The effects, on other parts of the body, which are less susceptible of the venereal irritation, or slower in their action, says Mr. Hunter, are much later in making their appearance. And when the first and second order of parts are both contaminated, the effects, generally, do not begin to appear in the latter, till after a considerable time, and sometimes not till those affecting the former parts have been cured.

Mr. Hunter, however, refers to instances, in which the periosteum, or bone, was affected before any of the first order of parts; but he was uncertain whether the skin or throat would afterwards have become diseased, as the disorder was not allowed to go on.

According to Delpech, the principal morbid effects, produced on the bones by syphilis, are periostoses, exostoses, and necrosis. As for caries, which has been commonly set down as a consequence of the disease, he says, that authors have generally mistaken necrosis for it; and that the pretended examples of caries of the bones of the nose and palate, are in fact more or less extensive denudations and mortifications of the maxillary and turbinated bones, the septum nasi, &c. (See *Chir. Clin. T.* 1. *p.* 355.)

Venereal Eruptions. The whole tenor of various facts, specified in the foregoing columns, tends to prove, that what is usually called the venereal disease, is in reality several diseases, modified also by constitution, climate, regimen, and mode of treatment. And, hence, perhaps, the chief source of all the perplexity and uncertainty, which are yet so manifest, as fully to justify the doubt, sometimes entertained, whether any disease, corresponding to the former notions of syphilis, really exists. Were any proof of the truth of this reflection needed, in addition to the many other proofs of it already premised, the subject of venereal eruptions would at once furnish it; for, here no kind of regularity can be traced, either in the appearances on the skin abstractedly considered, nor in the connexion between certain kinds of primary ulcers and particular forms of cutaneous disease. Nay, as I have noticed in the preceding pages, sometimes, in consequence of a primary venereal sore, different kinds of eruptions form together, or successively on one individual; and, as far as one can judge by the eye, exactly the same kind of chancre may produce very different breakings out in different persons, even though treated on precisely the same plan. These circumstances are truly confusing. In Mr. Rose's paper, however, there is a partial confirmation of one part of Mr. Carmichael's theory, viz. the frequency of papular eruptions after simple primary ulcers, or superficial sores, which readily heal. According to the latter gentleman, this form of eruption may also follow gonorrhœa, and is generally preceded by fever, and ends in desquamation. Whatever may be the degree of truth, respecting the relation between this kind of eruption and the alleged primary complaints, the practice recommended by Mr. Carmichael for such cases is judicious. General bloodletting is recommended, when there is fever, and the medicines praised are antimonials and sarsaparilla. Afterwards, when the fever subsides, and the eruption desquamates, an alterative course of antimony and calomel, it is said, will accelerate the cure, though *not absolutely* necessary. In cases of venereal pustular eruptions, supposed by Mr. Carmichael to be most frequent after chancres with elevated edges, without induration, bloodletting is also advised during the febrile stage, followed by antimonials, sarsaparilla, guaiacum, tar-ointment, baths of sulphurated kali, or the nitro-muriatic bath; and, after the pustules have terminated in scaly blotches, alterative doses of mercury, conjoined with sarsaparilla, or guaiacum. An eruption of tubercles, or spots of a pustular tendency, or of both intermixed, preceded by fever, and terminating in ulcers covered with thick crusts, complaints, which Mr. Carmichael considers a sequel rather of the phagedenic, than other chancres, he treats at first by bloodletting, followed by antimonials, sarsaparilla, guaiacum, compound powder of ipecacuanha, arseniate of kali, nitrous acid, and nitro-muriatic bath. Mercury is said to be hurtful, except in the last stage. To scaly blotches, which he conceives to be a sequel of the true chancre, or callous ulcer, he applies the same local treatment as to pustular eruptions, and he deems the question, whether sarsaparilla and guaiacum might here be substituted for mercury, yet unsettled. (See *Obs. on the Symptoms, &c. of Venereal Diseases, Synopsis, p.* 205. *&c.*) The investigations made in the military hospitals, decidedly prove, that all kinds of eruptions, supposed to be venereal, may be cured without mercury; but, I believe, the great and superior usefulness of moderate quantities of mercury, for the removal of the scaly, copper-coloured blotches is still generally acknowledged. But, even in these cases of copper-coloured spots, Mr. Bacot's advice may be good, viz. when the general health is much deranged, the tongue loaded and furred, and the appetite gone, to defer mercury, " until by proper evacuations and attention to the general health," the patient has had the benefit of a delay, " which will, in many instances, render all farther medical treatment unnecessary. It is undoubtedly true, that, whatever plan be pursued, these eruptive symptoms will eventually disappear; still, where they continue to linger for a long time, and are attended with their usual accompaniments of great languor, debility, and disturbed rest, I neither know, nor can I understand, the advantage of delaying that remedy, which repeated experience has taught me to rely upon," &c. (*Bacot on Syphilis, p.* 99.) Although Mr. Carmichael's practice seems good, his theory, about the connexion of certain sores with particular eruptions, and other peculiar secondary symptoms, appears to be nearly refuted by the late investigations made in the military hospitals. To some facts, relating to this question, I have already adverted.

There is as little certainty, about the essential characters of syphilitic eruptions, as about the test of every other symptom of the veneral disease, or rather diseases. While Mr. Hunter describes the eruption as generally occurring over the whole body, Dr. Bateman states, that syphilitic affections of the skin commonly make their first appearance on the face, where they are usually copious, and on the hands and wrists. *Pract. Synopsis of Cutaneous Diseases, p.* 332, *edit.* 3.) Their colour, he says, is in general less livid, than that of ordinary eruptions, being of a brownish red of different shades; but that this is not universal; for, some of the syphilitic ecthymata have a bright red base in the beginning. Exposure to cold accelerates their progress, and increases their extent; while, on the other hand, warmth retards and ameliorates them. (*P.* 333.) According to Hunter, the discolorations make the skin appear mottled, and many of the eruptions disappear, while others continue, and increase with the disease.

In other cases, the eruption comes on in distinct blotches, which are often not observed, till the scurf has begun to form. At other times, the eruption assumes the appearance of small distinct inflammations, containing matter, and resembling pimples, not being, however, so pyramidal, nor so red at the base. Mr. Hunter also observes, that venereal blotches, on their first coming out, are often attended with inflammation, which gives them a degree of transparency, which is generally greater in the summer than the winter, especially if the patient be kept warm. In a little time this inflammation disappears, and the cuticle peels off in the form of a scurf. The latter occurrence often misleads the patient and the surgeon, who look upon this dying away of the inflammation, as a decay of the disease, till a succession of scurfs undeceive them.

The parts affected next begin to form a copper-coloured, dry, inelastic cuticle, called a scurf, or scale. This is thrown off, and new ones are formed, which spread to the breadth of a sixpence or shilling; but seldom more extensively, at least for a considerable time. In the mean while, every succeeding scale becomes thicker and thicker, till at last it becomes a common scab. Then the disposition for the formation of the matter takes place in the cutis underneath, and a true ulcer is produced, which commonly spreads, although in a slow way.

When the affected part of the skin is opposed by another portion of skin, which keeps it in some degree more moist as between the nates, about the arms, between the scrotum and the thigh, in the angle between the two thighs, on the red part of the lip, or in the arm-pits, the eruptions, instead of being attended with scurfs and scabs, are accompanied with an elevation of the skin, which is swollen with extravasated lymph into a white, soft, moist, flat surface, which discharges a white matter.—(*Hunter.*)

Mr. Carlisle has pointed out what he terms an herpetic abrasion of the cuticle on the breast, or abdomen, having the appearance of venereal blotches. He states that it is less deep in the skin; that it has less of an inflammatory base; and that it is not so distinctly circumscribed, as the true venereal blotch. It never forms a purulent crust; but, is simply a furfuraceous scaling of the cuticle. This form of disease seems to him to be produced by a disordered stomach and liver. (See *Lond. Med. Reposit. Vol.* 7, *p.* 92.)

A venereal eruption often attacks that part of the fingers on which the nail is formed. Here, the disease renders the surface red, which is seen shining through the nail; and, if allowed to continue, a separation of the nail takes place.

When surfaces of the body covered with hair are attacked, the hair separates, and cannot be re-produced as long as the disease lasts.

It must be allowed, that it is frequently very difficult to say, whether an eruption is syphilitic, or not, and an opinion should rather be formed from the history of the case, than from any particular appearance of the eruption itself. As Dr. Bateman has remarked, the cutaneous eruptions, which are the result of the venereal poison, are often the source of considerable embarrassment to the practitioner. They assume such a variety of forms, that they bid defiance to any arrangement founded upon their external character; and, in fact, they possess no common, or exclusive marks, by which their nature and origin are indicated. There is, perhaps, no order of cutaneous appearances, and scarcely any genus, or species of the chronic eruptions, which these secondary symptoms of syphilis do not occasionally resemble. Dr. Bateman admits, however, that, in many cases, there is a difference, which a practised eye will recognise, between the ordinary diseases of the skin and the syphilitic eruptions to which the same generic appellation might be given. This, says he, is often observable *in the shade of colour*, *in the situation occupied by the eruption*, *in the mode of its distribution*, *and in the general complexion* of the patient. Hence, to a person conversant with those ordinary diseases, a degree of anomaly in these respects will immediately excite a suspicion which will lead him to investigate the history of the progress of such an eruption, and of its concomitant symptoms. (See *Bateman's Practical Synopsis of Cutaneous Diseases*, *p.* 331, 332, *Edit.* 3.)

Dr. Hennen, in his valuable book, does not pretend to be able to discriminate the true syphilitic eruptions from others, and, indeed, by what criterion they are to be known, I am myself entirely puzzled to comprehend, after the numerous facts so fully established by recent experimental inquiries. Dr. Hennen generally approves of delaying mercury at first, in order to see whether these cutaneous affections will yield to other means; "but (says he) I should not very long postpone the employment of the mildest mercurial alteratives, aided by warm bathing and sudorifics. (*On Military Surgery*, *Ed.* 2. *p.* 518.)

Venereal Disease of the Throat, *Mouth*, *and Tongue.*—In the throat, tonsils, and inside of the mouth, the disease is said, by Mr. Hunter, generally to make its appearance at once in the form of an ulcer, without much previous tumefaction. Consequently, the tonsils are not much enlarged.

A venereal ulcer in the throat was supposed, by the same author, to be in general tolerably well marked, though he confesses, that, it may not in every instance be distinguishable from an ulcer of a different nature. Several diseases of the throat, he remarks, do not produce ulceration on the surface. One of these is common inflammation of the tonsils. The inflamed place often suppurates in the centre, so as to form an abscess, which bursts by a small opening; but, never looks like an ulcer that has begun superficially, like a true venereal sore. The case is always attended with too much inflammation, pain, and tumefaction of the parts, to be venereal. Also when it suppurates and bursts, it subsides directly, and it is generally attended with other inflammatory symptoms in the constitution.

Mr. Hunter then notices an indolent tumefaction of the tonsils, peculiar to many persons, whose constitutions are disposed to scrofula. The complaint produces a thickness in the speech. Sometimes coagulable lymph is thrown out on the surface of the parts affected, and occasions appearances, which are by some called ulcers; by some, sloughs; and by others, putrid sore-throats. The case is attended with too much swelling to be venereal, and, with a little care, it may easily be distinguished from an ulcer or loss of substance. However, when this difference is not obvious at first sight, it is proper to endeavour to remove some of the lymph, and, if the surface of the tonsil underneath should appear to be free from ulceration, we may conclude with certainty, that the disease is not venereal. Mr. Hunter states, that he has seen a chink filled with coagulable lymph, so as to appear very much like an ulcer; but, on removing that substance, the tonsil underneath was found perfectly sound. He adds, that he has seen cases of a swelled tonsil, having a slough in its centre, which slough, before its detachment, looked very like a foul ulcer. The stage of the complaint, he says, is even more puzzling, when the slough has come out: for then the disease has most of the characters of the venereal ulcer. Whenever he met with the disease in its first stage, he always treated it, as if it had been of the nature of erysipelas, or a carbuncle. When the complaint is in its second stage, without any preceding local symptoms, he recommends the practitioner to suspend his judgment, and to wait a little, in order to see how far nature is able to relieve itself. If there should have been any preceding fever, the case is still less likely to be venereal. Mr. Hunter informs us, that he has seen a sore-throat of this kind mistaken for a venereal case, and mercury given until it affected the mouth, when the medicine brought on a mortification of all the parts concerned in the first disease.

Another complaint of these parts, which Mr. Hunter represents as being often taken for a venereal one, is an ulcerous excoriation, which runs along their surface, becoming very broad and sometimes foul, having a regular termination, but never going deeply into the substance of the parts, as Mr. Hunter believes the venereal ulcer does. No part of the inside of the mouth is exempt from this ulcerous excoriation; but, according to Mr. Hunter, the disease most frequently occurs about the root of the uvula, and spreads forward along the palatum molle. He remarks, that the complaint is evidently not venereal, *since it does not yield to mercury.* He has seen these ulcerous excoriations continue for weeks, without undergoing any change, and a true venereal ulcer make its appearance on the surface of the excoriated part. He says, that such excoriations were cured by bark, after the end of the mercurial course, by which the syphilitic sore was cured.

This author describes the true venereal ulcer in the throat, *as a fair loss of substance, part being dug out*, as it were, *from the body of the tonsil*: *it has a determinate* edge, and is commonly *very foul, having thick white matter, like a slough, adhering to it*, and not admitting of being washed away.

Here, however, as in most other supposed forms of syphilis, some test is wanting, by which the case may be certainly distinguished from other diseases of the throat presenting similar appearances: for, as Mr. Rose has very truly remarked, "the excavated ulcer of the tonsils, as described by Mr. Hunter, is not, as Mr. Carmichael seems to think, a peculiar symptom of the presence of the syphilitic virus. I have repeatedly seen it, as well as the scaly blotch, in cases where mercury had been freely employed for the primary sores, and in which I considered the virus as eradicated, and both have disappeared under the use of sarsaparilla." (*Med. Chir. Trans. Vol.* 8, *p.* 421.) In a recent work, Mr. Carmichael himself acknowledges the justice of the preceding observation, and owns, that since the publication of his Essays, he has often noticed the excavated ulcer of the tonsils, either attending the primary phagedenic ulcer or the train of constitutional symptoms which arise from it. (*On the Symptoms, &c. of Venereal Diseases, p.* 17.) In affections of the throat, Dr. Hennen states, that, he "would be more guarded than in any others, in the employment of mercury, until all inflammatory disposition was removed." Afterwards he has seen them yield, "as if by magic, so soon as the local effects of mercury on the parts within the mouth became obvious." But, when mercury was given earlier, he has seen a vast number of instances, in which irremediable mischief was done. (*On Military Surgery, Ed.* 2. *p.* 518.)

According to Hunter, lues venerea sometimes produces a thickening and hardening of the tongue, but frequently ulceration, as in other parts of the mouth. He describes venereal sores on the tongue, as generally more painful than those on the skin; but less so than common sore throats, from inflamed tonsils. They oblige the patient to speak thick, as if his tongue were too large for his mouth, with a small degree of snuffling.

Mr. Hunter doubted the reality of a venereal ophthalmy, though he owns that there are inflammations of the eyes, which yield to mercury. See the subject of iritis, in the article *Ophthalmy.*

Symptoms of the second stage of Lues Venerea.—The periosteum, fasciæ, tendons, ligaments, and bones, are the parts which Mr. Hunter enumerates, as liable to be affected in the second stage of lues venerea. This observation in its full extent, however, seems to be rendered rather questionable; for, it would appear from the evidence both of ancient and modern writers, that *true nodes* or *venereal swellings of the bones, and particularly caries, rarely take place from syphilis, unless mercury be employed.* It is an observation of Mr. Hunter's, that we cannot always know with certainty what parts may become affected in this stage of the disease. He says, he has known the distemper produce a total deafness, sometimes followed by suppuration, and great pain in the ear and side of the head. I have already explained, that it was one of this gentleman's doctrines, that the second order of parts were generally deep-seated. When these become irritated by the poison, he observes that the progress of the disease is more gradual than in the first order of parts. It assumes very much the character of scrophulous swellings, or chronic rheumatism; only it affects the joints less frequently than the latter affection does. A swelling sometimes makes its appearance on a bone, when there has been no possible means of catching the infection for many months; and, in consequence of the little pain experienced, the tumor may be of considerable size, before it is noticed. Sometimes, a great deal of pain is felt; but no swelling comes on, till after a long while. According to Mr. Hunter, these remarks are also applicable to swellings of the tendons and fasciæ. As tumors of this kind only increase by slow degrees, they are not attended with symptoms of much inflammation. When they attack the periosteum, they seem like an enlargement of the bone itself, in consequence of being very firm, and closely connected with the latter part. Mr. Hunter also further observes, that, in these advanced stages of the disease, the inflammation can hardly get beyond the adhesive kind, in which state, it continues to become worse and worse, and when matter is formed it is not true pus, but of a slimy description. Some nodes, he says, both of the tendons and bones, last for years, before they form any matter at all. *These cases* he considered *as not being certainly venereal*, though commonly considered as such. Mr. Hunter found it difficult to explain the reason, why, when lues venerea attacks the bones, or the periosteum, the pain should sometimes be very considerable, and sometimes very trivial. Venereal pains in the bones are described by Mr. Hunter as being of a periodical kind, generally most severe in the night-time.

At the present day, when many cases, formerly supposed to be syphilitic, are treated without any mercury, and even those which are reputed to be venereal are cured by much smaller doses of that medicine than were given in Mr. Hunter's time, nodes have become much less frequent, and I have already, in a previous part of this article, expressed my decided belief in the justness of the opinion given by Fallopius and others, that a disposition to nodes is often occasioned by the abuse of mercury.

Treatment of Lues Venerea.—In Mr. Hunter's opinion, the first order of parts, or those which are most susceptible of being affected in lues venerea, are also the most easy of cure; while the second order of parts take more time to be remedied.

In the class of complaints, arising in the second stage of the lues venerea, Mr. Hunter believed, that it was unnecessary to continue the employment of mercury till all the swelling had disappeared. For it is observed by this distinguished writer, that, since these local complaints cannot contaminate the constitution by re-absorption, and since the venereal disposition and action from the constitution can be cured, while the local effects still remain, and this even when the tumefaction, forming nodes on the bones, fasciæ, &c. has proceeded to suppuration, there can be no occasion for continuing the course, after the venereal action has been destroyed. Whatever may be hereafter decided, concerning the superiority of mercury as a remedy for many secondary symptoms, one thing appears already well made out, viz. that it should always be employed with moderation, lest it produce worse effects, and more terrible diseases than those, which it is designed to relieve. For an account of the various ways of exhibiting it, I must refer to the article *Mercury*. Delpech adopts the notion, that the primary symptoms of the venereal disease are most successfully treated, by introducing mercury into the system from the surface of the body, and, if possible, partly through the same set of absorbents as first took up the virus: for the cure of secondary symptoms, he prefers the blue pill. (*Chir. Clin. T.* 1.)

To the following ingenious reasoning, on the operation of mercury, and the principles by which its administration should be regulated, surgeons of the present day will not give more credit than facts warrant, because some of Mr. Hunter's opinions are manifestly influenced by the supposition, that mercury is *absolutely* necessary for the cure of the venereal disease.

In curing the lues venerea, mercury can only have two modes of action; one on the poison, the other on the constitution. If, says Mr. Hunter, mercury acted on the poison only, one might conceive it did so, either by destroying its qualities, by decomposing it, or else by attracting it and carrying it out of the circulation. If mercury acted in the first of these ways, one would expect, that the cure would depend on the quantity of the medicine taken into the system. If it acted in the second manner, one would infer, that the progress of the cure would be proportionate to the quantity of evacuation. But, observes Mr. Hunter, if it act upon the principle of destroying the diseased action of the living parts, and of counteracting the venereal irritation, by producing one of a different kind, then, neither quantity alone, nor evacuations, will avail much. He states, that the quickness of the cure depends on quantity, joined with visible effects. However, it is added, that although the effects which mercury has upon the venereal disease, are in some degree proportioned to the local effects of the medicine on some of the glands, or particular parts of the body, as the mouth, skin, kidneys, and intestines, yet such effects are not altogether proportioned to these other circumstances. When mercury disagrees with the constitution, so as to produce great irritability and hectic symptoms, this action of irritation, as Mr. Hunter explains, is not a counter-irritation to the venereal disease.

It was also noticed by the same author, that the effects of mercury on lues venerea are always in proportion to the quantity of the remedy exhibited in a given time, and the susceptibility of the constitution to the mercurial irritation. He says, that these circumstances require the most minute attention, and that, in order to obtain the greatest action of mercury with safety, and in the most effectual manner, the medicine must be given, till it produces effects somewhere. However, it must not be exhibited too quickly, in order that a sufficient quantity may be given, before we are obliged to stop, in consequence of the effects. Mr. Hunter thinks, that when the local effects are produced too quickly, they prevent a sufficient quantity of the remedy from being taken into the system to counteract the venereal irritation at large.

Mr. Hunter mentions his having seen some cases, in which mercury acted very readily locally, and yet, the constitution was hardly affected by it, for the disease would not give way. He states, that he has met with other cases, in which the mere quantity of mercury did not answer, till it was given so quickly as to affect the constitution in such a manner, as to produce local irritation, and, consequently, sensible evacuations. This, he observes, is a proof, that the local effects of mercury are often the sign of its specific effects on the constitution at large, and it shows that the susceptibility of the diseased parts to be affected by the medicine, is in proportion to its effects on the mouth. Its effects, he contends, are not to be imputed to evacuation; but, to its irritation. Hence he inculcates, that mercury should be given, if possible, in such a manner, as to produce sensible effects upon some parts of the body, and in the largest quantity that can be given, to produce these effects within certain bounds. Mr. Hunter also remarks, that these sensible effects should be the means of determining, how far the medicine may be pushed, so as to have the greatest effect on the disease without endangering the constitution. The practice must vary according to circumstances; and if the disease is in a violent degree, less regard must be had to the constitution, and mercury must be thrown into the system in larger quantities; a very dangerous precept, as far as I can judge from many cases in which I have seen it acted upon.

Mr. Hunter likewise acquaints us, that, when the disease is in the first order of parts, a smaller quantity of mercury is necessary, than when the second order of the parts is affected, and the disease has been of long standing, its first appearances alone being cured, and the venereal disposition still remaining in the secondary parts. For the purpose of curing the venereal disease, whether in the form of chancre, bubo, or lues venerea, Mr. Hunter was of opinion, that probably the same quantity of mercury is necessary. He represents, that one sore requires as much mercury as fifty sores in the same person, and a small sore as much as a large one. He thought, that the only difference, if there is any, must depend upon the nature of the parts affected, that is, on their being naturally active or indolent. He conceived, however, that, on the whole, recent venereal complaints are generally more difficult to cure, than the symptoms of lues venerea, and that this may make a difference in regard to the quantity of mercury necessary.

Having now delivered the principal general instructions, relative to the exhibition of mercury in the treatment of the venereal disease, as given by Mr. Hunter, I must not quit this subject without remarking, that even this eminent surgeon appears on the whole too partial to the long use of mercury, and sometimes to the introduction of immoderate quantities of it into the system. In general, however, his observations tend to condemn all violent salivations. It is to be recollected, that in his days, nobody had a suspicion that truly syphilitic sores (if this expression be allowable, while they cannot be defined nor distinguished by their appearances) would in the end spontaneously heal, and he himself had no dependance upon any medicine, except mercury, for the cure of the true venereal disease. But modern experience evinces, that the disorder seldom now presents itself in forms so bad and intractable as formerly; that it is even capable of spontaneously ceasing; and that we hardly ever see cases, in which it is requisite to give mercury, except in very moderate quantities. Indeed, such is the change, that many surgeons suspect that the very nature of the disease must have undergone a material alteration, or modification. In England, in my opinion, every thing is to be referred to the improved manner of employing mercury only in moderate doses, and never pushing its exhibition, till the constitution is so impaired, that undescribable forms of diseases ensue, which are sometimes the compound effect of mercury and syphilis together; and, in other instances, of that description which surgeons now frequently call *syphiloid*, or *pseudosyphilitic*, not depending upon the venereal poison at all, but upon a state of the system, which mercury is known to aggravate in the worst degree. For additional information concerning internal remedies for the venereal disease, see *Mercury*, *Guaiacum*, *Mezereon*, *Muriatic Acid*, *Nitrous Acid*, *Sarsaparilla*, *Sulphuric Acid*, *&c.*

With respect to the local treatment of the symptoms of lues venerea, Mr. Hunter thought that none would in general be necessary, since the constitutional treatment would commonly effect a cure. However, he admits, that sometimes the local effects will not give way, and the parts remain swollen in an indolent inactive state, even after there is every reason to believe, that the constitution is perfectly cured. In such cases, he recommends assisting the constitutional treatment by local applications of mercury to the part, either in the form of a plaster or ointment. The latter application, he says, is the best. When these are not sufficient, he advises an attempt to be made to excite inflammation of another kind. He says, *he has seen a venereal node, which gave excruciating pain, cured by merely making an incision down to the bone, the whole length of the node. The pain ceased, the swelling decreased, and the sore healed up kindly, without the assistance of a grain of mercury.* He mentions, that blisters have been applied to nodes with success, removing the pain, and taking away the swelling.

With regard to these last cases, I may add, that, for many years past, the idea of completely dispersing nodes by mercury has been entirely abandoned at St. Bartholomew's hospital. In this institution, long protracted mercurial courses for the cure of such swellings are totally relinquished. When small moderate quantities of mercury have had their full effect, a blister is applied over the swelling, and kept open, under which plan the tumor generally subsides, as far as its nature will allow.

Diseases resembling the Venereal. Pseudosyphilis.—Sores on the glans, penis, prepuce, &c. in the form of chancres, as Mr. Hunter notices, may and do arise without any venereal infection, and sometimes they are a consequence of former venereal sores, which have been cured.

The symptoms, produced by the venereal poison in the constitution, are such as are common to many other diseases. For instance, Mr. Hunter remarks, that blotches on the skin are common to what is called a scorbutic habit; pains are common to rheumatism; swellings of the bones, periosteum, fasciæ, &c. to many bad habits, perhaps, of the scrophulous and rheumatic kind. Thus, says he, *most of the symptoms of the venereal disease, in all its forms, are to be found in many other diseases. Hence, the original cause, and many leading circumstances, such as dates, effects of the disorder upon others, from connexion, when only local, the previous and present symptoms, &c.*

must be considered, before we can determine absolutely what the disease truly is. All the circumstances and symptoms, taken together, may be such, as will attend no other disease. However, Mr. Hunter confesses, that with all our knowledge, and with all the application of that knowledge to suspicious symptoms of this disease, *we are often mistaken, calling distempers venereal which are not so, and sometimes supposing really syphilitic affections to be of another nature.*

Mr. Hunter takes notice, that in some constitutions, rheumatism, in many of its symptoms, resembles the lues venerea. The nocturnal pains, swelling of the tendons, ligaments, and periosteum, and pains in those swellings, are symptoms both of the rheumatism, and also of the venereal disease, when it attacks such parts. Mr. Hunter, however, did not know, that *he had ever seen the lues venerea attack the joints*, though many rheumatic complaints of such parts are cured by mercury, and therefore supposed to be venereal.

Mercury, given without caution, often produces the same symptoms as rheumatism. Such complaints Mr. Hunter had seen mistaken for venereal ones, and mercury continued. He explains, that some diseases not only resemble the venereal in appearance, but in the mode of contamination, proving themselves to be poisons, by affecting the part of contact; then producing immediate consequences similar to buboes; and also remote consequences similar to the lues venerea.

Mr. Hunter observes, that it is nearly as dangerous, in some constitutions, to give mercury, when the disease is not venereal, as to omit it in other cases which are really syphilitic; and, had he been acquainted with recent investigations, he would undoubtedly have gone further, and declared, that it is in reality far more dangerous. Many of the constitutions, which put on some of the venereal symptoms, when the disease is not really present, he says, are those, with which mercury seldom agrees, and commonly does harm. He had seen mercury, which was exhibited for a supposed venereal ulcer of the tonsils, produce a mortification of those glands, and the patient was nearly destroyed.

Mr. Abernethy, in his *Surgical Observations*, 1804, has treated at some length of diseases resembling syphilis, and has adduced several very interesting cases, which I advise every surgical practitioner to read with the greatest attention, as in fact, they confirm the views of the subject lately so fully established.

" A gentleman (says he,) thought that he had infected a slight cut on his hand (which was situated in front of, and just below the little finger) with the discharge from a bubo in the groin, that he had occasion to open. The wound fretted out into a sore about the size of a sixpence, which he showed me, and which I affirmed had not the thickened edge and base, and other characters of a venereal chancre. I therefore recommended him to try the effect of local means, and not to use mercury.

" In about a month, the sore which had spread a little, became again contracted in its dimensions, and assumed an healing appearance. At this time pain was felt extending up the arm, and suddenly a considerable tumor arose over the absorbing vessels which proceed along the inner edge of the biceps muscle. This tumor became nearly as big as a small orange. As the original sore seemed now disposed to heal, and as there was no surrounding induration, I could not believe it venereal, and therefore recommended him still to abstain from mercury, and apply leeches and linen moistened in the aq. litharg. acet. comp. to the tumor formed over the inflamed absorbents. For it seemed to me, that if the venereal poison had been imbibed from the sore, it would have passed on to one of the axillary glands, and would have caused induration and inflammation to take place there, more slowly than had occurred on the present occasion.

" Under this treatment the tumor was discussed, and the sore at the same time healed. About three weeks afterwards, the patient called on me, and said that there were venereal ulcers in his throat; and in each tonsil there was an ulcer deeply excavated, with irregular edges, and with a surface covered by adhering matter; ulcers, in short, which every surgeon, who depends on his sight as his guide, would have pronounced to be venereal. Shortly after, also, some copper-coloured eruptions appeared on his face and breast. He showed his disease to several surgeons, on whose opinion he relied, who, without hesitation, affirmed that they were venereal, and that the mercurial course had been improperly delayed.

" Whilst the patient was looking out for lodgings, in order that he might go through the mercurial process, a circumscribed thickening and elevation of the pericranium covering the frontal bone, appeared: it was of the circumference of a half-crown piece; and was, in short, what every surgeon, who is guided only by his sight and touch, would, without hesitation, have called a fair corona veneris. I now told the patient, that I was more inclined to believe his disease was not syphilitic, from the sudden and simultaneous occurrence of this node with the sore throat, &c. Other surgeons thought differently; and I believe, this very sensible and amiable young man imagined, that his health would become a sacrifice, if he any longer attended to my opinion. He was preparing to submit to a mercurial course, when very important concerns called him instantly into the country. He went with great reluctance, taking with him mercurial ointment, &c.; and after a fortnight, I received a letter from him, saying that he found his complaints benefited by his journey, that business had prevented him from beginning the use of mercury for a few days, that he now found it was unnecessary, for his symptoms had almost disappeared, and shortly afterwards he became perfectly well."

Mr. Abernethy considers this case as the most unequivocal instance extant of a disease occurring, which could not from appearance be distinguished by surgeons of the greatest experience from syphilis, and which, however, was undoubtedly of a different nature, (that is to say, it was of a different nature, according to certain criteria, then generally believed, but which recent investigations have proved to be destitute of foundation.) All the tests, here alluded to, having been spoken of in the foregoing columns, I shall not here repeat them.

Some years ago the nitric acid was introduced as a remedy for syphilis. (See *Nitrous Acid.*) To the position of its efficacy being as great in venereal cases, as was first alledged, many surgeons have not acceded, though, as a sensible writer has observed, it has certainly been allowed, with some other medicines, to remain in a kind of copartnership with mercury, and admitted to be useful in venereal cases under certain circumstances. A great deal of this want of agreement, on the effects of remedies in syphilitic cases, is now explained by the imperfection of the diagnosis, and the important fact, that the disease may generally be cured in time, without any medicines whatsoever, though this time is sometimes long. Dr. Scott, who first suggested the use of nitrous acid, has attempted to account for its alledged occasional failures, by observing, that the acid which he employed was not pure nitric acid, but an impure acid, containing an admixture of muriatic acid. He therefore some time ago, recommended the use of a compound acid, containing three parts of nitric acid, and one of muriatic, which he administered internally, and also applied externally, largely diluted as a bath, until the gums were affected and ptyalism produced; and he conceived every trial as quite inconclusive, unless these constitutional effects occurred.

"The acid that I have used of late (says Dr. Scott,) is the nitro-muriatic; and it is formed by mixing together equal parts of the nitrous, or nitric acid, and muriatic acid. If these acids be in the state of concentration, that they usually possess in the shops, and if the quantities be considerable, a great volume of gas is eveloped on their coming into contact, which taints every part of a house, is extremely hurtful to the lungs, and disagreeable to the smell. To avoid this inconvenience, I put a quantity of water, at least equal in bulk to both the acids, into a bottle, and I add the acids to it separately. This method does not only prevent the unpleasant odour, but it tends to retain the chlorine, on which its effects depend. It is well known, that the nitro muriatic acid acts very readily on the metals and earth; nothing therefore, but glass, or extremely well glazed vessels of porcelain, should be used to contain it. Wooden tubs for bathing answer very well, and they should always be made *as small as possible*, compatible with their holding the body, or the limbs that we wish to expose to the bath. From their being small, we save acid, and are able to heat the bath with ease. In India, I have often exposed the whole body below the head to this bath; but here I have been satisfied, in general, with keeping the legs and feet exposed to it. In order to warm the bath, after the first time, I have commonly made a third or a fourth part of it be thrown away, and the loss replaced by boiling water and a proportional quantity of acid. To save the expenditure of acid, I have occasionally warmed a portion of the bath in porcelain vessels, placed near the fire, but I fear this may diminish its effects.

"It is no easy matter (continues Dr. Scott,) to give directions, with regard to the degree of acidity of the bath. I have commonly made it about as strong as very weak vinegar, trusting to the taste alone. The strength should be regulated by the degree of irratability of the patient's skin. I may say, that although I like to know, that it is strong enough to prick the skin a very little, after being exposed to it from fifteen to thirty minutes, yet I believe that even such an effect as this is unnecessary.

"The time too of remaining in the bath, in order to produce the greatest effect, is a matter of doubt. I have kept the legs and feet exposed to it for half an hour or more; but, with more delicate people, not above one half, or one third of that time. I have repeated these baths daily, or even twice or thrice a day." (See *Med. Chir. Trans. Vol.* 8, *p.* 181.) Dr. Scott adds, that the mere sponging the skin with nitro-muriatic acid, sufficiently diluted with water, gives rise to the very same effects as bathing, and is more easily adopted. Fifteen, or twenty minutes may be employed in the sponging, though a much less time produces very material effects.

Dr. Scott has found the nitro-muriatic acid particularly useful even in this country, in that description of syphilis, which is termed *pseudo-syphilis;* and he attributes the beneficial effects to the chlorine, which is loosely combined in this compound. (See *Journal of Science and the Arts, Vol.* 1, *p.* 205—211. *Lond. Med. Reposit. Vol.* 7, *p.* 59; *and Med. and Chir. Trans. Vol.* 8, *p.* 173, *et seq.*)

The only important conclusion which I venture to draw from Dr. Scott's observations, is a confirmation of the fact of the generally curable nature of syphilitic diseases, without the aid of mercury. And I further believe, that though the nitro-muriatic bath may sometimes be useful, the surest way of bringing it into discredit is to represent it as applicable to all forms of syphilis, for which, neither this remedy, nor even mercury itself, will ever suffice. The muriate of gold has been much commended of late years; but, after the facts detailed in this article, the alledged merit of new remedies must be received with suspicion, and in particular the idea of their specific powers rejected.

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VENESECTION. (from *vena*, a vein, and *sectio*, a division.) The operation of opening a vein. Phlebotomy. See *Bleeding*.

VERRU'CA. A Wart. See *Wart*.

VERTEBRÆ, DISEASE OF. The case here to be considered is a disease of the spine, sometimes originating in an ulceration of the intervertebral cartilages, sometimes in a morbid condition of the cancellous structure of the bodies of the vertebræ (*Brodie on Diseases of the Joints, p.* 259,) followed by a more or less complete loss of the power of using the legs.

Formerly, the affection of the limbs was generally called a palsy, and treated as a paralytic affection; to which it is in almost every respect perfectly unlike.

In the true paralysis (says Mr. Pott), from whatever cause, the muscles of the affected limb are soft, flabby, unresisting, and incapable of being put into even a tonic state; the limb itself may be placed in almost any position, or posture; if it be lifted up, and then let go, it falls down, and it is not in the power of the patient to prevent, or even to retard, its fall; the joints are perfectly and easily moveable in any direction; if the affection be of the lower limbs, neither hips, knees, nor ankles, have any degree of rigidity, or stiffness; but permit the limb to be turned, or twisted, in almost any manner.

In the present case, the muscles are indeed lessened, but they are rigid, and always at least in a tonic state, by which the knees and ankles acquire a stiffness not very easy to overcome. By means of this stiffness, mixed with a kind of spasm, the legs of the patient are either constantly kept stretched out straight, in which case considerable force is required to bend the knees, or they are, by the action of the stronger muscles, drawn across each other, in such manner as to require as much to separate them. When the leg is in a straight position, the extensor muscles act so powerfully as to require a considerable degree of force to bend the joints of the knees; and when they have been bent, the legs are immediately and strongly drawn up with the heels towards the buttocks. By the rigidity of the ankle joints, joined to the spasmodic action of the gastrocnemii muscles, the patient's toes are pointed downward, in such manner as to render it impossible for him to put his foot flat to the ground: which makes one of the decisive characteristics of the distemper.

The majority of those who labour under this disease are infants, or young children: adults are by no means exempt from it; but Mr. Pott never saw it at an age beyond forty; and Mr. Baynton never met with more than three instances, which approached that period of life. (*On Diseases of the Spine, p.* 4.)

In one case, however, recited by Mr. Brodie, the patient was forty-five years old. (*On Diseases of Joints, p.* 268.) By Pott, Baynton, and several other writers, a belief is entertained, that the disease is most inclined to happen in scrophulous subjects, in which opinion I am also disposed to join. There can also be no doubt of the fact, stated by Mr. Pott, that it most frequently happens in weak and delicate children.

According to Mr. Pott, if the patient be a child, the account, most frequently given, is, that for some time previous to the incapacity of using its limbs, it had been observed to be languid, listless, and very soon tired; that it was unwilling to move much, or briskly; that it had been observed frequently to trip and stumble, although no impediment lay in its way; that when it moved hastily, or unguardedly, its legs would cross each other involuntarily, by which it was often and suddenly thrown down; that if it endeavoured to stand still, and upright, unsupported by another person, its knees would totter and bend under it; that it could not, with any degree of precision or certainty, steadily direct either of its feet to any particular point, but, that in attempting so to do, they would be suddenly and involuntarily brought across each other; that soon after this, it complained of frequent pains and twitchings in its thighs, particularly when in bed, and of an uneasy sensation at the pit of the stomach; that when it sat on a chair, or a stool, its legs were almost always found across each other, and drawn up under the seat; and that in a little time after these particulars had been observed, it totally lost the power of walking.

The same author observes, that if the incurvation be of the neck, and to a considerable degree, by affecting several vertebræ, the child finds it inconvenient and painful to support its own head, and is always desirous of laying it on a table or pillow, or any thing to take off the weight. If the affection be of the dorsal vertebræ, it is soon attended with loss of appetite, hard dry cough, laborious respiration, quick pulse, and disposition to hectic.

Mr. Pott states, that an adult, in a cause where no violence has been committed or received, will tell you, that his first intimation was a sense of weakness in his back bone, accompanied with what he will call a heavy dull kind of pain, attended with such a lassitude as rendered a small degree of excercise fatiguing; that this was soon followed by an unusual sense of coldness in his thighs, not accountable for from the weather, and a palpable diminution of their sensibility. That, in a little time more, his limbs were frequently convulsed by involuntary twitchings, particularly troublesome in the night: that soon after this, he not only became incapable of walking, but that his power either of retaining or discharging his urine and feces was considerably impaired, and his penis became incapable of erection.

The adult also finds all the offices of his digestive and respiratory organs much affected, and complains constantly of pain and tightness at the stomach.

The true cause of the disease is a morbid state of the spine, and of some of the parts connected with it; *which distempered state of parts will, upon careful inquiry, be always found to have preceded the deformity some length of time*; in infants, this is the sole cause, and external violence has nothing to do with it. "In the adult (says Mr. Pott), I will not assert, that external mischief is always and totally out of the question; but I will venture to affirm, what is equal, as far as regards the true nature of the case, which is, that although accident and violence may, in some few instances, be allowed to have contributed to its more immediate appearance, yet the part in which it shows itself must have been previously in a morbid state, and thereby predisposed for the production of it. I do not by this mean to say, that a violent exertion cannot injure the spine, nor produce a paralytic complaint: that would be to say more than I know; but I will venture to assert, that no degree of violence whatever is capable of producing such an appearance as I am now speaking of, unless the bodies of the vertebræ were by previous distemper disposed to give way; and that no supposable dislocation, caused by mere violence done to the bones of the back, which bones were, before the receipt of the injury, in a sound state, can possibly be attended with the peculiar symptoms of a curved spine."

For some observations, connected with this point, I refer the reader to C. Bell's surgical Observations, Vol. I.

Mr. Brodie agrees with Mr. Pott and other writers on the fact, that the actual curvature must be preceded by a disease of the parts, unaccompanied with any visible deformity, and "cannot take place until the caries has made considerable progress." In the early stage of the case, therefore, when, as Mr. Brodie justly observes, the diagnosis is of the most importance, no information can be obtained from the appearance of the spine itself, the shape of which is yet unchanged; and frequently the symptoms which do take place early are not unequivocal; they are, according to this writer, "a pain, and some degree of tenderness in that part of the spine where the disease has begun; a sense of constriction of the chest; an uneasy feeling at the pit of the stomach, and of the whole abdomen; a disturbed state of the functions of the alimentary canal, and of the urinary bladder; a sense of weakness and aching, and occasional cramps of the muscles of the extremities." But, as Mr. Brodie confesses, very similar symptoms may arise from other causes, and sometimes no particular complaints are made previously to the actual discovery of the curvature. (*On Diseases of Joints, p.* 279, 280.)

I have already mentioned Mr. Brodie's opinion, deduced from dissection, that, in many instances caries of the spine has its origin in an ulceration of the intervertebral cartilages, beginning in their centre, and extending to their circumference, and afterwards affecting the bodies of the contiguous vertebræ; but that in other cases, the disease has its origin in the bodies of the vertebræ themselves, which are liable to the same peculiar disease of the cancellous structure, which is noticed in the articulating extremities of other bones. (*Brodie on Diseases of Joints, p.* 267.) This gentleman suspects that the disease, which begins in the cancellous structure of the vertebræ, is more immediately followed by suppuration, than that which commences in the intervertebral cartilages; and that the first form of the disease seldom occasions so extensive a destruction of the vertebræ as the last. "But (says Mr. Brodie) farther than this, nothing which I have hitherto observed, enables me to point out any circumstances, in which the symptoms of these different diseases differ." (*P.* 276.) Respecting another statement, that when the lumbar vertebræ are alone affected, the symptoms dependent on pressure or irritation of the spinal marrow are absent, I cannot say, that it accords with several cases which have fallen under my own notice; that is to say, if the affection of the lower limbs is to be received as a test of such irritation or pressure.

According to Mr. Pott, the true curvature is invariably uniform, in being from within outwards; but it varies in situation, in extent, and in degree; it affects the neck, the back, or the loins; it comprehends one vertebra only, or two, or more; and as few or more are affected, or as these are more or less morbid, and consequently give way more or less, the curve must be different.

In these cases, as Mr. Brodie remarks, "the distortion of the spine is usually of a peculiar kind, and such as nothing can produce, except the destruction of the bodies of one or more vertebræ. The spine is bent forward, so as to form an angle posteriorly; and although the destruction of the vertebræ may be the same, it is more obvious in some parts of the spine than it is in others. For example, the spinous processes in the middle of the back being long, and projecting downwards, the elevation of one of these must occasion a greater prominence, than that of one of the spinous processes of the neck, which are short, and stand directly backwards.

"Curvature of the spine, in the direction forwards, may arise from other causes, as a weak condition of the muscles, or a rickety affection of the bones. In general, in such cases, the curvature occupies the whole spine, which assumes the form of a segment of a circle. At other times, however, it occupies only a portion of the spine, usually that which is formed by the superior lumbar and inferior dorsal vertebræ." But here, as Mr. Brodie has found, the curvature is always gradual, and never angular; a circumstance by which it is distinguishable from the curvature produced by caries. The cases, however, he thinks, have often been confounded, and some speedy and complete cures of carious spine on record, he infers, must have been cases of an entirely different nature. (*On Diseases of Joints, p.* 282, *&c.* and *Earle, in Edinb. Med. Journal. Jan.* 1815.)

"Lateral curvatures of the spine are alleged generally to incline to the right side; and the fact is referred (with what correctness I know not) to the undue power which is acquired by the more general use of the right arm, and of other muscles, in the performance of the voluntary actions." (*Baynton on Diseases of the Spine, p.* 43.) It is admitted, however, that exceptions are met with, and that the lateral curvature sometimes tends to the left, and occasionally resembles the letter S reversed. On this subject, I have also another rare exception to specify, which is explained by Mr. Brodie, viz. that though lateral distortions of the spine generally arise from causes independent of caries, a slight degree of lateral curvature is, in some instances, produced by the bodies of the vertebræ having been destroyed on one side, by caries, in a greater degree than on the other. (*Brodie on Joints, p.* 284.)

In general, the lower limbs alone usually feel the effect. Mr. Pott, however, had seen two cases, in one of which the arms only were affected; in the other, both legs and arms. Mr. Ford showed him a lad, who had lost the use of both arms and legs from a curvature. An account of two similar examples was also communicated to Mr. Pott by Mr. Parke, of Liverpool.

Mr. Brodie has never known the paralysis affect the muscles of the arms, when the disease was at the lower or middle part of the spine; but he agrees, with Mr. Copeland, that the symptoms are not always confined to parts below the disease, and that it is not uncommon for pains in the upper extremities to accompany the paralytic affection of the legs and thighs. (*Brodie, p.* 285. *Copeland, Obs. on Diseased Spine, &c.*)

Very soon after the curvature, some patients are rendered totally and absolutely incapable not only of walking, but of using their legs in any manner; others can make shift to move about with the help of crutches, or by grasping their thighs just above the knees with both hands; some can sit in an armed chair, without much trouble or fatigue; others cannot sit up with any help; some retain such a degree of power of using their legs as to be able to shift their posture when in bed; others have no such power, and are obliged to be moved upon all occasions.

I have been present at the dissection of persons who died of lumbar abscesses, and who, while they lived, never suffered the peculiar loss of the use of the lower extremities, so well described by Mr. Pott, though the vertebræ were found to be diseased. However, in other instances of such abscesses, attended with caries of the spine, the legs are deprived of their power. But, whether the difference is to be explained by the consideration, that, in some cases, the disease of the bone may be secondary and the abscess itself the primary complaint, I cannot determine. At all events, suppuration is frequently only an effect, the curvature existing long before the abscess; and, in such cases, the legs are affected. Some time ago, Mr. Dunn, of Scarborough, consulted me about a case in which the latter facts were exemplified. Mr. Brodie's opinion, that suppuration takes place at an earlier period, in cases where the disease begins in the cancellous structure of the bones, has been already noticed. In having a tendency to excite suppuration, and in producing the weakness of the lower extremities, the present disease of the spine appears to be materially different from the absorption of the vertebræ, sometimes caused by the pressure of aneurisms, and other tumors. (*Hodgson on Diseases of Arteries, &c. p.* 80.)

Mr. Pott observes: When a child appears to be what the common people call naturally weakly, whatever complaints it may have are supposed to be caused by its weak state, and it is generally believed, that time and common care will remove them; but, when a curvature has made its appearance, all these marks of ill health, such as laborious respiration, hard cough, quick pulse, hectical heat and flushing, pain and tightness of the stomach, &c. are more attentively regarded, and set to the account of the deformity consequent to the curve, more especially if the curvature be of the dorsal vertebræ, in which case the deformity is always greatest; but, whoever will carefully attend to all the circumstances of this disorder, will be convinced, that most, if not all, the complaints of children, labouring under this infirmity, precede the curvature, and that a morbid state of the spine, and of the parts connected with it, is the original and primary cause of both.

Amongst many other reasons for thinking, that an effect was mistaken for a cause, Mr. Pott enumerates the following:

1. "That he did not remember ever to have seen this useless state of the limbs from a mere mal-formation of the spine, however crooked such malformation might have made it.

2. "That none of those deviations from right shape, which growing girls are so liable to, however great the deformity might be, was ever attended with this effect."

With respect to the treatment of diseased spine, I think one principle, laid down by Mr. Pott, must receive approbation; viz. that the primary and sole cause of all the symptoms is a distempered state of the parts, composing, or in immediate connexion with the spine, tending to, and most frequently ending in a caries of the vertebræ. Hence, says he, all the ills, whether general or local, apparent or concealed; the ill health of the patient, and in time the curvature. As the disease does not originate in the limbs, no application to them can be of any use, and the great indication must be to stop the progress of the disease in the affected part of the spine.

The first suggestion of the probability that issues might prove serviceable in this disease, appears to have been made to Mr. Pott by Dr. Cameron, of Worcester, who told him, that, having remarked in Hippocrates, an account of paralysis of the lower limbs, cured by an abscess in the back, he had, in a case of useless limbs, attended with a curvature of the spine, endeavoured to imitate this act of nature, by exciting a purulent discharge, and that it had proved very beneficial: which was confirmed to Mr. Pott by Mr. Jeffreys, of Worcester, who had made the experiment with the same success.

The practice, which Pott recommends, consists merely in procuring a large discharge of matter from the integuments on each side of the distempered bones, forming the curvature, and in maintaining such discharge until the patient shall have recovered his health and the use of his limbs. They who are little conversant with matters of this sort (says Mr. Pott) will suppose the means very inadequate to the proposed end; but they who have been experimentally acquainted with the very wonderful effects of purulent drains, made from the immediate neighbourhood of diseases, will not be so much surprised at this particular one; and will immediately see how such kind of discharge, made and continued from the distempered part, checks the further progress of the caries, gives nature an opportunity of exerting her own powers of throwing off the diseased parts, and of producing an union of the bones (now rendered sound), and thereby establishing a cure.

Mr. Pott considers it a matter of very little importance towards the cure, by what means the discharge be procured, provided it be large, that it come from a sufficient depth, and that it be continued for a sufficient length of time. He tried setons, issues by incision, and issues by caustic, and found the last in general preferable, being least painful, most cleanly, most easily manageable, and capable of being longest continued.

The caustics, he observes, should be applied on each side of the curvature, in such a manner as to leave the portion of skin covering the spinal processes of the protruding bones entire and unhurt, and so large, that the sores, upon the separation of the eschars, may easily hold each three or four peas, in the case of the smallest curvature; but, in large curves, at least as many more.

The issues, which modern surgeons usually make, for the relief of the symptoms arising from diseased vertebræ, are larger than such as Mr. Pott himself was in the habit of forming. They now commonly prefer making an issue on each side of the spinous processes, about three or four inches long, and half an inch broad.

The size of the issue intended to be made being determined, the place where it is to be made should be accurately marked out with ink. All the skin immediately around should then be covered with adhesive plaster, in order that it may be protected from the action of the caustic. Let the surgeon next take a piece of caustic potassa, or of potassa cum calce, and wrap a little tow round one end of it, so that he may take hold of it with safety and convenience. The other end of the caustic should then be moistened a little, and rubbed very quickly on the portion of the integuments which is to be converted into an eschar. The caustic is to be rubbed in this manner, till the part turns of a dull brown colour, when the caustic should be carefully washed off with a little wet tow, and a poultice applied.

As soon as the eschars admit of being removed, a row of peas, or beans, connected together with thread, should be laid on the sore, and confined there with sticking plaster. A compress, containing a piece of pasteboard, or sheet-lead, is then to be bound over the peas, or beans, with a roller. In consequence of the continued pressure, the peas, or beans, soon form little hollows for themselves, in which they should be regularly placed every day. When the pressure is not duly maintained, the granulations are apt to rise so high, that the peas cannot be well kept on the part. In this circumstance, the surgeon must try to repress the high surface of the sore, by sprinkling on it a little savine powder and subacetate of copper, mixed together in equal proportions. When this plan is unavailing, the re-application of the caustic becomes indispensable.

Whatever time may be requisite to restore the health, as well as the use of the limbs, Mr. Pott thinks, that the issues should be kept open until these objects are completely fulfilled; and even longer, especially in growing children. He owns, that nothing can be more uncertain than the time required for the cure. He has seen it perfected in two or three months; and he has known it to require two years; two thirds of which time passed before there was any visible amendment.

After the discharge has been made some time, the patient is found to be better, in all general respects, and if of age to distinguish, will acknowledge, that he feels himself to be better in health; he begins to recover his appetite, gets refreshing sleep, and has a more quiet and less hectical pulse; but, the relief which he feels above all others, is from having got rid of that distressing sensation of tightness about the stomach; in a little time more, a degree of warmth, and a sensibility are felt in the thighs, which they had been strangers to for some time; and generally much about the same time, the power of retaining and discharging the urine and feces begins to be in some degree exerted.

The first return of the power of motion in the limbs, says Mr. Pott, is rather disagreeable; the motions being involuntary, and of the spasmodic kind, principally in the night; and generally attended with a sense of pain in all the muscles concerned.

At this point of amendment, if it may be so called, it is no uncommon thing, especially in bad cases, for the patient to stand some time without making any farther progress; this, in adults, occasions impatience, and in parents, despair; but, in the milder kind of case, the power of voluntary motion generally soon follows the involuntary.

The knees and ankles, by degrees, lose their stiffness, and the relaxation of the latter enables the patient to set his feet flat upon the ground, the certain mark that the power of walking will soon follow; but those joints, having lost their rigidity, become exceedingly weak, and are not for some time capable of serving the purpose of progression.

An attentive examination of the morbid appearances, and their effects, in different subjects, led Mr. Pott to conclude, amongst other things, that the disease which produces these effects on the spine, and the parts in its vicinity, is what is in general called scrophula.

That ulceration or caries of the bodies of the vertebræ affected, is the common morbid change and not enlargement.

That when the attack is made upon the dorsal vertebræ, the sternum and ribs, for want of proper support, necessarily give way, and deformity, additional to the curve, is produced.

That this kind of caries is always confined to the bodies of the vertebræ, seldom or never affecting the articular processes. Two cases were seen by Pott, in which the bodies of the vertebræ were completely detached from their processes, so as to leave the membrane of the spinal marrow perfectly bare.

That without this destruction of the bodies of the vertebræ, there can be no curvature of the kind here treated of; or, in other words, that erosion is the *sine quâ non* of this disease; that although there can be no true curve without caries, yet there is, and that not infrequently, caries without curve.

That the caries with curvature and useless limbs is most frequently of the cervical or dorsal vertebræ, the caries without curve, of the lumbal; though this is by no means constant or necessary.

That, in the case of carious spine, without curvature, it most frequently happens, that internal abscesses, and collections of matter are formed, which matter makes its way outward, and appears in the hip, groin, or thigh; or, being detained within the body, destroys the patient: the real and immediate cause of whose death is seldom known, or even rightly guessed at, unless the dead body be examined.

That what are commonly called lumbal and psoas abscesses, are not infrequently produced in this manner, and, therefore, when we use these terms, we should be understood to mean only a description of the course which such matter has pursued in its way outward, or the place where it makes its appearance externally, the terms really meaning nothing more, nor conveying any precise idea of the nature, seat, or origin of a distemper subject to great variety, and from which variety its very different symptoms and events, in different subjects, can alone be accounted for.

That, contrary to the general opinion, a caries of the spine is more frequently a cause, than an effect of these abscesses.

That the true curvature of the spine, from within outward, of which the paralytic or useless state of the lower limbs is a too frequent consequence, is itself but *one* effect of a distempered spine; such case being always attended with a number of complaints, which arise from the same cause: the generally received opinion, therefore, that all the attending symptoms are derived from the curvature, considered abstractedly, is by no means founded in truth, and may be productive of very erroneous conduct.

That when two or more vertebræ are affected, forming a large curve, however perfect the success of the treatment may be with regard to the restoration of health, and limbs, yet the curvature will and must remain, in consequence of the union of the bones with each other.

That the useless state of the limbs is by no means a consequence of the altered figure of the spine, or of the disposition of the bones with regard to each other, but merely of the caries: of this truth there needs no other proof, than what may be drawn from the cure of a large and extensive curvature, in which three or more verbetræ were concerned: in this the deformity always remains unaltered and unalterable, notwithstanding the patient recovers both health and limbs.

Pott contends, that a morbid state of the parts, previous to deformity, caries, or curve, must be allowed. All the general complaints of persons, afflicted with this disorder, he says, will, upon careful inquiry, be found to have preceded any degree of deformity, to have increased as the curve became apparent, and to have decreased as the means used for relief took place; the pain and tightness about the stomach, the indigestion, the want of appetite, the disturbed sleep, &c.&c. gradually disappear, and the marks of returning health become observable, before the limbs recover the smallest degree of their power of moving.

On the other hand, is admitted to be as true, that when from extent, or degree, or inveteracy of the caries, the issues are found to be unequal to the wished-for effect, the general complaints receive no amendment; but increase until the patient sinks under them.

If all this be true, says Mr. Pott, and it be found that the issues are capable of affecting a perfect cure, even after a caries has taken place, and that to a considerable degree, is it not reasonable to conclude, that the same means, made use of in due time, might prove a preventive?

Besides the forms of disease of the spine, treated of in this article, the observations of Mr. Wilson prove, that the distemper may sometimes begin within the theca vertebralis, and thence extend to the bones. He also demonstrated, at the College of Surgeons, scrophulous tumours in the spinal marrow. Such diseases would create a loss of power in the parts below them, without any curvature of the spine. (*Lectures on the Skeleton, &c. p.* 397.)

In France, the same indication is followed as that on which Mr. Pott lays stress, viz., to endeavour to arrest the disease of the spine by means applied in the vicinity of the morbid parts. But, instead of employing caustic issues, the moxa is used, and sometimes repeated cupping near the affected bones; both which means were particularly recommended by Desault.

Another practice, which yet has partisans, though it was strongly disapproved of by Pott, is that of supporting the spine with machinery. Perhaps, the latter author may have carried his objections to this method beyond all reason, and with the exception of Dr. Harrison (see *Lond. Med. and Physical Journ. Nov.* 1820.) I believe, no modern practitioner now ever advises it on the supposition of there being any *dislocation*; an error, which formerly prevailed. As Mr. Brodie observes, certainly no machines ought ever to be employed for the purpose of elongating the spine and correcting the deformity: but, if they be used simply to take off the weight of the head, chest, and upper extremities, from the diseased part of the spine, they may sometimes be of service. The late Sir James Earle had a very favourable opinion of their utility. I believe, with Mr. Brodie, that they ought never in the first instance to supersede the constant maintenance of the horizontal position; but, that they may be advantageous, when circumstances make it desirable that the patient begin to sit up a part of the day. (*On Diseases of the Joint, p.* 291.)

From Mr. Pott's own account, it will be seen, that he never pretended that issues, kept open in the vicinity of the disease, were infallible; and a late eminent surgeon has actually referred the good which Pott thought accrued from them, to the long observance of the horizontal posture. Mr. Baynton, the gentleman to whom I allude, also mentions, that M. David is the only writer who has suggested that rest would effect the cure of diseases of the spine. On this point, however, Mr. Baynton was entirely mistaken, as, about eighteen years ago, Loder wrote some remarks, particulary directed to the object of recommending quietude in the present disease, as the best means of promoting anchylosis. (See *Med. Chir. Beobachtungen, p.* 251; *8vo. Weimar,* 1794.)

Now, although I fully concur in the propriety of keeping the patient as quiet as possible in the recumbent position, inasmuch as motion must be hurtful to the diseased part of the spine, it does not follow, that because this admission is made, that issues should be rejected, and that rest must do every thing. In one part of Mr. Baynton's reasoning, an error prevails, which I shall here notice, as it seems greatly to have influenced his opinions; and, as far as I know, it has not been remarked by the critical examiners of that gentleman's book. The mistake is in supposing, that the process, by which the diseased part of the spine is to be restored and united, should be conducted exactly on the same principles as the union of bones free from disease. In fact, there is an additional indication, which is to stop the progress of the disease, for which purpose, experience proves, that issues, *aided by rest*, are the means affording the best chances of success. I have attended several children myself, who, from the effect of issues, recovered the use of their lower extremities, even though they could not be kept constantly at rest. I must also give my testimony to the truth of Mr. Brodie's statement, that many patients are benefited almost immediately the issues are made, or uniformly find themselves better after each application of the caustic. (*On Diseases of Joints, p.* 282.) In some cases, however, caustic issues fail to afford relief; and when they are of no use, rest in the horizontal posture, below ground, I believe, must soon be the patient's doom. Whether the occasional failure of issues is to be ascribed to the advanced progress which the disease has made, or to its having begun in the cancellous structure of the vertebræ, as suggested by Mr. Brodie, future observation must decide.

Consult *Pott's Chirurgical Works, Vol.* 3. *G. Gebb, Select Cases of the Disorder commonly termed Paralysis of the Lower Extremities, 8vo. Lond.* 1782. *C. H. Wilkinson, Essays on Distortion of the Spine, &c. 8vo. Lond.* 1798. *Loder, Med. Chir. Beobachtungen, B.* 1, *p.* 247, *&c. 8vo. Weimar,* 1794. *J. C. Frank, Oratio de Vertebralis Columnæ in Morbis Dignitate; Paviæ,* 1791. *C. Van Roy, De Scoliasi, 4to. Lugd.* 1774. *Sir J. Earle, Observations on the Cure of Curved Spine; in which the effect of Mechanical Assistance is considered. 8vo. Lond.* 1803. *Bergamaschi, Osservazioni sulla Inflammazione dello Spinale Medollo e delle sue Membrane; 4to. Par.* 1810. *T. Baynton, An Account of a Successful Method of Treating Diseases of the Spine; 8vo. Bristol,* 1813. *H. Earle, in Edinb. Med. and Surg. Journ. for January* 1815. *J. L. Choulant, Decas Pelvium Spinarumque Deformatarum; 4to. Lips.* 1818. *G. Malsch, de nova Machina Graefiana Distortiones Spinæ Dorsi ad Sanandas, necnon Disquisitio Deformitatum istarum; 4to. Berol.* 1818. *Abercrombie, in Edinb. Med. and Surg. Journ. for January* 1818. *Kapelar, in Annuaire Med. Chir. des Hôpitaux de Paris, T.* 1, *p.* 390; *4to. Paris,* 1819. *T. Copeland, Obs. on the Symptoms and Treatment of Diseased Spine; 8vo. B. C. Brodie, Pathological and Surgical Observations on the Joints, p.* 257, *&c. 8vo. Lond.* 1818. *James Wilson, Lectures on the Structure and Physiology of the Skeleton, and on the Diseases of the Bones and Joints; p.* 395, *8vo. Lond.* 1820. *W. T. Ward, Distortions of the Spine, Chest, and Limbs; 8vo. Lond.* 1822. *J. Shaw on the Nature and Treatment of Distor-*

tions to which the Spine and Bones of the Chest are subject, &c.; 8*vo. Lond.* 1823. *J. Boyle, on Moxa and Spinal Diseases*; 8*vo. Lond.* 1825.

VINEGAR. (See *Acetic Acid.*)

VINUM OPII. Take of extract of opium ℥i, cinnamon bark bruised, cloves bruised, of each ʒj.; wine a pint. Macerate for eight days, and filter. The thebaic tincture, or liquid laudanum of Sydenham. In surgery, it is often preferred to the common tincture of opium, as an application to the eye.

VIPER, BITE OF. (See *Wounds.*)

VOLVULUS. (from *volvo*, to roll up.) See *Intussusception.*

W

WART. Mr. Hunter observes, that a wart appears to be an excrescence from the cutis, or a tumour formed upon it, by which means, it becomes covered with a cuticle, which is either strong and hard, or thin and soft, just as the cuticle is which covers the parts, from which the excrescence arises. Warts are radiated from their basis to their circumference. The surface of the radii appears to be pointed, or granulated, like the surface of healthy granulations, with the exception of being harder, and rising higher. The surface, on which a wart is formed, seems only to be capable of producing one; for the surrounding and connecting surface does not throw out a similar substance. Thus, when a wart has once begun to grow, it rises higher and higher, without becoming larger at its basis. Such excrescences seem to have within themselves the power of growing; for, as Hunter remarks, after they have risen above the surface of the skin, on which their basis cannot grow larger, they swell out into a round thick substance, which becomes rougher and rougher.

In consequence of this structure, warts are very liable to be hurt by bodies rubbing against them, and, from such a cause, they often bleed very ,profusely, and are rendered sore and painful. (*On the Venereal Disease, p.* 250, *Edit.* 2.)

As warts are adventitious substances, and not any part of the original structure of the body, their powers of life are weak. Hence, when stimulated, they generally become smaller, and at length altogether disappear or drop off.

On this principle, warts may frequently be cured by the application of the sulphate of copper, or a powder, composed of the powders of savine leaves and the subacetate of copper, in equal proportions.

However, the employment of stronger escharotic, like the nitrate of silver, or the concentrated acetic acid; the removal of such excrescences with a knife or pair of scissars; or tying their necks with a ligature; is a mode frequently preferred, because the cure is sooner accomplished.

The two last methods are eligible, when the wart has a narrow neck; but, after the removal of the excrescence, it is still proper to touch the root with the caustic, or the acetic acid; for, unless the whole be completely destroyed, the wart will inevitably grow again.

Warts on the pudenda, and about the anus, scarcely ever withstand the effect of the powder of savine, and subacetate of copper, though they will sometimes resist a course of mercury, adequate to cure lues venerea; a consideration, which led Mr. Hunter to believe them not to be syphilitic. In this opinion, I believe, all the best surgeons of the present day concur.

WHITLOW. (*Panaris, Onychia, Panaritium, Paronychia.*) A whitlow is an inflammation, about the end of the finger, exceedingly painful, and very much disposed to suppurate. The toes are also sometimes the seat of the disease.

Writers usually divide whitlows into four kinds. In the first, or mildest, a vesicle, filled with matter, commonly arises near the root or side of the nail, after a superficial inflammation of trivial extent. The matter is situated immediately under the cuticle. Sometimes the abscess takes place under the nail, in which case, the pain is severe, and not unfrequently shoots upward as far as the external condyle.

The second kind of whitlow is chiefly situated in the cellular substance under the cutis, and, for the most part, occurs at the very end of the finger. In this sort of case the inflammatory symptoms, especially the pain, are far more violent than in other common inflammations of not greater extent. However, although the pain is thus severe, it does not in general extend far from the part affected. Writers usually impute the violence of the pain, and the considerable degree of inflammation attending the complaint, to the hard and unyielding nature of the skin on the finger. To the same cause they also ascribe the difficulty of perceiving any fluctuation, after matter is formed; and the slowness with which the pus makes its way outward.

The third kind of whitlow is distinguishable from the others by the following circumstances. With the most excruciating pain, there is very little swelling in the affected finger, but a vast deal in the hand, particularly about the wrist, and over the whole fore-arm. The pain extends to the hand, wrist, elbow, and even the shoulder. When suppuration takes place, a fluctuation can never be felt in the finger, though it may very often be distinctly perceived in the hand, at the wrist, or even somewhere in the fore-arm. The case is frequently accompanied with considerable fever. The disease is seated in the tendons and their sheaths, and the power of moving the fingers, and even the whole hand, is lost.

Authors describe the fourth kind of whitlow, as arising principally from an inflammation of the periosteum. The case is attended with one peculiarity, which is, that, however violent the pain may be, it never extends to the hand, and fore-arm, nor is there any external swelling of the affected finger. Suppuration generally follows very soon, the usual consequence of which is a caries, or rather a necrosis, of the subjacent finger-bones.

Whitlows commonly begin on the inside of the fingers; but they do occasionally commence on the back of these parts, and even on that of the hand. Though pain about the wrist is usually the effect of inflammation in the finger, Acrel mentions a case, in which the disorder was altogether confined to the hand itself. (*Vorfalle*, 2 *B. p.* 191.)

Mr. Wardrop has favoured the public with an account of a particular species of whitlow, which, from its malignant character, he has denominated the *onychia maligna*. "The commencement of this disease is marked by a degree of swelling, of a deep red colour, in the soft parts at the root of the nail. An oozing of a thin ichor afterwards takes place at the cleft formed between the root of the nail and soft parts, and at last the soft parts begin to ulcerate. The ulcer appears on the circular edge of the soft parts at the root of the nail, it is accompanied with a good deal of swelling, and the skin, particularly that adjacent to the ulcer, has a deep purple colour. The appearance of the ulcer is very unhealthy, the edges being thin and acute, and its surface covered with a dull yellow, or brown coloured lymph, and attended with an ichorous and very fetid discharge. The growth of the nail is interrupted, it loses its natural colour, and at some places appears to have but little connexion with the soft parts. In this state (says Mr. Wardrop) I have seen the disease continue for several years, so that the toe or finger became a deformed bulbous mass. The pain is sometimes very acute; but the disease is more commonly indolent, and accompanied with little uneasiness. This disease affects both the toes and the fingers. I have only observed it on the great toe, and more frequently on the thumb, than any of the fingers. It occurs, too, chiefly in young people; but, I have also seen adults affected with it." (*Wardrop in Med. Chir. Trans. Vol.* 5, *p.* 135, 136.)

The causes of whitlows are generally of a local nature. Writers enumerate the following as the most common: a contusion; suddenly warming the finger when it is exceedingly cold; pricks with needles, or other sharp instruments; and the insinuation of irritating matter into scratches on the finger. A surgeon, in operating for a fistula in ano, has been known to cut his finger, and have in consequence of the accident a very severe and dangerous kind of whitlow. Richter also mentions a person, who had a most obstinate whitlow, in consequence of a slight wound on the finger, in examining the head of a horse that had the glanders. Sometimes the cause of a whitlow depends on a splinter, or thorn, which continues lodged in the part. Very often, no particular cause whatever can be assigned for the complaint.

The first case, which occurs about the root of the nail, ought to be opened as soon as possible. When this plan is not adopted, the matter is apt to penetrate more deeply, reach the root of the nail and occasion a loss of this part. When an effectual opening is not made, the matter collects again. In general, a detachment of the cuticle takes place, as far as the abscess extends. When the inflammation has been very violent, and the matter has made its way as far as the root of the nail, the nail itself is in general gradually detached, while the denuded portion of the root of the nail acts on the sore as a foreign body, and hinders it from healing. Hence the surgeon should repeatedly cut away as much of the lower edge of the nail as he can, and insinuate a little soft lint between the margin of the nail and the sore, in order to keep the latter from being irritated by the former, In proportion as the old nail gradually separates, a new one makes its appearance.

When matter lies under the nail, an opening should be made through the part, as speedily as possible, for the discharge of the abscess. In order to perform this operation, Richter advises the surgeon to scrape the nail with a piece of glass, till it is as thin as it can well be, when it may be cut through with a bistoury.

In the second species of whitlow, suppuration may sometimes be prevented, and the inflammation be resolved by the timely employment of proper means. When the pain is violent, and acute fever prevails, it may be advisable to bleed the patient. In a few severe cases, the application of three or four leeches to the affected finger has been known to procure prompt relief. (*Schmucker.*) Theden thinks, that applying a roller round the finger, hand, and arm, and frequently wetting the first two parts with a lotion, the most certain means of resolving the inflammation. Platner advises the finger to be for some time immersed in water, as warm as the patient can bear. Some recommend the external use of camphorated spirit, or the volatile alkali; while others advise the affected finger to be plunged in a warm solution of soap, or kali. When the whitlow is occasioned by a prick, particular care must be taken, that no extraneous substance remain in the puncture.

When the symptoms do not lessen by the fourth day, Richter recommends an opening to be made. Even when no fluctuation is discovered, he approves of making a crucial incision in the seat of the pain, and, he states, that although no matter may be discharged, the patient always derives infinite relief from the operation. The benefit, he says, may either be imputed to the bleeding, or to the division of the hard tense skin, which compresses the subjacent inflamed parts. Sometimes, the collection of matter can be plainly felt, and, in this case, there can be no hesitation about the place where the opening should be made. However, it may be proper to remark, that the opening should always be made sufficiently large. When the surgeon makes a small puncture, it soon closes again, and a repetition of the operation becomes necessary. When opening the abscess is delayed, the theca of the flexor tendons easily becomes affected, or the matter may spread to a considerable extent under the skin. Sometimes it makes its way through the cutis, by ulceration, and raises up the cuticle. In this case, as soon as the cuticle has been opened, a director should be introduced into the aperture in the skin, and the latter opening be enlarged with a bistoury.

The third species of whitlow seldom affects the last phalanx of the fingers; but generally the second or third. In this case, Richter enjoins us never to defer making an opening longer, than the third day. If we wait till suppuration happens, we shall wait till the tendons are destroyed, and the use of the finger lost. In the case under consideration, the matter is always of bad quality, and very small in quantity. A fluctuation in the finger can seldom be felt. However, in a few instances the matter is perceptible at the extremity of the finger, or about the finger-joints but more often, in the palm of the hand, or near the wrist. In these circumstances, the tendons are in general already destroyed, and a stiffness of the finger and hand is to be apprehended. When the complaint is the consequence of a puncture, the best plan, according to Richter, is at once to enlarge the wound; for, in this sort of case, all other methods are unavailing. It is not enough, however, to cut through the skin; the tendinous theca itself must be laid open.

When a collection of matter forms towards the wrist, attended with violent pain in that situation, an opening must also be made there. If an opening should have already been made in the hand, a probe may be introduced into the wound, and another aperture made in an eligible situation by cutting on the end of the instrument. In the same way, Richter advises an opening to be made in any part of the fore-arm, where great pain, or the symptoms of suppuration, may indicate its propriety.

In the fourth kind of whitlow, early incisions, made down to the bone, are the most certain means of obviating the danger. When such incisions are not made early enough, suppuration takes place, and the bone perishes. The cut is to be made in the place where the pain is most severe. When the first phalanx is affected, the incision may be made in front of the finger, but when the second or third is the seat of the complaint, the opening should be made on one side. However, in order that the opening may be useful, it is absolutely necessary to make it down to the bone. When the incision is delayed too long, a small quantity of unhealthy matter is usually detected, and the bone is found in the state of necrosis. As an exfoliation can hardly be expected in this situation, it is best to remove at once the diseased piece of bone. When the last phalanx alone is affected, the finger retains its form, with the exception of its end being a little shorter and flatter. When the disease, however, is situated in the third phalanx, Richter thinks it better to amputate the finger, than remove the diseased bone, as the finger, if left, would always remain stiff and unserviceable. (See *Anfangsgr. der Wundarzneykunst, Vol. 7.*)

With regard to the treatment of the species of whitlow, named by Mr. Wardrop, *onychia maligna*, all local applications have in many instances proved quite ineffectual, and the part been amputated. The only local treatment, which Mr. Wardrop has ever seen relieve this complaint has been the evulsion of the nail, and afterwards the occasional application of escharotics to the ulcerated surface. I have myself seen a similar plan occasionally succeed, and the applications which appeared to answer best, were arsenical lotions, Plunket's caustic, or a very strong solution of the nitrate of silver. Nothing, however, will avail, till the nail is removed, and its total separation sometimes takes up a good deal of time, unless the patient submit to the great pain of having it cut away.

Mr. Wardrop tried with success the exhibition of mercury in four cases of the onychia maligna. The medicine was given in small doses at first, and afterwards increased, so as to affect the gums in about twelve or fourteen days. When the system was in this state, the sores in general soon assumed a healing appearance, and the bulbous swelling gradually disappeared. (See *Med. Chir. Trans. Vol. 5, p.* 138.)

WOUNDS. A great deal of the subject of wounds has been already considered in the articles, *Gun-shot Wounds; Head, Injuries of; Hemorrhage; Hydrophobia; Parotid Duct; Sutures; Tetanus; Throat;* &c.

A wound may be defined to be a recent solution of continuity in the soft parts, suddenly occasioned by external causes, and generally attended at first with a greater or lesser degree of hemorrhage.

Wounds in general are subject to considerable variety in their nature, degree of danger, facility of cure, and the consequences, which are to be apprehended from them. Some wounds are perfectly trivial, not extending more deeply than the skin and cellular membrane; while others are more serious, penetrating the muscles, tendons, large blood-vessels, and nerves of importance. There are also certain wounds, which are not confined to the soft parts, but injure even the bones; such are many sabre-wounds, which frequently separate at once both a portion of the scalp and the subjacent part of the skull. Many wounds of the head, chest, and abdomen injure the organs contained in those cavities. In short, the varieties, and the degree of danger, attending wounds in general, depend very much upon some of the following circumstances: the extent of the injury; the kind of instrument with which it has been inflicted; the violence, which the fibres of the part have suffered, in addition to their division; the size and importance of the blood-vessels and nerves which happen to be injured; the nature of the wounded part, in respect to its general power of healing favourably, or not; whether the operations of the system at large, and life itself, can be well supported, or not, while the functions of the wounded part are disturbed, interrupted, or suspended, by the accident;

the youth, or old age of the patient; the goodness, or badness of his constitution; and the opportunities which there may be of administering proper surgical aid, and assistance of every kind.

Wounds are distinguished by surgical writers into several kinds; viz. *incised, punctured, contused, lacerated, poisoned,* and *gun-shot wounds.* They also make another equally important division into *Wounds of the Head, Thorax, Abdomen, &c.*

Of gun-shot wounds, and wounds of the head, an account has already been given. (See *Gun-shot Wounds,* and *Head, Injuries of.*) The other cases I shall now proceed to consider.

Incised Wounds. As a general observation, it may be stated, that, *cæteris paribus,* a wound which is made with a sharp cutting instrument, which is, in short, a mere incision, is attended with less hazard of dangerous consequences, than any other kind of wound whatever. The fibres have only been simply divided; they have suffered no contusion, nor laceration; consequently, they are less likely to inflame severely, or to suppurate, or slough; and they commonly admit of being united again in a very expeditious manner.

Generally simple incised wounds bleed more freely, than contused and lacerated ones, which at first sometimes scarcely pour out any blood at all, although considerable blood-vessels may be injured. But this circumstance, apparently diminishing the danger of contused and lacerated wounds, is deceitful, and serves rather to render the case in reality more perilous, by inducing the inexperienced practitioner to be off his guard against hemorrhage. Thus, in gun-shot wounds, it often happens, that, on their first occurrence, the bleeding is trivial; but, the side of some large artery having suffered great violence at the time of the accident, it may ulcerate, or slough, a week or ten days afterwards, and an alarming, and even fatal effusion of blood be the result.

In cases of simple incised wounds, the bleeding, which at once take place from all the divided vessels, is a source of very useful information to the surgeon, inasmuch as it enables him to judge, what danger is to be apprehended from the hemorrhage, whether the cut vessels are large enough to demand the ligature, or, on the contrary, whether they are such as will cease to bleed, either by slight pressure, or of their own accord.

In a recent simple incised wound, there are three objects, which the surgeon should endeavour to accomplish without the least delay. The first, and that which requires his immediate interference, is the bleeding, which must be checked. The second is the removal of all extraneous matter from the surface of the wound. The third is the reunion of the opposite sides of the injury.

When the divided vessels are not above a certain size, the bleeding soon spontaneously ceases, and no surgical measures need be taken on this particular account. When the wounded vessels are even somewhat larger, and their situation is favourable for compression with a bandage, it is often advisable to close the wound and apply compresses and a roller, rather than have recourse to ligatures, which always create a certain degree of irritation, and suppuration. However, though I have made this observation, I should be exceedingly sorry to appear at all against the general preference to ligatures, whenever the wounded arteries are above a certain magnitude. In this circumstance, tying the bleeding vessels is the only safe mode of proceeding. When the artery is of considerable size, and its mouth can be readily seen, the most proper instrument for taking hold of it is a pair of forceps. In applying the ligature, the surgeon must take care to pull its ends in such a manner, that the noose will not rise above the mouth of the vessel, and for the purpose of altering the direction of the force employed in tightening the ligature, the ends of the thumbs are generally made use of. The tenaculum is commonly employed for taking up arteries, which are not large and distinct.

Very fine ligatures, of sufficient strength, are at present often applied, as well to large as small vessels. One half of each ligature should always be cut off, before the wound is closed, and there are some surgeons, who prefer the method of cutting off all the ligature, except what forms the noose immediately round the artery. (*Delpech, Mém. sur la Pourriture d' Hôpital, p.* 29; *Lawrence in Med. Chir. Trans. Vol.* 6. *p.* 156.) To the latter plan, however, a few surgeons have adduced objections, particularly Mr. Guthrie, who only admits the utility of it in cases where the wound will not unite by the first intention; (*On Gun-shot Wounds, p.* 94,) and Mr. Cross, of Norwich. (See *the London Medical Repository, Vol.* 7, *p.* 353.) The experiments of Mr. Cross tend to the following conclusions:

First, If the wounds do not unite by the first intention, the ligatures may escape with the discharge, without any inconvenience.

Secondly, If common ligatures of twine are cut short, the wound may unite over them, and they may be found in abscesses after an interval of many weeks.

Thirdly, if the finest dentist's silk be employed in the same way, and the wound unite over it, the ligature may be detached from the vessel, and remain buried in an abscess, where it will be found at different periods, from one to seven months; and this may happen, whether the vessel be firmly compressed with a single ligature, or divided between two ligatures, so as to imitate the circumstances under which vessels are tied after operations.

Fourthly; If Indian silk, fine as hair, be put round a vessel, so as to diminish its diameter, or to effect its obliteration, by just compressing its sides together, it may remain in this situation, without exciting abscess, or producing any inconvenience. The ligature may be thus applied to compress an artery for the cure of aneurism; but not to secure vessels divided in operations. If a thin ligature be drawn sufficiently tight upon a vessel on the face of a stump to be secure, Mr. Cross is persuaded, that the extremity of the vessel, which becomes insulated, as it were, must die. (See *Lond. Med. Reposit. Vol.* 7, *p.* 363.) It deserves attention, that the preceding inferences are chiefly founded on experiments made upon asses and dogs For further observations, see *Aneurism*, *Hemorrhage*, *Ligature*, *Surgery*, *&c.*

The bleeding having been suppressed, the next object is to remove any extraneous matter, such as dirt, bits of glass, clots of blood, &c. from the surface of the wound. Were this circumstance neglected, the plan of uniting the opposite sides of the cut by the adhesive inflammation, or by what is more frequently termed union by the first intention, would in general be frustrated.

As soon as attention has been paid to the foregoing indications, the surgeon must put the lips of the wound in contact, and take measures for keeping them in this state, until they have grown firmly together. The sides of incised wounds are kept in a state of apposition by means of adhesive plaster, a proper position, the pressure of a roller, and in a few particular instances, by the employment of sutures.

With respect to sutures, as they create pain, irritation, and some degree of suppuration, they ought never to be employed when the parts can be kept in contact without them. However, certain cases require them, and it is admitted by many experienced surgeons, that in sabre-wounds of the ears, eyelids, nose, and lips, it is proper to use them. (See *Assalini's Manuale di Chir. Parte Seconda, p.* 10.) An account of the several kinds of sutures, with remarks on their employment, will be found in the article *Sutures.*

The best and most common method of keeping the surfaces of divided parts in contact is by means of strips of adhesive plaster. When they are to be applied, the surgeon should put the wounded limb or parts in the position which is most favourable to bringing the lips of the wound together. With this view, a position should generally be chosen, which relaxes the skin and subjacent muscles. An assistant should then place the edges of the wound as evenly together as possible, and hold them in this state, until the surgeon has secured them in this condition by strips of adhesive plaster, applied across the line of the wound. In general, it is deemed advisable to leave a small interspace of about a quarter of an inch between each two strips of plaster, by which means the matter cannot be confined in case of suppuration. Over these first strips, lint is to be applied, and kept in its place with other pieces of adhesive plaster. Then, if necessary, a pledget and compresses are to be put on the part, and, lastly, the bandage, or roller, is to be applied.

In this manner, the fresh-cut surfaces are brought into contact; and to preserve them quietly in this state, is the next great aim which the surgeon should have in view. The wounded part should be laid in the posture which was found the most favourable for approximating the sides of the cut at the time of applying the dressings, and the patient should be directed to keep the part in a perfectly quiet state.

When attention is paid to these circumstances, it often happens, that the two opposite surfaces of the wound grow together again in the course of forty-eight hours, without any degree of suppuration. The process by which this desirable event is accomplished is well known among surgeons, by the name of *union by the first intention.* Besides the advantage of the cure being effected in this way with the greatest expedition possible, there is still another thing much in favour of constantly promoting this method of healing wounds, which is, that the scar is much less than after any other mode of cicatrization, and the part is covered with original skin, which is always much stronger than any which can be formed as a substitute for it.

It is wonderful with what celerity union by the first intention takes place under favourable circumstances. In the course of three days, the large wound, made in the operation of amputation, is frequently all healed, except just where the ligatures are situated.

When the two sides of the wound have been brought together, before the oozing of blood has entirely ceased, Mr. Hunter conceives, that blood itself becomes the first bond of union; but, on this point, Professor Thomson, of Edinburgh, entertains a doubt; and all practical surgeons agree, that the lodgment of blood on the surface of a wound is more likely to prevent than promote the union of the parts. In all common instances, what Mr. Hunter calls the adhesive inflammation takes place. In this process, coagulating lymph either issues from the half-closed mouths of the vessels, or from the surface of the opened cells of the cellular substance. This becomes the first uniting medium, and very soon afterwards, in some inexplicable manner, a vascular intercourse is established between the opposite sides of the wound.

The power which parts of the animal body have, of thus growing together, is strikingly evinced by the possibility of removing a part of one body, and then uniting it to some part of another. In this latter case, there can be no assistance given to the union on one side, since the detached part, as Mr. Hunter observes can hardly do more, than just preserve its own living principle, and accept of union. In this way, says the same writer, the spurs of the young cock can be made to grow on its comb, or on that of another cock; and its testicles, after having been removed, may be made to unite to the inside of any cavity of an animal.

Every one initiated in surgery has heard of the feats of Taliacotius, Garengeot, and others, who are said to have succeeded in effecting the union of parts which were completely severed from the body. Several other not less extraordinary performances by modern surgeons are recorded. (See *Observations on Adhesion, with two Cases, demonstrative of the Power of Nature to reunite parts which have been by accident totally separated from the animal System, by Wm. Balfour, 8vo. Edinb.* 1814.) Indeed, the well-known practice of transplanting the teeth, the experiments of Duhamel and Hunter, and the number and respectable character of the testimonies upon this subject, fully convince me of the *occasional* success which may attend the endeavour to bring about such an union. Experience also fully proves the *frequent* success which attends an endeavour to unite a part, which retains only the slight connexion of a small piece of flesh, or even a few fibres. My friend, Mr. Lawrence, attended a case, which illustrates the truth of this statement. A man, on the top of a stage coach, was carried under a gateway, which did not leave sufficient room for him to pass without injury, and his head was so much wounded, that one of his ears was entirely separated, with the exception of an attachment by a trivial piece of integuments. Mr. Lawrence assented to the man's wish of not having the separation completed, and fixed the part in its situation with a few sutures. The consequence was, that the ear soon united again, and the patient escaped all disfigurement. Of the knowledge of the disposition of living cut-surfaces to grow together with considerable expedition, surgeons, both of ancient and modern times, have availed themselves, not only in the treatment of accidental wounds, but also in the removal of deformity, as exemplified in the cure of fissures in the palate, or lips, (see *Harelip*,) but most particularly in the curious and interesting art of forming new under-lips, and noses, and closing large deficiencies in the urethra with flaps of flesh, raised from the adjacent parts, shaped according to circumstances, and laid directly down upon a fresh cut surface purposely prepared, where it is steadily confined for a certain time with sutures, or simple adhesive plaster, and pressure, as the nature of the case may indicate. Nay, sometimes, the flesh for the formation of the organ to be restored has even been taken from a distant part, as for instance, from the arm, for the restoration of parts of the face. When this was done, the limb was confined in close contact with the raw surface formed on the face, until an union between them had been effected; a division was now performed with the scalpel, and the opportunity taken to shape the portion of the limb, which was to be left behind, according as the part to be restored might be the ear, nose, or lip. At the present day, the flesh is usually taken from the adjacent parts; a conexion of the flap with the rest of the body is retained, so as to insure some circulation of blood in it, and it is turned into any position which the circumstances may demand. (See *Gaspar Taliacotius, Chirurgia Nova de Narium, Aurium, Labiorumque Defectu, per insitionem cutis ex humero sarciendo, &c. 8vo. Francof.* 1598. *J. C. Carpue, an Account of Two successful Operations for restoring a lost Nose from the Integuments of the Forehead, 4to. Lond.* 1816. *Giuseppe Baronio, Degli Innesti Animali, 8vo. Milan. C. F. Graefe, De Rhinoplastice, sive Arte curtum Nasum ad Vivum restituendi, commentatio, quâ prisca illius ratio iterum experimentis illustratur novisque methodis ad majorem perfectionem perducitur, 4to. Berol.* 1818. *Sir A. Cooper, on Unnatural Apertures in the Urethra; Surgical Essays, Part 2. H. Earle, on the Re-establishment of a Canal in the place of a portion of the Urethra, in Phil. Trans. for* 1821. *A Case of restored Nose, by Mr. C. Hutchison. A Case of artificial Anus cured by G. F. Collier, in Med. and Physical Journ for June,* 1820.)

Mr. John Bell describes the process of adhesion to be this: either the arteries of the opposite surfaces inosculate mouth to mouth, or rather each cut-surface throws out a gluten; the gluten fills up the intermediate space; into that gluten the lesser arteries of each cut-surface extend themselves, and it is thus, perhaps, by the generation of a new intermediate substance, that the continuity and entireness of the part are so quickly restored. If any one point fail to adhere, there the wound must run into suppuration; because, says Mr. J. Bell, at that point there is a separation of parts, which is equivalent to a loss of substance.

The same writer observes, that there are, no doubt, accidents, both of the constitution and the wound, which will prevent adhesion. If the patient be of a bad habit of body; if he be lying in a foul hospital, in the midst of putrid sores, and breathing a contagious air; if he be ill of a fever, or flux, or any general disease; then the properties of the body being less perfect, the wound will not adhere. Mr. J. Bell also notices, that, if the wound be foul, made with a poisoned weapon, or left with foreign bodies lodged in it; or if a considerable quantity of blood be poured out into the cavity of the wound, or if there be a wounded lymphatic, or a wounded salivary duct, a wounded intestine, or a bleeding artery or vein, the immediate adhesion of the whole of the wound may be prevented. However, I cannot help remarking, that, though Mr. John Bell, in imitation of most surgical writers, sets down the wound of a lymphatic, as preventive of the union of wounds, I cannot say that I ever saw such an effect imputable to the cause just mentioned. Also, when an artery or vein is cut, and requires to be tied, the adhesion of the wound would be prevented only just where the ligature lies, and at no other point.

There is no wound, observes Mr. John Bell, in which we may not try with perfect safety to procure this adhesion; for nothing can agree better with one surface of the wound, than the opposite one, which has been just separated from it. They may immediately adhere together, and even if they should not do so, no harm is done, and the wound will yet suppurate as favourably, as if it had been roughly dressed with dry caddis, or some vulnerary balsam, or acrid ointment. If one part should suppurate, while one half adheres, then, says Mr. John Bell, one half of our business is done. In short, this simple duty of immediately closing a wound is both natural and safe. (*Discourses on the Nature and Cure of Wounds, Vol.* 1.)

Upon this interesting topic of the advantages of union by the first intention, the most enlightened surgeons of all Europe now begin to entertain only one opinion. The practice is generally adopted, both in the treatment of accidental cuts and of the wounds resulting from surgical operations. Thus Assalini, one of the best modern surgeons in Italy, begins his Manual of Surgery with the following xiom: "Wounds and injuries of the soft parts, produced by cutting instruments, from the trifling wound of a vein, made for the purpose of discharging a few ounces of blood, to the incision in the uterus for the extraction of the fœtus, inclusively, should all be united by the first intention." (See *Manuale di Chirurgia; Discorso Primo. Milano*, 1812.)

British surgeons have, indeed, been accused by M. Roux of indiscriminate partiality to the plan of uniting all incised wounds by the first intention; and his countryman Baron Larrey has wished the method to be discontinued after amputation, in order (as he states) to lessen the chance of tetanus. But the exceptions which these surgeons wish to make are few, and few as they are, they are not likely to be established, since several of the circumstances, alledged as reasons for limiting so beneficial a practice, are hypothetical, and far from being clearly proved. (See *Roux, Mémoire et Obs. sur la Réunion immédiate de la Plaie après l'Amputation circulaire des Membres*, 8*vo. Paris*, 1814. *Larrey, Mém. de Chir. Mil. Tome* 4, 8*vo.* 1812—17.)

Sometimes the attempt to procure union by the first intention fails, even in cases of incised wounds; but, in this circumstance, no harm arises from the kind of practice which has been followed. The case, in fact, now falls into nearly the same state as would have occurred had no attempt at union been made at all. The patient has taken the chance of a quicker mode of cure; but he has not been successful, and he must now be cured by a process, which, on account of its slowness, he at first wished to avoid. It is to be observed, also, that union by the first intention, if not spoiled by sutures, rarely fails so completely that there is not a partial adhesion of some points of the wound. The moment when we observe pain, inflammation, and swelling of the wound, a separation or gaping of its lips, the stitches tense, (when these have been used,) and the points where the stitches pass particularly inflamed, Mr. John Bell advises us to undo the bandages, draw out the sutures, and take away every thing which acts like a stricture on the wound. These prudent measures, he observes, may abate the rising inflammation, and prevent the total separation of the skin, while an endeavour may still be made to keep the edges of the wound tolerably near each other by the more gentle operation of sticking-plasters.

However, when the inflammation rises still higher, and it is evident that a total separation of the sides of the wound cannot be avoided, Mr. John Bell wisely recommends leaving the parts quite loose, and applying a large soft poultice; for, says he, should you in this critical juncture, persist in keeping the parts together with sutures, the inflammation, in the form of erysipelas, would extend over the whole limb, attended with a fetid and bloody suppuration. After the wound has been brought into a favourable state, another attempt may be made to bring the edges near each other, not with sutures, but strips of adhesive plaster, or the gentle application of a bandage.

Mr. John Bell concludes with remarking, that the suppuration, production of granulations, and all that follows, are the work of nature. The only thing that the surgeon can usefully do, is to take care of the health. When the wound does not suppurate favourably, the discharge generally becomes profuse, thin, and gleety. This state is to be amended by bark, wine, rich diet, and good air.

I shall conclude this subject of union by the first intention, with an extract from the writings of Mr. Hunter, who observes that

"It is with a view to this principle of union, that it has been recommended to bring the sides (or lips) of wounds together; but as the natural elasticity of the parts makes them recede, it has been found necessary to employ art for that purpose. This necessity first suggested the practice of sewing wounds, and afterwards gave rise to various inventions in order to answer this end, such as bandages, sticking-plasters, and ligatures. Among these, the bandage, commonly called the uniting bandage, is preferable to all the rest, where it can be employed; but its application is very confined, from being only adapted to parts where a roller can be used. A piece of sticking-plaster, which has been called the dry suture, is more general in its application than the uniting bandage, and is therefore preferable to it on many occasions.

"I can hardly suppose (says Mr. Hunter) a wound, in any situation, where it may not be applied, excepting penetrating wounds, where we wish the inner portion of the wound to be closed equally with the outer, as in the case of hare-lip. But even in such wounds, if the parts are thick, and the wound not large, the sides will seldom recede so far as to make any other means necessary. The dry suture has an advantage over stitches by bringing a larger surface of the wound together, by not inflaming the parts to which it is applied, and by neither producing in them suppuration nor ulceration, which stitches always do. When parts, therefore, can be brought together, and especially where some force is required for that purpose, from the skin not being in large quantity, the sticking-plaster is certainly the best application. This happens frequently to be the case after the removal of tumours, in amputation, or where the sides of the wound are only to be brought together at one end, as in the hare-lip; and I think the difference between Mr. Sharp's cross-stitch, after amputation, as recommended in his Critical Inquiry, and Mr. Alanson's practice, shows strongly the superiority of the sticking-plaster (or dry suture). In those parts of the body where the skin recedes more than in others, this treatment becomes most necessary; and as the scalp probably recedes as little as any, it is therefore seldom necessary to apply any thing in wounds of that part; the practice will certainly answer best in superficial wounds, because the bottom is in these more within its influence.

"The sticking plasters should be laid on in strips, and these should be at small distances from each other, viz. about a quarter of an inch at most, if the part requires close confinement; but when it does not, they may be at greater distances. This precaution becomes more necessary if the bleeding is not quite stopped;

there should be passages left for the exit of blood, as its accumulation might prevent the union, although this does not always happen. If any extraneous body, such as a ligature, should have been left in the wound, suppuration will take place, and the matter should be allowed to vent at some of those openings, or spaces, between the slips of plaster. I have known a very considerable abscess formed in consequence of this precaution being neglected, by which the whole of the recently united parts have been separated.

" The interrupted suture, which has generally been recommended in large wounds, is still in use, but seldom proves equal to the intention. This we may reckon to be the only one that deserves the name of suture; it was formerly used, but is now in a great measure laid aside in practice, not from the impropriety of uniting parts by this process, but from the ineffectual mode of attempting it. In what manner better methods could be contrived, I have not been able to suggest. It is to be understood, that the above methods of bringing wounded parts together, in order to unite them, are only to be put in practice in such cases as will admit of it; for if there was a method known, which, in all cases, would bring the wounded surfaces into contact, it would in many instances be improper, as some wounds are attended with contusion, by which the parts have been more or less deadened; in such cases, as was formerly observed, union cannot take place according to our first principle, and therefore it is improper to attempt it.

" In many wounds, which are not attended with contusion, when we either know or suspect that extraneous bodies have been introduced into the wound, union by the first intention should not be attempted, but they should be allowed to suppurate, in order that the extraneous matter may be expelled. Wounds which are attended with laceration, although free from contusion, cannot always be united by the first intention; because it must frequently be impossible to bring the external parts, or skin, so much in contact, as to prevent that inflammation which is naturally produced by exposure. But even in cases of simple laceration, where the external influence is but slight, or can be prevented, (as we observed in treating of the compound fracture), we find that union by the first intention often takes place; the blood, which fills up the interstices of the lacerated parts, having prevented the stimulus of imperfection in them, and prevented suppuration, may afterwards be absorbed.

" Many operations may be so performed as to admit of parts uniting by the first intention; but the practice should be adopted with great circumspection: the mode of operating with that view, should in all cases be a secondary, and not a first consideration, which it has unluckily been too often among surgeons. In cases of cancer, it is a most dangerous attempt at refinement in surgery.

" In the union of wounded parts by the first intention, it is hardly or never possible to bring them so close together at the exposed edges, as to unite them perfectly by these means; such edges are therefore obliged to take another method of healing. If kept moist, they will inflame as deep between the cut surfaces as the blood fails in the union, and there suppurate and granulate; but if the blood be allowed to dry and form a scab between, and along the cut edges, then inflammation and suppuration of those edges will be prevented, and this will complete the union, as will be described by-and-by.

" As those effects of accidental injury, which can be cured by the first intention, call up none of the powers of the constitution to assist in the reparation, it is not the least affected or disturbed by them; the parts are united by the extravasated blood alone, which was thrown out by the injury, either from the divided vessels or in consequence of inflammation, without a single action taking place, even in the part itself, except the closing or inosculation of the vessels; for the flowing of the blood is to be considered as entirely mechanical. Even in cases where a small degree of inflammation comes on, it is merely a local action, and so inconsiderable, that the constitution is not affected by it; because it is an operation, to which the powers belonging to the parts themselves are fully equal. The inflammation may produce a small degree of pain, but the operation of union gives no sensation of any kind whatever." (*Hunter on the Blood, Inflammation, and Gun-shot Wounds.*)

Contused and Lacerated Wounds.—Lacerated wounds are those in which the fibres, instead of being divided by a cutting instrument, have been torn asunder by some violence capable of overcoming their force of adhesion. The edges of such wounds, instead of being straight and regular, are jagged or unequal.

The term *contused* is applied to these wounds which are occasioned by some blunt instrument, or surface, which has violently struck a part of the body.

These two species of wounds greatly resemble each other, and as they require nearly the same kind of treament, writers usually treat of them together.

Lacerated and contused wounds differ from simple incised ones in appearing, at first view, much less alarming than the latter, while, in reality, they are infinitely more dangerous. In simple cut wounds, the retraction of the parts, and the hemorrhage, are generally much more considerable than in a lacerated wound of the same size. However, notwithstanding these circumstances, they commonly admit of being healed with far greater ease. It is worthy of particular notice, that lacerated and contused wounds are not in general attended with any serious effusion of blood, even though large blood-vessels may be injured. I say, in general, because, in the year 1813, I saw a soldier, whose death was occasioned by a sudden effusion of a very large quantity of blood from the internal jugular vein, which vessel had been injured by a musket-ball, that first entered the integuments behind the mastoid process, and passed obliquely downwards and forwards towards the sternum. The blood did not issue externally; but formed betwixt the integuments and the trachea, a large dark-coloured swelling, which produced almost immediate suffocation. At the memorable siege of Saragossa, Professor Assalini saw a surgeon, whose left carotid artery had been injured by a musket-ball, perish of hemorrhage in a few seconds. (See *Assalini's Manuale di Chirurgia, p.* 32, *Milano*, 1812.)

In most cases, however, there is little or no hemorrhage from lacerated or contused wounds, and it is a circumstance which often leads inexperienced practitioners to commit great mistakes, by inducing them to promise too much in the prognosis which they make. Surgeons versed in practice, however, do not allow themselves to be deceived by the absence of hemorrhage, and, in proportion as there is little bleeding, they apprehend that the violence done to the fibres and vessels has been considerable. What is it, but the contused and lacerated nature of the wound, that prevents hemorrhage from the umbilical arteries, when animals divide the navel-string with their teeth? Whole limbs have frequently been torn from the body, without any hemorrhage of consequence taking place.

In the Phil. Trans. Cheselden has recorded a very remarkable case, in which a man's arm was suddenly torn from his body. Samuel Wood, a miller, had round his arm a rope, which got entangled with the wheel of the mill. He was lifted off the ground, and then stopped by a beam, which prevented his trunk from passing further; at this instant, the wheel, which was moving with immense force, completely tore and carried away his arm and scapula from his body. The appearance of the wound, occasioned in this manner, must of course be horrible, and the first idea, thence arising, must naturally be that the patient cannot possibly survive. Samuel Wood, however, escaped with his life. The limb had been torn off with such velocity, that he was unaware of the accident, till he saw his arm moving round on the wheel. He immediately descended by a narrow ladder from the mill, and even walked some paces, with a view of seeking assistance. He now fell down from weakness. The persons, who first came to his assistance, covered the wound with powdered sugar. A surgeon, who afterwards arrived, observing that there was no hemorrhage, was content with bringing down the skin, which was very loose, so as to make it cover the surface of the wound. For this purpose he used two cross stitches. The patient was conveyed, the next day, to St. Thomas's Hospital, and put under the care of Mr. Fern. This practitioner employed the usual means for preventing the bad symptoms most to be expected in this sort of case. The first dressings came away without any bleeding; no alarming consequences ensued; and the patient, in two months, completely recovered.

When the arm was examined, it was found, that the muscles, inserted into the scapula, were torn through near their insertions; while other muscles, arising from this bone, were carried away with it. The skin covering the scapula had remained in its natural situation, and seemed as if it had been divided precisely at the insertion of the deltoid muscle.

In La Motte's *Traité des Accouchemens* may be found an account of a little boy, who, while playing near the wheel of a mill, got his hand, fore-arm, and arm, successively entangled in the machinery, and the limb was violently torn away at the shoulder-joint, in consequence of the lad's body not being able to pass in the direction in which the arm was drawn. The bleeding was so trivial, that it was stopped with a little lint, and the boy very soon recovered.

In the fifth vol. of the Edinb. Med. Commentaries, may also be perused the history of a child, three years and a half old, whose arm was torn off by the wheel of a mill. Mr. Carmichael, who saw the child about an hour after the accident, found it almost in a dying state, with cold extremities, small faltering pulse, and all the right side of the body convulsed. However, there was hardly any bleeding. The arm was broken about an inch and a half above the elbow; the stump had a dreadful appearance; all the soft parts were in a contused and lacerated state, and the humerus was laid bare as high as the articulation, which was itself exposed. The skin and muscles were lacerated to a much greater extent, and in different directions. The remainder of the humerus was removed from the shoulder-joint by amputation, only as much skin and muscle being left as was sufficient to cover the wound. In two months, the child was well.

In the *Mem. de l'Acad. de Chir. T.* 2, is an account of a leg being torn away at the knee-joint by a cart-wheel. The patient was a boy, about nine or ten years of age. This accident, like the foregoing ones, was accompanied with no hemorrhage. The lower portion of the os femoris, which was exposed, was amputated, together with such portion of the soft parts as was in a contused and lacerated state. The patient experienced a perfect recovery.

The preceding cases strikingly confirm the observation which I have already made, in regard to the little bleeding which usually arises from contused and lacerated wounds.

In these instances, the pain is also in an inverse ratio to the cause of the accident: it is generally very severe, when the wound is only moderately contused: and, on the other hand, the patient scarcely suffers any pain at all, where there has been so violent a degree of contusion, as at once to destroy the organization of the part.

When the bruised fibres have not been injured above a certain degree, the part suppurates; but such portions of the wound as have suffered greater violence inevitably die, and are cast off in the form of sloughs. Granulations are afterwards formed, and the breach of continuity is repaired by the process of cicatrization. (See *this word.*)

When a still greater degree of violence has been done, and especially when arteries of a certain magnitude have been injured, a mortification is too frequently the consequence. However, if the constitution be good, and the mischief not too extensive, the case may still end well. But, in other instances, the event is alarmingly dubious; for the mischief is then not limited to the wounded parts, which have suffered the greatest degree of contusion, but too frequently extends over such parts as were not at all interested by the wound itself.

The mortification, arising directly from the impaired organization of parts, is not what is the most alarming circumstance. A still more dangerous kind of mortification is that which is apt to originate from the violent inflammation occasioned by the accident. This consequence demands the utmost attention on the part of the surgeon, who must let no useful means be neglected, with a view of diminishing the inflammation, before it has attained too high a degree, and very dangerous symptoms have commenced. In the first instance, he should not be afraid of letting the wound bleed a little, if it should be disposed to do so. The edges of the wound should then be gently drawn towards each other, with a few strips of sticking plaster, so as to lessen the extent of the exposed surface; but no sutures are proper. Indeed, the plan of diminishing the exposed surface of a contused wound with strips of adhesive plaster is not invariably right; because their application creates a hurtful degree of irritation. The method is chiefly advisable, when there is a large loose flap of skin, which can be conveniently brought over the wound. In other cases, it is best to leave the parts free, uncompressed, and unconfined with any adhesive plaster, because, if it were applied, its irritation would do harm, and could not possibly procure any union of the parts. Under the most favourable circumstances, hardly any part of the wound can be expected to unite by the first intention: the whole or the greater part of it will necessarily suppurate, after the detachment of the sloughs. The surface will then granulate, new skin will be formed, and the part heal just like a common wound. Perhaps, until the sloughs separate, the best application is a soft poultice, which should be put on cold, lest it bring on too great an oozing of blood.

Nothing, indeed, is so proper for checking any tendency to hemorrhage as cold applications, which are also the most effectual in preventing and diminishing the great degree of inflammation, which is one of the most dangerous consequences of this description of wounds.

No surgical writer, I think, has given more rational advice, respecting contused wounds, than that published by Professor Assalini. In general, says he, the treatment of contused wounds, whether they be simple and slight, or complicated and severe, requires the active employment of debilitating means in order to prevent inflammation. Cold water and ice; and general and topical bleeding; are the things usually resorted to with success. Vulnerary lotions, camphorated spirit, and other spirituous applications are improper, and if their pernicious effects are not always very evident, it is only because the contused injuries have been trifling, and in their nature perfectly easy of cure. In these cases, as well as in those of extravasations and glandular swellings, Assalini gives a preference to cold applications. The internal remedies and regimen (says he) should also be adapted to the condition of the patient. A cannon-ball, at the end of its course, may come into contact with a limb, and fracture the bones, while the integuments have the appearance of being uninjured. Such cases are often attended with dreadful mischief in the soft parts around the bone, which generally sphacelate. This is an accident for which immediate amputation is mostly indispensable (see *Gun-shot-wounds*); but if any thing be capable of preventing inflammation and gangrene, it is an active debilitating plan of treatment, assisted with cold applications to the injured part. In such cases, the internal and external use of stimulants is approved of by many surgeons. But Assalini prefers considering the state of the injured limb, just like what it is when affected with frost; and he thinks that the employment of stimulants will necessarily produce the same effect as caloric prematurely applied to parts deadened with cold. On the contrary, from the outward employment of ice and cold lotions in these cases, and in contused injuries in general, he has seen the greatest benefit derived.

Assalini conceives, that reason will be found to support this practice. The operation of cold, he says, retards the course of the blood, which meeting with only damaged vessels, augments the extravasation as it continues to flow. By lessening the temperature of the part, cold applications likewise diminish the danger of inflammation and sphacelus, at the same time that they have the good effect of rendering the suppuration, which must ensue, less profuse than it would be, were not the extravasation of blood, and violence of the inflammation, lessened by such applications, and a lowering plan of treatment.

Why, says Assalini, should not this method, which is so generally adopted to prevent the effects of concussion of the brain after blows on the head, be for analogous reasons employed in examples of extravasation and commotion in other parts of the body? (*Manuale de Chirurgia, Parte Prima*, p. 17.) Cold applications, however, in cases of contused wounds, are chiefly to be preferred for the first day or two, in order to check the increase of extravasation and inflammation. After this period, I give a decided preference to an emollient linseed poultice, which will be found the most easy dressing during those processes, by which the sloughs are detached, the surface of the wound cleansed, and the origin of granulations established. When these changes have happened, the remaining sore is to be treated on the same principles as ulcers in general. See *Ulcer*.

Punctured Wounds.—A *punctured* wound signifies one made with a narrow-pointed instrument, the external orifice of the injury being small and contracted, instead of being of a size proportionate to its depth. A wound, produced by a thrust of a sword, or bayonet, affords us an example of a punctured wound.

Wounds of this description are in general infinitely more dangerous than cuts, notwithstanding the latter have the appearance of being by far the most extensive. In cases of stabs, the greatest degree of danger always depends on the injury and rough violence which the fibres have suffered, in addition to their mere division. Many of the disagreeable consequences are also to be imputed to the considerable depth to which these wounds extend, whereby important parts and organs are frequently injured. Sometimes the treatment is rendered perplexing by the difficulty of removing extraneous substances, as for instance a piece of the weapon, which has been left in the wound. Lastly, experience proves, that punctured wounds and stabs are particularly liable to be followed by a great deal of inflammation, fever, deep-seated abscesses, sinuses, &c.

A strange notion seems to pervade the writings of many systematic authors, that all the danger and disagreeable consequences of punctured wounds are entirely owing to the narrowness of their orifices, which prevents suitable applications from being made to their bottom. Hence, it is absurdly recommended to dilate the opening of every stab, with a view, as is generally added, of converting the accident into a simple incised wound. Some of these writers are advocates for making the dilatation with a cutting instrument, while others, with equal absurdity, propose to enlarge the opening with tents.

Certain authors regard a punctured wound, as a recent sinus, and, in order to make the inner surfaces unite, they recommend exciting a degree of inflammation in them, either by means of setons or injections.

In the earliest edition of *The First Lines of the Practice of Surgery*, I have taken particular pains to expose the folly and errors which prevail in most writings on this part of practice. In the above work, I have remarked, that if the notion were true, that an important punctured wound, such as the stab of a bayonet, could be actually changed into a wound partaking of the mild nature of an incision, by the mere enlargement of its orifice, the corresponding practice would certainly be highly commendable, however painful. But the fact is otherwise: the rough violence done to the fibres of the body by the generality of stabs, is little likely to be suddenly removed by an enlargement of the wound. Nor can the distance to which a punctured wound frequently penetrates, and the number and nature of the parts injured by it, be at all altered by such a proceeding. These, which are the grand causes of the collections of matter that often take place in the cases under consideration, must exist, whether the mouth and canal of the wound be enlarged or not. The time when incisions are proper, is, when there are foreign bodies to be removed, abscesses to be opened, or sinuses to be divided. To make painful incisions sooner than they can answer any end, is both injudicious and hurtful. They are sometimes rendered quite unnecessary, by the union of the wound throughout its whole extent, without any suppuration at all.

Making a free incision in the early stage of these cases, undoubtedly seems a reasonable method of preventing the formation of sinuses, by preventing the confinement of matter, and, were sinuses an inevitable consequence of all punctured wounds, for which no incisions had been practised at the moment of their occurrence, it would undoubtedly be unpardonable to omit them. Fair, however, as this reason may appear, it is only superficially plausible, and a small degree of reflection soon discovers its want of real solidity. Under what circumstances do sinuses form? Do they not form only where there is some cause existing to prevent the healing of an abscess? This cause may either be the indirect way in which the abscess communicates externally, so that the pus does not readily escape; or it may be the presence of some foreign body, or carious bone; or, lastly, it may be an indisposition of the inner surface of the abscess to form granulations, arising from its long duration, but removable by laying the cyst completely open to the influence of the air. Thus it becomes manifest, that the occurrence of suppuration in punctured wounds is followed by sinuses only when the surgeon neglects to procure a free issue for the matter, after its accumulation; or when he neglects to remove any extraneous bodies. But as dilating the wound at first can only tend to augment the inflammation, and render the suppuration more extensive, it ought never to be practised in these cases, except for the direct objects of giving free exit to matter already collected, and of being able to remove extraneous bodies palpably lodged. I shall once more repeat, that it is an erroneous idea to suppose the narrowness of punctured wounds so principal a cause of the bad symptoms with which they are often attended, that the treatment ought invariably to aim at its removal.

Recent punctured wounds have absurdly had the same plan of treatment applied to them as old and callous fistulæ. Setons and stimulating injections, which, in the latter cases, sometimes act beneficially, by exciting such inflammation as is productive of the effusion of coagulating lymph, and of the granulating process, never prove serviceable when the indication is to moderate an inflammation, which is too apt to rise to an improper height. The counter-opening, that must be formed in adopting the use of a seton, is also an objection. However, what good can possibly arise from a seton in these cases? Will it promote the discharge of foreign bodies, if any are present? By occupying the external openings of the wound, will it not be more likely to prevent it? In fact, will it not itself act with all the inconveniences and irritation of an extraneous substance in the wound? Is it a likely means of diminishing the immoderate pain, swelling, and extensive suppuration, so often attending punctured wounds? It will undoubtedly prevent the external openings from healing too soon; but cannot this object be effected in a better way? If the surgeon observes to insinuate a piece of lint into the sinus, and pass a probe through its track once a day, the danger of its closing too soon will be removed.

The practice of enlarging punctured wounds by incisions, and of introducing setons, is often forbidden by the particular situation of these injuries.

In the first stage of a punctured wound, the indication is to guard against the attack of violent inflammation. When no considerable quantity of blood has been lost, general and topical bleeding should be practised. In short, the antiphlogistic plan is to be followed. As no man can pronounce, whether such wounds will unite, or not, and as no harm can result from the attempt, the orifice ought to be closed, and covered with simple dressings. In such cases, cold applications are also highly commendable. Whether gentle compression might be made to promote the adhesive inflammation, or not, may be doubtful: I confess that I should not have any reliance upon its usefulness. Perfect quietude is to be observed. When the pain is severe, opium is to be administered.

Sometimes, under this treatment, the surgeon is agreeably surprised to find the consequent inflammation mild, and the wound speedily united by the first intention. "Numerous are the examples of wounds, which penetrate the large cavities, being healed by the first intention, that is, without any suppuration. Even wounds of the chest itself, with injury of the lungs (continues an experienced military surgeon and professor), ought to be united by the first intention. (*Assalini, in Manuale di Chirurgia, parte Seconda, p.* 13.) More frequently, however, in cases of deep stabs, the pain is intolerable; and the inflammatory symptoms run so high as to leave no hope of avoiding suppuration. In this condition, an emollient poultice is the best local application; and, when the matter is formed, the treatment is like that of abscesses in general. See *Suppuration.*

Poisoned Wounds: Bite of the Viper.—If we exclude from present consideration the bites of mad dogs, and other rabid animals, which subject is fully treated of in the article *Hydrophobia*, wounds of this description are not very common in these islands. In dissections, pricks of the hand sometimes occur, and they are, in reality, a species of poisoned wound, frequently causing considerable pain and irritation in the course of the absorbents; swelling and suppuration of the lymphatic glands of the arm, or axilla; and severe fever and constitutional irritation. An instance of the fatal consequences of such an injury must still be fresh in the recollection of the profession; and some others of yet more recent date have taken place in this metropolis. (See *London Medical Repository, Vol.* 7, *p.* 288.)

In many instances, however, surgeons wound their fingers in dissecting bodies, and no particular ill consequences ensue. The healthy and robust are said to suffer less frequently after such accidents, than persons whose constitutions have been weakened by hard study, excesses, pleasure, or previous disease. It is remarked, also, that pricks of the fingers, met with in opening the bodies of persons who have died of contagious diseases, and where a virus, or infectious matter, might be expected to exist in such bodies, do not communicate the infection. Doubtless (observes Richerand) the activity of certain animal poisons, from which the venereal and several other diseases arise, is extinguished with life. (*Nosographie Chir. T.* 1, *p.* 102, 103, *Edit.* 4.)

With regard to the treatment of the pricks of dissecting scalpels, the surgeons of the continent recommend the immediate cauterization of the little wounds with a grain of caustic potassa, or the liquid muriate of ammonia. Tonic remedies, particularly wine, are prescribed, and great attention paid to emptying the bowels.

The stings of bees, wasps, and hornets, are also poisoned wounds, though they are seldom important enough to require the assistance of a surgeon. The hornet is not found in Scotland; but it is an inhabitant of several of the woods in England. Its sting, which is more painful than that of a bee, or wasp, is not, however, often the occasion of any serious consequences. The stings of all these insects are attended with a sharp pain in the part, very quickly succeeded by an inflammatory swelling, which, after a short time, generally subsides of itself. When the eye is stung, as sometimes has happened, the effects may be very severe, as is elsewhere noticed. (See *Ophthalmy.*) It has been lately observed, that the pain of the stings of venomous insects, like the bee, depends less upon the introduction of the sting into the part, than upon that of the venomous fluid. The experiments of Professor Duméril tend to prove, that, when the little poison-bladder, situated at the base of the sting, has been cut off, a wound with the sting then produces no pain. The poison flows from the vesicle through the sting at the instant when this passes into the flesh. The exact nature of the venomous fluid is not known. When applied to mucous surfaces, or even to the surface of the conjunctiva of the eye, it causes no disagreeable sensation; but when it is introduced into the skin, by means of a needle, it immediately excites very acute pain.

Oil, honey, spirits of wine, the juice of the plantain, and a variety of other local applications, have been extolled as specifics for the relief of the stings of insects. Modern experience, however, does not sanction their claim to this character. In fact, none of these applications either neutralize the poison, or appease with superior efficacy the pain of the sting.

These cases should all be treated on common antiphlogistic principles, and the most rational plan is to extract the sting, taking care, in the first instance, to cut off the little poison-vesicle with scissars, lest in the attempts to withdraw the sting, more of the virus be compressed into the part. The stung part should then be immersed for a time in ice-cold water, and afterwards covered with linen wet with the liquor plumbi acetatis dilutus. Were the inflammation to exceed the usual degree, leeches and aperient medicines would be proper. In short, as there is no specific for the cure of these cases, they are to be treated with common antiphlogistic means.

With regard to the bites of serpents, those inflicted by the rattle-snake of America, and the cobra di Capello of the East Indies, are the most speedily mortal. Indeed, this is so much the case, that sometimes there is scarcely an opportunity of trying any remedies; and, even when the patient is not destroyed thus rapidly, there is such general disorder of the nervous system, with repeated faintings and sickness, that medicines cannot well be retained in the stomach, at least for some time.

Mr. Catesby, in the Preface to his Natural History of Carolina, informs us, that the Indians, who, by their constant wanderings in the woods, are liable to be bit by snakes, know, as soon as they receive the injury, whether it will prove mortal or not. If it be on any part at a distance from large blood vessels, or where the circulation is not vigorous, they apply their remedies; but if any vein of considerable magnitude be hurt, they quietly resign themselves to their fate, knowing that nothing can then be of service. Amongst the remedies on which they chiefly depend, are seneka root, volatile alkali, and, particularly, strong dozes of arsenic, as will be presently noticed again.

If we put out of consideration animals affected with rabies, the viper inflicts the worst poisoned wound ever met with in these islands. In fact, it is an animal that inserts into the part which it bites, a poison capable of exciting very serious consequences. The jaws of the viper are furnished with teeth, two of which in the upper jaw are very different from the rest. These, which are about three lines long, are covered, for about two-thirds of their length, with a membranous coat, or sheath, are of a curved shape, and articulated with the jawbone. When the animal is tranquil, and his mouth shut, they lie down with their points turned backwards; but they instantly project forwards when it is irritated, and about to bite. In them are canals, which terminate by a very narrow fissure, on their convex sides, a little way from their points. The rest of these fangs is very hard and solid; and the canal is usually filled with a transparent, yellowish fluid, the poison of the viper.

This venomous fluid is secreted by two glands, or rather by two clusters of glands, one on each side of the head, placed on the front of the forehead, directly behind the eye-ball, under the muscle which serves to depress the upper jaw. Thus the muscle cannot act without pressing upon them, and promoting the secretion of the fluid, which they are destined to prepare. A little bag, or vesicle, connected to the base of the first bone of the upper jaw, as well as to the end of the second, covers also the roots of the curved fangs, and forms a receptacle for the venom.

The viper is chiefly found in hilly, stony, and woody districts, and seldom in flat, or marshy places. It is not its nature to attack man, or large animals, except when provoked. Its venom is only employed for the destruction of smaller animals, such as mice, frogs, &c. which are usually swallowed whole, and to the digestion of which the venomous secretion is by some writers supposed to contribute. When, however, a viper is pursued, trod upon, taken hold of, or hurt, it immediately bites, and were it only on account of the shape of the fangs, the wound might be attended with very unpleasant effects; but it is certain of being so, by reason of the species of inoculation which complicates it, and of which the mechanism is as follows:

When a viper is about to bite, it opens its mouth very wide. The two curved fangs, which had previously lain flat down, in the cavity of the membrane attached to their base, now project, and become perpendicular to the lower jaw. When the bite takes place, the poison is propelled through the fangs, by the contraction of the muscles, and the closure of the mouth, and is injected into the wound with a force proportioned to its accidental quantity at the time, and the vigour of the animal.

The bite of a viper is quickly followed by severe effects, some of which are local, and the others general; but it is with the former that the disorder invariably commences. At the instant of the bite, the bitten part is seized with an acute pain, which rapidly shoots over the whole limb, and even affects the viscera and internal organs. Soon afterwards, the wounded part swells and reddens. Sometimes, the tumefaction is confined to the circumference of the injury; but, most frequently, it spreads extensively, quickly affecting every part of the limb, and even the trunk itself. A sanious fluid is often discharged from the wound, around which phlyctenæ arise, similar to those of a burn. After a short time, however, the pain abates considerably; the inflammatory tension changes into a doughy, or œdematous softness; the part grows cold; and the skin exhibits large livid spots, like those of gangrene. The general symptoms also come on with celerity; the patient is troubled with anxiety, prostration of strength, difficulty of breathing, and cold profuse sweats. Vomiting frequently occurs, and sometimes copious bilious evacuations from the bowels. These symptoms are almost constantly attended with an universal yellowness, and excruciating pain about the navel.

The effects occur in the same way in nearly all subjects, with some differences depending upon the particular irritability and constitution of the patient; the high or low temperature of the atmosphere; the greater or lesser anger of the viper; the number of its bites; the size of the reptile itself; the depth to which the fangs have penetrated; and whether the bitten part happens to be one of great sensibility, or was naked, or not, at the time of the accident. In general, weak, pusillanimous persons, of bad constitutions, and loaded stomachs, suffer more sudden and alarming ill consequences, than strong, healthy subjects, who view the danger without fear. Several bites are, of course, more dangerous than a single one; and, lastly, it has been remarked, that the venom of the viper is more active in summer than the spring.

A year or two ago, however, the newspapers recorded the death of a servant, from the inadvertent application of the poison to a scratch on his hand, as he was examining the fangs and venomous organs of a viper perfectly torpid in the winter season.

Severe, however, as the effects of the bite of a viper may be, they are far from being so perilous as they are commonly supposed to be. Indeed, the injury rarely proves fatal to an adult, even when inflicted by a viper in the middle of summer, the period when the animal is most active and vigorous. Exceptions to this common belief, however, are upon record. Thus, in the year 1816, a woman in France, aged sixty-four, was bit on the thigh by a viper, and died in thirty-seven hours, notwithstanding the internal use of the liquor ammoniæ, and the enlargement of the wound, and cauterization of it with this fluid. In this case, it is to be observed, that an hour elapsed before any thing was done. (See *Annales du Cercle Medicale*, *T.* 1, *p.* 44, *8vo. Paris*, 1820.)

Fontana, therefore, was not exactly correct in concluding, that the bite of an ordinary viper will not prove fatal to a full-grown person, nor even to a large dog, though it does so to smaller animals. Five bites from three strong and healthy vipers were not able to kill a dog weighing sixty pounds; and, as this dog was little more than a third part of the weight of an ordinary man, Fontana supposed, that a single bite could never be fatal to an adult. He says, that he had seen a dozen cases himself, and had heard of fifty more, only two of which ended fatally. Concerning one of these cases he could get no information; the other patient perished of gangrene, twenty days after the bite. The mortification began three days after the accident, the bitten place having been deeply scarified almost as soon as the injury was received. Fontana believes, that much of the faintness, &c. which ensues upon the bite of a viper, is the mere effect of terror. "Upon a person being bit, (says he,) the fear of its proving fatal terrifies himself and the whole family. From the persuasion of the disease being mortal, and that not a moment is to be lost, they apply violent or hurtful remedies. The fear increases the complaint. I have known a person, that was imperceptibly bit in the hands or feet, and who after seeing the blood, and observing a viper near him, suddenly fainted away; one, in particular, continued in a swoon for upwards of an hour, until he was accidentally observed, and recovered out of it by being suddenly drenched in cold water. We know, that death itself may be brought on by very violent affections of the mind, without any internal disease. Why may not people, who are bit, die from a disease, produced entirely by fear, and who would not otherwise have died from any complaint produced by the venom?" Although it must be owned, that Fontana bestowed a great deal of attention upon this subject, the above reasoning is hypothetical and inconclusive. If it were to be granted, that some very timid, delicate, or nervous people, die from fear alone, it could not be admitted, that the generality of people, bit by snakes, perish also from the violent effect of mental alarm.

Whenever the patient dies, the catastrophe is always ascribable to the quantity of venom inserted in the wound; the number of bites; their situation near important organs; and the neglect of proper means of relief. In ordinary cases of a single bite upon the extremities, the patients would get well even without any assistance; but the symptoms would probably be more severe, and the cure slower.

From some facts, recorded by Sir Everard Home, and observations made on the operation of the poisons of the black spotted snake of St. Lucia, the cobra di Capello, and the rattle-snake, it appears, that "the effects of the bite of a snake vary according to the intensity of the poison. When the poison is very active, the local irritation is so sudden, and so violent, and its effects on the general system are so great, that death soon takes place. When the body is afterwards inspected, the only alteration of structure met with is in the parts close to the bite, where the cellular membrane is completely destroyed, and the neighbouring muscles very considerably inflamed. When the poison is less intense, the shock to the general system does not prove fatal. It brings on *a slight degree of delirium, and the pain in the part bitten is very severe;* in about half an hour, *swelling takes place from an effusion of serum in the cellular membrane,* which continues to increase, with greater or less rapidity, for about twelve hours, extending, during that period, into the neighbourhood of the bite. *The blood ceases to flow in the small vessels of the swollen parts; the skin over them becomes quite cold; the action of the heart is so weak, that the pulse is scarcely perceptible, and the stomach is so irritable that nothing is retained by it. In about sixty hours, these symptoms go off; inflammation and suppuration take place in the injured parts;* and when the abscess formed is very great, it proves fatal. When the bite has been in *the finger,* that part *has immediately mortified.* When death has taken place, under such circumstances, *the absorbent vessels, and their glands, have undergone no change similar to the effects of morbid poisons,* nor has any part lost its natural appearance, except those immediately connected with the abscess. In those patients who recover with difficulty from the bite, the symptoms produced by it go off more readily, and more completely, than those produced by a morbid poison, which has been received into the system." (*Sir E. Home, Case of a Man who died in Consequence of the Bite of a Rattle Snake, in Phil. Trans.* 1810.)

Numerous remedies for the bites of common vipers have obtained celebrity. According to certain writers, each of these remedies has effected wonderful cures; and yet, as Boyer well remarks, every one of them has been in its turn relinquished for another, the sole recommendation of which has frequently consisted in its novelty. Any of these boasted medicines, though of opposite qualities, cured, or at least seemed to cure, the patients, and the partisans of each considered that he had a right to extol his own remedy as a specific, when the patient to whom he administered it was seen to recover perfectly, after suffering a train of severe symptoms. But the reason of this pretended efficacy becomes obvious, when one knows that the bite of a viper is of itself rarely mortal to the human subject, and that the severity of the symptoms materially depends upon the quantity of the venom in the wound. (*Boyer, Traité des Maladies Chir. T.* 1, *p.* 428.)

The treatment of the bite of a viper is divided into local and general means.

The local treatment has for its principal object the destruction of the venom; the prevention of its entrance into the vessels, or the removal of it from the wound.

Of scarifying the wound, I shall only say, that it promises no utility, if it be practised with a view of letting such dressings be applied, as are extolled as specifics; for we now know, that there is no local application which is entitled to this character. Fontana was an advocate for applying a ligature round the limb, in order to check the ingress of the venom into the circulation; and he thought that he had seen much good result from this practice. Sir Everard Home is also of opinion, that "the only rational local treatment, to prevent the secondary mischief, is making ligatures above the tumefied part, to compress the cellular membrane, and set bounds to the swelling, *which only spreads in the loose parts under the skin;* and scarifying freely the parts already swoln, that the effused serum may escape, and the matter be discharged as soon as it is formed. Ligatures (he says) are employed in America, but with a different view, viz. to prevent the poison being absorbed into the system." (*Phil. Trans. for* 1810, *p.* 87.) At all events, if compression be employed, it should be so regulated as not to create any risk of gangrenous mischief, by its interruption of the circulation.

Suction of the wound has been proposed, and seems founded on reason; but experience, I believe, has determined little in its favour. A cupping glass might be employed, but, probably, no mode of suction would succeed in extracting the whole of the poison.

The most certain method of removing the virus consists in the excision of the bitten part. This operation, however, would hardly be proper, unless done immediately after the injury, before much inflammation had come on. It is likewise a practice to which many patients would not assent, and even some surgeons may deem the proceeding too severe, in relation to the bite of the viper of this country. The bite might also be inconveniently situated for the excision of the parts.

Another plan, more commonly preferred, is that of destroying the envenomed part with caustic, or the actual cautery. When this is done in time, the poison is prevented from extending its irritation over the nervous system, through the medium of which all the worst symptoms are usually excited. The caustic, and cautery, may also have the effect of chemically destroying the venom itself, while they must tend to hinder its passage into the circulation, inasmuch as they destroy the neighbouring absorbent vessels. The caustic which Fontana preferred was potassa. But, as Boyer sensibly remarks, every caustic, of equal strength, must infallibly have the same effect, as its mode of operating is that of destroying the point of irritation, viz. the seat of the venom. In France, liquid caustics are preferred, the fluid muriate of antimony, the liquor ammoniæ, or the sulphuric, or nitric acid, because their action is quicker, and they more certainly penetrate to the bottom of the wound. (*Traité des Mal. Chir. T.* 1, *p.* 429.) Either of these liquids may be applied by means of a slender pointed bit of wood, which is to be dipped in it, and then introduced into the punctures made by the fangs of the reptile. The piece of wood should be withdrawn, wet once more, and applied again. If a drop of the caustic can be inserted, so much the better. When the bite is very narrow and deep, the caustic cannot well be introduced before the mouth of the wound is somewhat enlarged with a lancet. A little bit of lint may then be wet in one of the above fluids, and be pressed deeply into the wound.

After the caustic has produced an eschar, the best application is an emollient poultice.

It is not, however, every bite of a viper, that requires local treatment, even of this degree of severity. As Boyer observes, when the wound is superficial; the viper benumbed with cold; its poison considerably exhausted by its having previously bitten other animals; the swelling inconsiderable; and the patient neither affected with prostration of strength nor pain about the præcordia; a few drops of ammonia may be introduced into the wound, and a small compress wet with the same fluid applied. Formerly, olive oil was considered, in England, one of the best applications for the bites of snakes, and its virtues were afterwards extolled in France by Pouteau; but, says Boyer, it posseses no specific efficacy, as the experiments of Hunaud and Géoffroi have decidedly proved. (*Traité des Maladies Chir. T.* 1, *p.* 431.)

With respect to the general treatment, if we exclude emetics, of which Dr. Mead had a high opinion, when the patient was much jaundiced, the favourite medicines are cordials, ammonia, and arsenic. The ancients employed theriaca, Mithridates, salt, and the carbonate of ammonia. Of all stimulants, however, the liquor ammoniæ is that which now obtains the greatest confidence; or, else, the *eau de luce*, which only differs from the fluid ammonia, in containing a small quantity of the oleum succinatum. In France, this remedy is even at the present time regarded, as having the best claim to the title of a specific for the bite of a viper. (*Boyer, op. cit.*)

In France, Bernard de Jussieu first tried ammonia in the year 1747 (see *Hist. de l' Acad. des Sciences*, 1747); since which time it has been extensively employed for the cure of the bites of vipers, both as an internal and external remedy. It had, however, been highly praised by Dr. Mead, at a much earlier period.

A few drops of the remedy are to be exhibited every two hours; but, as it is very powerful, it must always be diluted with tea, or some other drink, or the mistura camphoræ. The dose, however, must depend upon the age and constitution of the patient, and the intensity of the symptoms. Four or five drops suffice for a person of weak, delicate, irritable habit; but twelve or fifteen may be given to stronger subjects, when the symptoms are violent. With ammonia, some practitioners order wine.

In St. George's Hospital, the man who was bit by the rattle-snake kept for exhibition, took aperient medicines, the liquor ammoniæ, æther, the spiritus ammoniæ, comp. opium, and other stimulants; but without any apparent benefit. The diseaae followed that course, which Sir E. Home has described as usual when the shock on the system is not directly fatal, and the mischief in the arm ultimately produced the man's death. (See *Phil. Trans.* 1810.)

From the following passage, in relation to the bites of snakes in general, it seems that Sir Everard Home, in 1810, had no confidence in any medicines which had then been duly tried. "The violent effects which the poison produces on the part bitten, and on the general system, and the shortness of their duration, where they do not terminate fatally, (says he,) have frequently induced the belief, that the recovery depended on the medicines employed; and, in the East Indies, eau de luce is considered as a specific.

There does not appear to be any foundation for such an opinion; for when the poison is so intense as to give a sufficient shock to the constitution, death immediately takes place, and where the poison produces a local injury of sufficient extent, the patient also dies, while all slighter cases recover. The effect of the poison on the constitution is so immediate, and the irritability of the stomach so great, that there is no opportunity of exhibiting medicines, till it has fairly taken place, and then there is little chance of beneficial effects being produced."—(*Sir E. Home, in Phil. Trans.* 1810.)

Fontana also had little faith in reputed antidotes; but it is to be noticed, that his observations refer only to the bites of vipers. "In no country (says he) through which I passed, could I ever find any two people or persons, bit by the viper, either in the mountains or valleys, that used the same remedies. Some used theriaca alone, either externally or internally applied; others common oil; a third set used stimulants, such as the strongest spirituous liquors; whilst others, on the contrary, tried every different kind of sedative. In short, there is hardly any active kind of medicine that has not been tried as a cure in this disease; while at the same time, it is certain that, under all the varieties of application, none of the patients died." Hence, Fontana concluded, that none of the remedies had any effect in curing the disease.

Later observations, however, tend to raise our hopes, that a medicine is now known, which really seems to possess considerable efficacy against the bite, even of a very formidable kind of snake. From some facts, recorded in Dr. Russell's History of Indian Serpents, on the authorities of Mr. Duffin and Mr. Ramsay, it appears, that the Tanjore pill, of which arsenic is the chief ingredient, is exhibited with considerable success in India after the bites of venomous serpents: this information led Mr. Chevalier to propose the fair trial of arsenic.

Mr. Ireland, surgeon to the 60th regt. had formerly heard Mr. Chevalier recommend the trial of arsenic, and he was resolved to make the experiment whenever an opportunity offered. On his arrival in the island of St. Lucia, he was informed, that an officer, and several men, belonging to the 68th regiment, had died from the bites of serpents, supposed to be the coluber carinatus of Linnæus.

The reader will find some interesting account of the serpent, here alluded to, in a tract, which I have lately read, entitled *Monographie du Trigonocéphale des Antilles, ou Grand Vipère Fer-de-Lance de la Martinique, par A. Moreau des Jonnés, 8vo. Paris,* 1816.

Mr. Ireland also learnt, that every thing had been tried by the attending medical men to no purpose, as all the patients had died, some in six, and others in about twelve hours from their receiving the wound.

A case, however, soon came under Mr. Ireland's own observations, and as nothing that had been done before seemed to have been of any service, he was determined to give arsenic a full trial.

"Jacob Course, a soldier in the York light infantry volunteers, was bitten in the left hand, and the middle finger was so much lacerated, that I found it necessary to amputate it immediately at the joint with the metacarpal bone.

"I first saw him about ten minutes after he had received the wound, and found him in a torpid, senseless state; the hand, arm, and breast of the same side were much swelled, mottled, and of a dark purple, and livid colour. He was vomiting, and appeared as if much intoxicated. Pulse quick and hard: he felt little or no pain during the operation.

"The wound being dressed, and the patient put to bed, I ordered a cathartic clyster, and the following medicine to be taken immediately. R. Liquor. Arsenic. ʒij. Tinct. Opii gt. x. Aq. Menth. Pip. ℥iss; which was added to half an ounce of lime juice, and as it produced a slight effervescence, it was given in that state; this remained on his stomach, and was repeated every half hour for four successive hours. In the mean time, the parts were frequently fomented with common fomentations, and rubbed with a liniment composed of Ol. Terebinth. ℥ss. Liquor. Ammon. ℥ss. and Ol. Oliv. ʒiss. The cathartic clyster was repeated twice, when the patient began to be purged; and the arsenical medicine was now discontinued. He had become more sensible when touched, and from that time he gradually recovered his faculties; he took some nourishment, and had several hours sleep.

"The next day, he appeared very weak and fatigued; the fomentation and liniment were repeated. The swelling diminished gradually; the natural colour and feeling returned, and, by proper dressings to the wound and attention to the state of his bowels, he soon recovered and returned to his duty."

Mr. Ireland recites about four other examples, in which arsenic was exhibited with similar success.

It deserves particular notice, that the liquor arsenicalis employed by Mr. Ireland was prepared according to Dr. Fowler's prescription, which directs sixty-four grains of arsenic, and as many of the fixed vegetable alkali, to be dissolved in a sand heat, and the solution to be made an exact pint, so that two drachms contain one grain of arsenic in solution. (See *Med.-Chir. Trans. Vol.* 2, *p.* 393, *&c.*

Wounds of the Thorax.—The thorax is a cavity of an irregularly oval figure, bounded in front by the sternum, laterally by the ribs, posteriorly by the vertebræ of the back, above by the clavicles, and below by the diaphragm, a very powerful muscle, which forms a kind of partition between the cavity of the thorax and that of the abdomen.

The diaphragm is not stretched across, in a straight direction, from one side of the chest to the other; but, on the contrary, descends much further in some places than in others. If the cavity of the thorax be opened, by a transverse section, about the middle of the sternum, the diaphragm appears, on examination, to be very prominent and convex towards its centre, while it sinks downward at its edges, towards all the points to which the muscle is attached. At its anterior, and most elevated part, it is fixed to the ensiform cartilage, whence descending obliquely to the right and left, it is inserted on both sides, into the seventh rib, all the lower ribs, and lastly, into the lower dorsal vertebræ. According to this description, it is obvious, that the cavity of the thorax has much greater depth and capacity behind than in front; a circumstance which surgeons ought to be well aware of, or else they will be liable to give most erroneous opinions concerning wounds of the chest. For instance, a practitioner, deficient in anatomical knowledge, might imagine, that a weapon pushed from above downward into the front of the chest, could never reach the lungs, after having penetrated the cavity of the abdomen. It is a fact, however, that no instrument could pass in this direction, even some inches below the highest part of the abdomen, without entering the chest.

The whole cavity of the thorax is lined with a membrane, named the pleura, which is every where adherent to the bones which form the parietes of this cavity, and to the diaphragm. Each side of the thorax has a distinct pleura. The two membranes meet in the middle of the chest, and extend from the sternum to the vertebræ. In this manner, two cavities are formed, which have no sort of communication with each other. By the two pleuræ, touching and lying against each other, a middle partition is formed, called the mediastinum. These two membranes are intimately adherent to each other in front, the whole length of the sternum; but, behind, where they approach the vertebræ, they separate from each other, so as to leave room for the aorta, œsophagus, &c. The heart, enclosed in the pericardium, occupies a considerable space on the left of the mediastinum, and all the rest of the chest is filled with the lungs, except behind, where the large blood-vessels, nerves, thoracic duct, and œsophagus are situated. In the perfectly healthy state, the lungs do not adhere to the pleura; but, in the majority of subjects, at least in this climate, who are examined after death, such adhesions are found in a greater or lesser degree. The disease may probably be occasioned by very slight inflammation; and, as the surface of the lungs is naturally destined to be always in close contact with the pleura, and patients are frequently not suspected to have any thing wrong in the thorax, this morbid change being often accidentally discovered after death, in looking for something else; it may be concluded that it does not produce any serious effects.

The thorax is subject to all kinds of wounds; but their importance particularly depends on their depth. Those which do not reach beyond the integuments do not differ from common wounds, and, when properly treated, are seldom followed by any bad consequences. On the contrary, those which penetrate the cavity of the pleura, even by the slightest opening, may give rise to alarming symptoms. Lastly, wounds injuring any of the thoracic viscera, are always to be considered as placing the patient in a state of considerable danger.

From what has been said, it appears, that wounds of the thorax are very properly divisible into three kinds: viz. 1. such as effect only the skin and muscles; 2. such as enter the cavity of the chest, but injure none of the viscera; 3, others which injure the lungs, or some other viscus.

Superficial Wounds of the Thorax.—Immediately a surgeon is called to a recent wound of the chest, his first care should be to ascertain whether the weapon has penetrated the pleura or not. In order to form a judgment on this circumstance, surgical writers recommend, 1. Placing the wounded person in the same posture in which he was when he received the wound, and then carefully examining with the finger, or probe, the direction and depth of the stab. 2. The examination, if possible, of the weapon, so as to see how much of it is stained with blood. 3. The injection of fluid into the wound, and attention to whether it regurgitates immediately, or lodges in the part. 4. The colour and quantity of the blood discharged from the wound are to be noticed, and whether any is coughed up. 5. We are to examine, whether air escapes from the wound in respiration, and whether there is any emphysena. 6. Lastly, the state of the pulse and breathing must be considered.

In wounds of the chest, however, surgeons should not be too officious with their probes, merely for the sake of gratifying their curiosity, or appearing to be doing something. No judicious surgeon can doubt, that authors have dwelt too much on the subject of probing wounds of the abdomen and thorax; for they would really lead their readers to believe, that, until the wound has been traced with the finger or probe to its very bottom and termination, surgeons are not qualified to institute any mode of treatment. The only advantage of knowing that a wound penetrates the chest is, that the practitioner immediately feels himself justified in having recourse to bleeding and other antiphlogistic means, with the view of preventing inflammation of the pleura and lungs, which affection, if not controlled in time, often proves fatal. However, there can be little doubt, that if the nature and depth of the wound cannot be readily detected with the eye, the finger, or a probe, or by the discharge of air or blood, it is much safer to bleed the patient, than to put him to useless pain with the probe, and waste opportunities of doing good, which too frequently can never be recalled. In short, generally speaking, it is better and more advantageous, for all patients, that some of them should lose blood, perhaps unnecessarily, than that any of them should die, in consequence of the evacuation being omitted or delayed.

Almost all writers, who have taken pains to direct how wounds of the thorax should be probed, conclude with remarking, that, however advantageous a knowledge of the direction and depth of the wound may be, much harm has frequently been done by pushing the attempts to gain such information too far. It is, perhaps, of greater importance to learn, by some kind of examination, the extent of a wound, which does not reach beyond the integuments, or intercostals, than to know whether the wound extends into the cavity of the chest. For, even when the pleura is found to be divided, if the wound be attended with no urgent symptoms, the information is of no practical use, if we make it a rule to adopt, without the least delay, a strict antiphlogistic plan of treatment in all cases, in which there is any doubt, or chance of the parts within the chest being wounded, and likely to inflame. Besides, frequently, the symptoms are more urgent and alarming than they could be, were only parts on the outside of the thorax injured; and under such circumstances, it is manifest that a probe cannot be necessary for discovering that the wound extends into the chest.

With respect to the injection of luke-warm water, or any other fluid, and the circumstance of its regurgitation, as a criterion of the wound being only superficial, the plan is more objectionable than the employment of a probe; for, if the liquid be propelled with force, it may be injected into the cellular substance, and seem to be passing through the track of the wound into the chest, while, in reality, not a drop does so. Besides, is it a warrantable proceeding to try to insinuate any quantity or kind of liquid whatever between the pleura and lungs, into a situation, in which it must necessarily obstruct the important function of respiration, and cause serious inconvenience?

When air issues from the wound in expiration, there is ground for suspecting that the lungs are wounded. But I believe that such authors as represent this circumstance as an infallible criterion of the nature of the accident labour under a mistake; for when there is simply an opening in the chest, without any injury of the lungs whatever, the same symptom may occur. The air, which is discharged through the wound in expiration, has previously entered the bag of the pleura through the same wound in inspiration. In order to remove all doubt, the patient may be requested to expire, as strongly as he can, so as to force out whatever air may have accumulated in the chest. At the end of each expiration of this kind, care must be taken to bring the skin closely over the orifice of the wound, and to keep it thus applied, during each following inspiration, for the purpose of preventing the external air from entering. In this way, if there be no wound of the lungs, all the air will soon be expelled; but if it still continues to be discharged in expiration, the lungs must be wounded.

Sometimes an emphysematous swelling takes place round wounds of the thorax, in consequence of a quantity of air diffusing itself in the cellular substance. In wounds which are straight and ample, this symptom is very uncommon; but, in cases of narrow oblique stabs, and where the lungs are wounded by the points of broken ribs, it is by no means unfrequent. (See *Emphysema.*) When a considerable quantity of blood flows from the wound, there is reason for conjecturing, not only that the weapon has penetrated the cavity of the thorax, but that some of the thoracic viscera are injured. Excepting the intercostal arteries, which run along the edges of the lower ribs, and the trunks of the thoracic arteries, all the other vessels, on the outside of the chest, are very inconsiderable. The effects of compression will indicate, whether the blood escapes from an artery on the outside of the cavity of the pleura; and sometimes the situation and direction of a wound at once denotes that the hemorrhage cannot proceed from the trunks of the thoracic arteries.

Even the appearance of the blood which comes from the wound may lead to some conjectures concerning the depth of the injury. The blood which flows from wounds of the lungs is of a brighter scarlet colour, and more frothy, than that which is discharged from the vessels of any other part.

There can be no doubt of the lungs being wounded, when the patient is observed to spit up blood; but the absence of this symptom is not a positive proof of their being untouched, though unquestionably a very important circumstance in the diagnosis, and, generally speaking, a correct criterion of the lungs having escaped injury. At all events, when no blood is spit or coughed up, the lungs can never be deeply penetrated.

The state of the pulse, and that of respiration, ought to be particularly attended to by the practitioner. Neither one nor the other seems altered, at least at first, when wounds do not reach more deeply than the integuments: but those which penetrate the cavity of the thorax, and, especially, such as injure the viscera, may frequently be distinguished, from the very first moment of their occurrence, by their effects on the sanguiferous system, and the function of respiration. When the lungs are wounded at a point where they adhere to the pleura, no air can be effused in the thorax, and the functions of those organs may, on this account, suffer less disturbance than would be the consequence of an equal degree of injury at some other unadherent portion of the lungs. Experience proves, that when either air or blood insinuates itself between the lungs and the pleura, the lungs become immediately oppressed, the breathing is attended with great difficulty, the pulse is weak, contracted, and intermittent.

Wounds of the integuments and muscles of the thorax are not attended with any particular danger; they heal with the same readiness, and by the same means, as common superficial wounds in any other part of the body.

When the case is a punctured, or a gun-shot wound, some writers are advocates for laying open the track of the injury, from one end to the other, if its course should not be too extensive, and they then recommend dressing the cavity down to its bottom. When the track of the wound was too extensive, a seton was sometimes introduced. The aim of such exploded practices was to prevent the outer part of the wound from healing too soon, and thus give time for the whole of it to heal in an equal degree. When a seton was used, the thickness of the skin was gradually diminished, and after the whole of it had been removed, a slight compression was kept up for a few days, with a view of completing the cure.

The French surgeons have the discredit of having brought setons into fashion in this branch of surgery; and I am particularly glad that a late writer has well exposed the absurdity of the practice. "We find (says Mr. John Bell) the history of it to be plainly this: that as Guy de Chauliac, Parè, and all the older surgeons, did not know how to dilate gun-shot wounds, they found these same setons useful in bringing the eschar sooner away, and in preserving an open wound; and, as they believed the wounds to be poisoned, they took the opportunity of conducting, by these setons, whatever acrid medicines might, according to the prevailing doctrines of that time, have any chance of correcting the poison." Mr. J. Bell notices, how surprising it is to see the cruelty and perseverance with which some modern practitioners, particularly French, draw these cords through wounded limbs; and when the roughness of such a cord, or the acrimony of the drugs conveyed by it, produces a copious suppuration, these men are delighted with such proof of their success. The setons have been introduced by the French surgeons, across the thickest parts of the limbs, along the whole length of the fore-arm, and at the same time, frequently through the wrist-joint. The setons have also been covered with stimulating applications. Profuse suppurations, and dreadful swellings, of course ensued; still, as Mr. J. Bell has remarked, these cruelties were continued till the wound healed almost in spite of the pain; or till the coming on of very dreadful pain, great suppurations, convulsions, &c. made the surgeon discontinue the method, or even amputate the limb. The French have become so familiarized to setons, that they do not restrict their use to flesh wounds; they pass them quite across the thorax, across the abdomen, and even through wounds of the knee-joint.

When we wish to excite inflammation, in the cavity of the tunica vaginalis, for the purpose of radically curing a hydrocele, we either pass a seton through the part; lay it open with an extensive incision; cram a tent into it; or inject some irritating fluid into it. While the animal machine continues the same, says Mr. John Bell, the same stimuli will produce the same effects, and a seton, injection, or long tent, if they produce pain or inflammation in the scrotum, will not be easy in the chest; and unless we can use them in the chest, with the same intentions with which we use them in the hydrocele, (in other words,) unless we are justified in inflaming the chest, and causing an adhesion of all the parts, we cannot use them with any consistency or good sense.

With regard to the cases which the French adduce in confirmation of the good effects of their plans, I am entirely of opinion with Mr. J. Bell, that the facts only prove, that *the patients recovered in spite of the setons.* "It is like (adds this author) what happened to a surgeon, who was dabbling in the thorax with a piece of caustic, which fell directly into the cavity of the chest, where it caused very large suppurations, and yet the patient was saved. The patient recovered, in spite of the caustic, just as M. Guerin's patient, and many other poor unhappy souls, who lived in spite of the setons. One would think, that people took a pleasure in passing setons across the eye-ball, the chest, the knee-joint, &c. merely to make fools stare, when the business might be as effectually done with an abscess lancet."

Mr. John Bell, in his usual lively style, makes the employment of tents, in wounds of the chest, seem equally ridiculous and improper. Indeed, he says, *he knows of no occasion in all surgery, in which tents can be useful, except in the single one of a narrow opening which we desire to dilate, in order to get at the bottom of the wound; and where, either on account of some great artery, or the fearful temper of our patient, we dare not use the knife.* (See *J. Bell on Wounds. Discourse 2, Vol. 2.*)

Having hitherto been engaged rather in pointing out what ought not to be done than what ought, I shall next make some remarks on the line of conduct which should be adopted in cases of wounds of the parietes of the chest.

When the wound is a common cut, the sides of the division are to be brought into contact, and maintained in this positition with strips of adhesive plaster, compresses, and a bandage, until they have grown together. If the surgeon take care to relax such muscles as happen to be cut, or to be situated immediately under the wound of the integuments, there will rarely be any need of sutures.

As cut wounds seldom or never penetrate the chest, and there is generally no reason why they should not unite by the first intention, without being followed by extensive inflammation and abscesses, antiphlogistic means should be employed with moderation. Bleeding will not often be requisite. The grand objects are to keep the patient in a quiet state, on rather a low diet, and to hinder him from taking wine, porter, spirits, or any other stimulating beverages.

If the wound, instead of healing favourably, should inflame, the treatment should be regulated by the principles laid down in the article *Inflammation.* If it suppurate over its whole surface, but without a great deal of surrounding swelling and inflammation, one or two strips of sticking-plaster, may still be used with advantage; for, in this way, the cavity, which must now be filled up by granulations, will be rendered much smaller than it otherwise would be. Some very soft lint may be laid in the cavity of the wound, which the sticking plaster does not entirely remove, and over the whole a pledget of some mild, unirritating ointment. No pressure is now proper, until the inflammation diminishes; and if the discharge should be profuse, or the surrounding inflammation considerable, the best application would be an emollient poultice. In this state of things the patient should also be bled, and leeches be applied near the inflamed parts.

When the case is a stab, or punctured wound, the fibres of the divided parts are not simply cut, they are also considerably stretched, bruised, and otherwise injured. Hence, generally they will not admit of being united so readily, as the sides of a clean incision, made with a sharp instrument. However, the possibility of uniting the opposite sides of punctured wounds must depend very much on the shape of the weapon, and the suddenness, roughness, and violence with which it was driven into the part. A prick with a needle is a punctured wound; so is that often made by surgeons with their lancets; yet these injuries do not frequently bring on violent inflammation, and abscesses, as other wounds frequently do, which are inflicted with bayonets and pikes.

Let us suppose a man to have received a thrust of a bayonet, which has run into the skin and muscles covering one side of the thorax: what plan can the surgeon follow, with the greatest advantage to his patient?

Instead of laying open the whole track of such a wound with a knife, as is barbarously recommended in many of the principal works on surgery; instead of drawing a seton through its whole course, or of cramming into the part, a hard, irritating tent; the practitioner should take whatever chance there may be of uniting the wound without suppuration. For this purpose, he should recollect, that the great degree of violence done to the parts in punctured wounds is the reason why they are so apt to inflame and suppurate. Hence, the expected inflammation is to be counteracted in the very first instance; and immediately the wound is dressed, the patient should be freely bled, and take some saline purgative medicines. With regard to the dressings, the orifice of the wound may be lightly closed with sticking plaster, or covered with any mild superficial applications. Over and around these, the surgeon may apply linen, kept continually wet with cold water or the liquor plumbi acetatis dilutus. As, however, many patients have a strong dislike to cold applications to any wounds upon their bodies, it is often necessary to dispense with this practice. The dressings are to be retained with a roller; but it is not to be tight, as pressure is more likely to do harm than good. Thus the inflammation of the wound will be moderated; the extravasation of blood prevented; the chance of union by the first intention taken; and all painful operations avoided. And nothing is more certain than the fact, that, if antiphlogistic means be strictly employed, many stabs heal without abscesses, or any very severe symptoms, when no hope could be entertained of their doing so under other treatment. But if suppuration should happen, and a collection of matter take place, would the patient suffer more, or be put into greater danger, by having a proper depending opening, of just sufficient size, now made into the abscess in an eligible place, than if he had submitted to have the formidable operation of laying open the whole extent of a stab performed in the first instance? In short, will he suffer half so much, be half so long in getting well, or have to encounter half the danger? With all this advantage, he will have taken a certain chance, which attends all these cases, of the wound becoming united by what is called the first intention, that is to say, without any suppuration. I need not enlarge upon this subject, but refer the reader to what has been said in the preceding columns on the subject of *Punctured Wounds*, and to the treatment of abscesses, in the article *Suppuration*. Gun-shot wounds, merely injuring the parietes of the chest, are to be treated according to principles elsewhere explained. (See *Gun-shot Wounds.*)

Of Wounds penetrating the Cavity of the Thorax.—Penetrating wounds of the chest are always dangerous, and claim the utmost attention of the practitioner. I shall first treat of such wounds as enter the cavity of the thorax, but without injuring the viscera.

In the healthy state, the lungs so completely fill the thorax, that, both in inspiration and expiration, they are always in close contact with the pleura; and whenever air, blood, or any other matter, insinuates itself between the pleura costalis and pleura pulmonalis, more or less oppression and difficulty of breathing immediately take place. In all wounds, attended with a division of the pleura costalis, and occurring in a situation where there happens to be no adhesion between this membrane and the lungs, some of the external air, or a small quantity of blood, or both, can hardly fail to get into the cavity of the thorax. If one of the intercostal arteries be wounded, and the external orifice be very narrow, the blood, furnished by this vessel, may pass into the chest, and immediately produce oppression of the breathing, and other symptoms of pressure on the lungs. Of what is to be done in this case, I shall presently speak.

When a wound is known to have entered the pleura, and there is no symptom leading to a suspicion that the lungs, or any large vessel, is wounded, the injury is to be dressed according to common principles, and the more superficially the better. Authors also usually direct us, just before we close the opening, to tell the patient to make a deep inspiration, for the purpose of expelling as much of the air as possible, which may have passed into the cavity of the pleura. At the end of such inspiration, the edges of the wound in the skin are to be brought together, and kept so, with sticking plaster, compresses, and a roller. The other indications are to prevent inflammation of the pleura and lungs, by rigorous antiphlogistic remedies, particularly bleeding, which should be copious, and repeated, as circumstances may require.

Penetrating wounds of the chest may be complicated with some of the following circumstances: 1. Foreign bodies. 2. Injury of one of the intercostal arteries. 3. Protrusion of a portion of the lungs. 4. Emphysema. 5. Extravasation of blood in the thorax.

1. Almost all these wounds occasion pain and difficulty of breathing. Many of them are also followed by an emphysematous swelling around the wound; the patient frequently coughs up blood; and, after having had, for some time, a small, contracted irregular pulse, with a pallid countenance, and cold extremities, he is too often seized with severe febrile symptoms, the effect of inflammation of the lungs and parts within the chest. These

symptoms should be counteracted by bleeding, a very low regimen, opening saline medicines, the use of leeches, or cupping, and the strict observance of quietude. If such indisposition should continue longer than a few days, without diminution, writers inform us, that there is ground for suspecting, that they depend upon the presence of some foreign body. However, it may be doubted, whether Sabatier's advice, immediately to make search after the extraneous substance, is proper, under these circumstances. For my own part, I cannot think the symptoms, above related, by any means unequivocal, and even were they so, the practice would still be questionable. (See *Médecine Opératoire*, *Tom.* 2, *p.* 244.

Sabatier has quoted the two following cases, for the purpose of showing what may be attempted in these cases.—"A man, twenty-seven years of age, was struck very violently with a knife, on the outer part of the fourth true rib. Simple dressings were applied for the first few days; but a considerable coughing, and spitting of blood ensuing, M. Gerard was consulted, who found, that the symptoms depended on the presence of a piece of the knife, which had pierced the rib, and was projecting some way into the thorax. So little of the foreign body was on the outside of the rib, and it was so fixed in the bone, that it could neither be extracted with any kind of forceps, nor even moved in the least with a leaden mallet, &c. Although, the only expedient seemed now to be that of sawing, or cutting out the portion of the rib, Gerard conceived that an attempt might first be made to extract the foreign body, by pushing it from within outward. For this purpose, having put a steel thimble on his index finger, he introduced it into the cavity of the thorax, and thus succeeded in pushing out the piece of the knife.

A spicula of the bone was afterwards felt; but it was too firmly connected with the rest of the rib to admit of being completely taken out. Gerard was absurd enough to *surround the whole rib*, *at the splintered part*, *with a ligature*. To these ingenious proceedings, as the French term them, was imputed, not only the cessation of all the bad symptoms, but a speedy recovery. (See *la Faye's Notes to the Traité des Opérations de Dionis.*)

An officer was shot in the left side of the chest. The ball entered about where the bone and cartilage of the seventh true rib unite, and came out in the situation of the angle of the same bone, which was broken in two places. The posterior part of the first false rib was also broken. Incisions were made, which enabled the surgeon to take away several splinters of bone, and facilitated (that mischievous French practice) the introduction of a seton. Soft mild dressings were applied. The patient was bled twenty-six times, with the view of relieving the fever, difficulty of breathing, and spitting of blood. On the fifth day, suppuration commenced, and the seton could be easily drawn. In about a fortnight, the patient's sufferings considerably abated, and he passed some of the ensuing days in a tolerably easy state. Circumstances, however, made it necessary to move him to another place, and on the twenty-fourth day, he had a bad night; febrile symptoms came on; and the discharge was not of its usual consistence. He was bled twice more, and his critical state led the surgeon to examine the wounds again. On passing a finger into the posterior wound, a foreign body was felt, and easily extracted. It was a piece of the patient's coat. A spicula of bone was also felt more deeply lodged, which required the wound to be dilated. Partial relief followed the removal of these extraneous substances.

On the thirtieth day, the bad symptoms recurred, two more bleedings were practised, and, *as fears were entertained that the seton was doing harm*, it was suppressed. The patient now first made complaint of feeling something, which pricked him, in a deep situation, between the two openings of the wound. It was therefore determined to divide all the parts intervening between the two orifices, and occupying an extent of seven or eight inches. Guerin cut the parts between the two ribs, from within outward, under the guidance of his finger introduced into the posterior wound, care being taken not to cut near the lower edge of the upper rib. In this way, the whole track of the ball was laid open, and in the middle of it a very sharp splinter was found, projecting into the substance of the lungs. It was removed, and the wound dressed with simple applications. From this day all the bad symptoms ceased. (*Obs. de Guerin in Mem. de l'Acad. de Chir. T.* 2; *4to.)*

Mr. John Bell has taken notice of the preceding case; he observes, that some of Guerin's steps were bold and good, as well as successful; but, that the employment of the seton was wrong. The example teaches us several important circumstances: 1. The propriety of making very free dilatations for the extraction of splinters of bone. 2. The utility of repeated copious bleedings, which, in the above case, indeed, had the greatest effect both in preventing such hemorrhage in the chest, as would probably have produced suffocation, and also in averting a degree of pulmonary inflammation, which would have proved fatal.

Mr. John Bell judiciously condemns the seton: "Had M. Guerin (says he) been asked what good it was to do, it would have been difficult for him to have invented even a plausible apology for the practice, which if it was not doing good, could not fail to do harm. Was this seton necessary for keeping the wound open? No, surely; for the wound could not have closed, while it was irritated, and kept in suppuration by splinters of bone, and a piece of cloth within the breast. Was it to draw the piece of cloth out? Surely, in the course of twenty days, a piece of cloth would have had some chance, at least, of being floated towards the wound, either by the natural flux of the matter, or, by the help of a mild injection. Was it useful in supporting the discharge? This would have been a sore question for M. Guerin; for it supported the suppuration only by inflaming the chest; and where inflammation of the chest, or high cough, or bloody expectoration, or a profuse discharge, were the chief dangers, a great seton could hardly be a comfortable inmate in the breast. I think one might very boldly promise to produce bloody expectoration and terrible cough, profuse suppurations, and oppression, to any degree, by drawing such a cord across a sound thorax."

Mr. John Bell next censures M. Guerin for not having discovered the pricking piece of bone before the thirty-eighth day; a disadvantage, which he partly ascribes to the seton, the pain of drawing which across the chest deadened every lesser pain, and, consequently, the patient could not feel the trifling pricking of the bone, till his greater sufferings from the seton were allayed. "In short (says Mr. John Bell), M. Guerin passes a great strap of coarse linen across the cavity of the chest, and when it causes inflammation, he thinks to subdue it by bleeding; when M. Guerin continued for thirty days drawing a coarse seton through the breast every morning, and bleeding for the cough every night, what did he do, but raise inflammation with his left hand, to show how well he could cure it with his right?" (See *John Bell on Wounds, Vol. 2, p.* 36—38.)

The liability of wounds of the chest to be complicated with the lodgment of foreign bodies, is a circumstance, of which the practitioner should ever be mindful. "In the examination of the bodies of soldiers, who have died from these injuries (says Dr. Hennen), I have frequently found pieces of wadding or clothes, spiculæ of bone, and balls, and, in one case, some charpie used as a dressing; either loose in various parts of the lungs, or lying in sacs, which the exertions of the constitution to free itself, had thrown round them by the medium of the coagulating lymph. In the more fortunate few, who have recovered, these matters have been discharged from the wounds, or extracted from them by the surgeon. In some lucky cases, they have been ejected by the convulsive efforts to cough, which their irritation has occasioned." (*On Military Surgery, Ed. 2. p.* 367.) For an account of the dexterity, with which Larrey has sometimes traced balls in the chest, and extracted them by bold operations, I must refer to his valuable writings. (See *Mem. de Chir. Mil. T.* 4. *p.* 250, &c.) Balls have sometimes lodged and remained encysted in the lungs, for upwards of twenty years, without the health being at all disturbed by their presence. (See *Percy, Manuel, &c. p.* 125; *Boyer, Traité des Mal. Chir. T.* 7, *p.* 310, &c.)

2. When one of the intercostal arteries is wounded by a narrow oblique stab, the accident cannot at first be known. In this case, the blood commonly makes its way into the cavity of the chest where it causes a more or less considerable extravasation. But when the wound is ample, and direct, the effused blood, which has all the characters of arterial blood, leaves no doubt, concerning the injury of an intercostal artery. However, if any uncertainty prevail, it may easily be dispelled, by introducing a finger into the wound, and making pressure with it on the lower edge of the rib, which corresponds to the vessel suspected to be injured.

Gerard proposed to stop hemorrhage from the intercostal artery, by means of a ligature. His plan was to enlarge the external wound, as far as the upper edge of the rib, corresponding to the wounded intercostal artery, and then to introduce into the chest a common curved needle, armed with a ligature, to which was attached a dossil of lint. The needle was passed behind the rib, rather higher than the superior edge of the bone. The point of the instrument was then pushed, from within outward, and brought out through the external wound, together with the ligature. When the dossil had come into contact with the artery, the two ends of the ligature were tied over a thick compress, placed on the outside of the rib. In this manner, the bone was surrounded with the ligature, and the artery compressed.

Goulard, of Montpelier, having found difficulty in passing a common needle, whose shape little corresponded to the track through which it had to pass, being curved towards its point, and straight towards the eye, invented one expressly for this operation. He also objected to the common bent needles, as he conceived that they might wound the lungs with their sharp points and edges. Goulard's needle formed three-fourths of a circle, and was fixed on a long handle, which facilitated its introduction. The eye, in which the ligature was put, was situated near the point, which was a little blunted, and the ligature lay in a groove, in the convexity of the instrument. When the needle had passed through the intercostal muscles, and its point had made its appearance over the rib, which was above the artery, the ligature was untied, and held, while the needle was withdrawn at the place where it had entered. The ligature was then tied, as in Gerard's method.

It was afterwards thought, that compression might answer better, than the foregoing use of the ligature. Lóttery, professor of anatomy in the university of Turin, constructed, for this purpose, a steel plate, which is described, and engraved in the second volume, 4to. of the Mémoires de l'Acad. de Chir. This plate was narrow at one end, broad at the other; and curved in two directions at its narrow part, where there were some holes, by means of which a compress, for the artery, was fastened on the instrument. The broad end of the plate had two long parallel slits, through which a riband was passed, with which the instrument was secured.

When the wound, corresponding to the intercostal artery, was sufficiently extensive in the transverse direction, the narrow, bent end of the instrument was so introduced, that the lower edge of the rib above was placed in the concavity of the curvature, while the compress acted on the edge of the bone, and, of course, on the artery. The rest of the instrument applied itself to the side of the thorax. in which situation it was fastened. When the wound was not ample enough, a sufficient dilatation of it was first made for the introduction of the instrument.

Quesnay employed a piece of ivory, which he covered with lint, &c. and then introduced within the chest. The instrument was then drawn from within outward, by means of a riband, and thus the necessary compression was produced.

Quesnay's plan is somewhat like that invented by Lóttery. But, to have introduced the compress entirely into the thorax, together with the ivory, which was the basis of it, and then to have drawn the contrivance from within outward, as was probably intended, a very large wound would have been indispensable. This was also one of the many strong objections to Lóttery's instrument, which, in fact, could only be employed, when there was a free and ample opening.

Belloque, seeing the inefficacy of all the compressing means, used before his time, and their inconveniences, invented an instrument, which, he says, is calculated for making proper pressure, and, following the motion of the ribs, without hindering the escape of extravasated blood. The machine is engraved, and described, in 2 T. of Mem. de l'Acad. de Chir. 4to. It is composed of two plates, which are wadded, and capable of being brought towards each other by means of a screw. This instrument, as Sabatier observes, may indeed answer; but, it is complicated, and awkward, and its utility is founded on the supposition of the wound being larger than wounds are, which are made with common weapons.

Justly averse to any unnecessary multiplication of surgical instruments, modern practitioners reject all particular contrivances for stopping hemorrhage from the intercostal arteries. Indeed, as the accident is very rare, it is probable, that if the best instrument possible were devised, it would hardly ever be at hand, when required.

A common dossil of lint (says Sabatier), fastened to a strong ligature, and introduced between the two ribs, or even quite into the chest, and then drawn, from within outward, like Quesnay's compress, would fulfil every desirable purpose. The external wound should then be covered with simple dressings, and a bandage applied round the body. The patient should be freely, and repeatedly bled, and treated on the most rigorous antiphlogistic plan.

Professor Assalini joins all the best modern surgeons in reprobating the introduction of the preceding contrivances and extraneous substances into the chest, in order to stop hemorrhage from the intercostal artery. All these methods, he remarks, are calculated to excite a dangerous degree of inflammation in the chest. Hence, he prefers, simply cutting the artery across, so as to allow it to retract, and if this plan fail he recommends the wound to be closed. Should the blood find its way into the chest, it is true, the consequences will be serious, but not fatal; and if the symptoms require it, the operation of empyema may afterwards be done. A small quantity of effused blood, however, may be absorbed, and no such proceeding be requisite. (*Manuale di Chirurgia, p.* 58—59.)

Dr. Hennen conceives, that whenever the tenaculum *can* be used for an injured intercostal artery, the practice should be adopted. He states, that cases are reported, in which the vessel was thus secured; but that he has never seen the method adopted himself. "Unfortunately (says he), we but too often are disappointed in finding the source of the hemorrhage, and here judicious pressure is our only resource. In some very slight cases, I have used the graduated compress with success; but, if the sloughing is extensive, nothing but the finger of an assistant, relieved as often as occasion may require, and pressure direct upon a compress placed along the course of the vessel, or so disposed as to operate upon its bleeding orifice, will be of any avail. (*Military Surgery, Ed.* 2, *p.* 377.)

3. The protrusion of a portion of the lungs, in consequence of wounds penetrating the chest, is a very unusual case; but there are some instances recorded by writers; and one case I attended myself after the battle of Waterloo. Schenckius relates an example, taken from Rolandus. The latter was called to a man, who had been wounded in the thorax, six days before. A portion of the lung protruded in a state of mortification. Rolandus extirpated it, and the patient soon recovered.

Tulpius has recorded a similar fact. A man received an extensive wound, just below his left nipple. His naturally gay disposition, however, led him to neglect the injury; and on the third day a piece of the lungs, three inches in length, protruded. The patient went to Amsterdam, whence he was distant two days' journey, for the purpose of receiving succour in one of the hospitals of that city. The protruded piece of lung, which was already mortifying, was tied, and cut off with scissars. It weighed three ounces. The wound healed in a fortnight, and the patient experienced no complaint afterwards, except a slight cough, with which he was occasionally troubled. He survived the accident six years, leading a wandering, drunken life. After death, nothing particular was observed in the thorax, except that the lungs had become adherent to the pleura, in the situation of the wound. Hildanus relates another case: a man was wounded with a knife, between the fifth and sixth ribs, near the sternum. As a piece of lung protruded at the opening, and had a livid colour, it was extirpated with the actual cautery. The wound was then dilated, and the ribs kept apart, with a wooden wedge, under which plan, the portion of lung, girt by the opening, shrunk within the chest. The patient was soon completely well.

A fourth example of a protrusion of a piece of lung through a wound in the thorax, is among the cases, recorded by Ruysch. The servant of a sea-faring man was wounded in the anterior and inferior part of the chest, and was immediately attended by a surgeon who mistook the protruded piece of lung, for a portion of omentum, and applied a tight ligature round it. Ruysch, who was consulted, soon detected the mistake which had been made, but he delivered his opinion, that the wound would heal very well, as soon as the tied piece of lung was detached. The event justified his prognosis, and the patient recovered.

When the protruded portion of lung is sound, the reduction ought to be made, without the least delay. It should be done on the same principles, as those, on which protruded pieces of intestine, or omentum, are reduced. (See *Wounds of the Abdomen.*) A recurrence of the accident is to be prevented by closing the wound, and placing a compress over it. But when the piece of lung is already in a mortified state, in consequence of the constriction which it has suffered, or when its large size prevents reduction, Sabatier is of opinion, that the only resource is to extirpate the part, after applying a ligature round its base. If the latter step were not taken, a dangerous hemorrhage might follow, or even an extravasation in the thorax. (*Médecine Opératoire, Tom. 2, p. 224.*) However, the practice recommended by Sabatier, appears questionable in the instance of mortification, because the dead part will naturally be thrown off by a spontaneous process; and when the wound is too small to allow the part to be returned, its dilation might be more advisable than the removal of a considerable portion, or even any of the lung.

After the battle of Waterloo, I had a patient with a protrusion of a piece of lung, four or five inches in length. The part was much bruised, and could not be easily reduced. I therefore applied a ligature round its base, and cut it off. Previously, however, I made an incision in it, in order to ascertain whether it would bleed freely, which being the case, induced me to use a ligature. I was afterwards informed by my friend Mr. Collier, that the man died.

4. Emphysema is another symptom, with which penetrating wounds of the chest are frequently complicated, especially, when they are small, and indirect. When such wounds are small, and not straight in their course; when their track is rendered impervious either by change in the situation of the muscles, the swelling of the parts, clots of blood, or any extraneous substances; air may insinuate itself into the cellular substance, so as to cause a great deal of tumor and distention. Emphysema is easily distinguishable by the tumefaction of the part affected, without any pain, or change of colour in the skin, and by the crepitation, which is perceptible, on pressing the air from one part of the cellular substance into another. Emphysema may take place, where the lungs are not wounded, but in this case, it can never be of much extent. Here the emphysematous swelling is caused by the air, which insinuates itself into the cavity of the thorax through the wound, during the first inspirations, which follow the accident, and the same air is expelled in the subsequent acts of expiration. But when the lungs are wounded, the emphysema arises from the escape of air from those organs, during inspiration, first into the cavity of the thorax, and thence, through the inner opening of the external wound, into the cellular substance.

I should have deemed it unnecessary to have said any thing in this part of the work, on the present subject, and have contented myself with referring to the article *Emphysema*, were not the cause of this symptom rather perplexing, and did I not hope that the following extract from Sir A. Halliday's publication will tend to facilitate the comprehension of these cases. This gentleman mentions the following circumstances, under which air may escape from the lungs, or emphysema arise.

1st. "An injury or disease of the pleura pulmonalis, causing a wound or ulceration of that membrane, and thus allowing the air to escape from the lungs, as in oblique external wounds, where the outer opening, and that of the pleura costalis have healed, or closed up, and in ulcers of the surface of the lungs.

2dly. "The pleura pulmonalis, and pleura costalis, may be wounded or ulcerated, when there is no external opening, as when the ends of fractured ribs penetrate through both into the substance of the lungs; and it is from this accident, &c. that emphysema most commonly takes place.

3dly. "The common integuments of the parietes of the chest, the intercostal muscles, and the pleura costalis, may be wounded, while the pleura pulmonalis and the lungs remain uninjured, so that the air admitted from without, and collected in the cavity of the thorax, may be pressed into the cellular membrane, so as to occasion emphysema."

The same writer remarks, "that the lungs in the thorax have often, and not unaptly, been compared to a bladder in a close pair of bellows; but if we suppose the bellows to be divided into two compartments, and each of these to contain a bladder, which mutually communicate with each other, and with the external air, by means of a tube, which is exactly adapted to the nozzle of the bellows, and which admits the air only into the cavity of the bladders, and not into the space betwixt the bladders and bellows, we shall then have a perfect representation of the mechanical structure of the thorax. The bellows will represent the thorax, divided in the middle by the mediastinum; the bladders will represent the lungs of the right and left sides; and the tube, which communicates with the bladders and with the external air, will represent the trachea. The only thing, which is wanting to render this mechanical representation perfect, is, that the bladders should exactly fill the bellows, so as to leave no air betwixt them and the bellows."

It is explained by Sir A. Halliday, that when the handle of the bellows is lifted up, the bladders become filled by the external air, which rushes in through the tube, which communicates with both of them. When the handle is depressed, the air is expelled again. In the like manner, the lungs are filled with air, and emptied again when the capacity of the chest is enlarged by the inspiratory muscles, and then diminished by the expiratory ones.

When emphysema arises from a wound, or ulceration of the pleura pulmonalis, on one side of the thorax, the case is nearly the same as if an opening were made in one of the bladders, which opening would form a communication, as the same gentleman observes, with the bellows and bladder on one side. If this should happen, while the handle of the bellows is depressed, no sooner is the handle raised, than air rushes into the space, betwixt the bladder and bellows, and on keeping up the handle a little while, the bladder will become quite collapsed, and the place which it occupied, while distended, will now be occupied by the air. "If now," says Sir A. Halliday, "we attempt to force out the air, by depressing the handle of the bellows, we shall find that this cannot be done; for there is no direct communication between the bellows and the external air; and as the effused air presses equally on all parts of the collapsed bladder, it cannot escape through it."

When the thorax is expanded in inspiration, the pressure is taken off the surface of the wounded lung, and the air, which now enters this organ, instead of distending its cells, passes through its wound into the space between the pleura pulmonalis and pleura costalis. The lung will, indeed, be partially expanded, as long as inspiration on that side goes on; the more so, the smaller its wound is. At every expiration, however, when the thorax is diminished, the effused air will be compressed against the wounded lung; but none of the air, which has escaped, can re-enter the lung again; "because (as the preceding writer accurately remarks) the whole of the air, contained in the lung, must be forced out, and then the pressure (of the air) against every part of the collapsed lung being equal, will prevent its separating any part, so as to make a passage for itself into the trachea." Thus fresh air accumulates at every inspiration in the space, between the pleuræ, while none can escape from the same situation during expiration, and the quantity accumulated will, at last, equal that which is received into the other lung, during the most powerful inspiration.

When the pleura pulmonalis, and pleura costalis are both wounded, the same effusion of air between them continues from the abovementioned causes, till the lung collapses. When an attempt is now made to expire, the injured side of the thorax must continue distended, notwithstanding every effort of the patient. In this expiratory act, however, if the capacity of the thorax be diminished, and the air compressed, a part of it finds its way through the wound in the pleura costalis, into the common cellular substance of the parietes of the chest.

The passage of air into the cavity of the thorax during the inspiration is, as Sir A. Halliday observes, now more easy than the return of that already effused in the cellular membrane, and consequently, the *subcutaneous emphysema* continues to increase, with a rapidity which is remarkable, as long as the patient lives.

To explain the origin of emphysema, in cases of wounds, which only enter the chest, and do not injure the lungs at all, this writer has recourse to the simile of the bellows and bladders. Were an opening made into the bellows, without injuring the contained bladders, and the access of air by this opening more free, than that by the nozzle, communicating with the cavity of the bladder, more air would enter by the opening, than by the pipe, on the handle being raised, so that the bladder would not rise as usual, when no opening in the side of the bellows existed. If the latter opening be smaller, than that of the pipe, the bladder will only be partially filled, and on depressing the handle of the bellows, the air, contained in the bladder, and that between the bladder and the bellows, will be expelled, in the same proportion to each other, as that in which they were formerly filled. This process would continue to go on in the same way, did not the bladder naturally collapse more and more from its gravitation. Let us now stop the mouth of the pipe, while the handle of the bellows is raised, and the bladder partially filled. On trying next to depress the handle, it results, that, as no air can escape from the pipe, the air contained between the bladder and the bellows, must be first evacuated, while that contained in the bladder of the sound side, will be forced into the bladder on the injured side, and either distend it, so as to rupture it, or cause it to protrude.

Hence, in the case of a wound, penetrating the chest, without injuring the lungs, if the air can enter more freely by the wound, than by the trachea, more of it will enter, in the act of inspiration, into the cavity of the thorax, than into the lungs. On the contrary, when the opening of the wound is not so large as that of the trachea, less air will enter the thorax than the lungs.

In the expiration, the air will be forced from the two different situations, in proportion to the quantity, which enters each of them in inspiration, and no air at all would accumulate in the thorax, did not the lungs always tend to collapse from their gravitation. Should, however, the patient, in making an effort to expire, contract the glottis, the air, contained in the lungs of the sound side, may be propelled into the bronchia and air cells of the lungs, on the same side as the wound, so as to distend them, and even make them protrude at the wound.

Dr. Halliday remarks, that such a protrusion often happens, when wounds are made in dogs, and has been erroneously adduced as an argument against the collapse of the lungs, when an opening is made into the thorax of the human subject. (See *Obs. on Emphysema, by Sir A. Halliday*, 1807.)

For information concerning the treatment of this affection, see *Emphysema*.

5. I have already noticed, that wounds of the thorax may injure one of the intercostal arteries, and when the blood cannot flow outward, it may be extravasated in the chest. The same consequence may follow wounds of the pulmonary vessels, those of the heart, or of the heart itself. And here I may take the opportunity of remarking, that sometimes wounds of the heart do not prove instantaneously fatal. A case, in which a bayonet passed through the colon, stomach, diaphragm, part of the lungs, and the right ventricle of the heart, and yet the patient lived nine hours after the receipt of the injury, is recorded by Dr. Babington. (See *Med. Records and Researches, Lond.* 1798; *also a case by Chastenet in Journ. de Med. Mil. T.* 2.) In almost all cases, however, such injuries prove instantly fatal; and the same remark will extend to cases of hemorrhage from vessels above a certain size, but when they are less consider-

able, the patient may live for a greater or less time, and receive the aid of surgery.

The following are the symptoms, which denote an extravasation of blood in the thorax. The patient feels great oppression, and such uneasiness as will not let him long continue in one position. Unless he bend his body very much forward, in which position, the diaphragm is relaxed, and not so much dragged by the weight of the extravasated fluid, he feels great difficulty in standing or sitting up. When the thighs are bent, the patient can lie with tolerable ease on his back; he is also not averse to lying on the side, on which the wound is situated; but he cannot place himself on the opposite side, without feeling very acute pain in the situation of the mediastinum.

His respiration is short, frequent, and interrupted by sighs; his veins become empty; a cadaverous paleness spreads over his countenance; his extremities become cold; a viscid perspiration covers his neck and temples; his teeth chatter; his pulse becomes weak; and if, as most frequently happens, the lungs are wounded, he spits up frothy blood, and air issues from the wound.

Though one might suppose the above class of symptoms always attendant on a considerable effusion of blood in the thorax, this is not the case. Wounded persons have been known to die of such an extravasation, whose respiration was tolerably free, and who did not complain of suffering more inconvenience in one posture, than another. Sabatier says, that several facts of this kind have fallen under his own observation. Other wounded persons, also, who suffered most of the complaints ascribable to extravasation of blood in the thorax, have been cured by ordinary means. Mery gives an account of a young man, wounded in the anterior and superior part of the chest, about two o'clock in the morning, who had such difficulty of breathing, and fever, five hours afterwards, that an extravasation was supposed to exist, and Mery was thinking of making an opening for its evacuation. A tumor near the great pectoral muscle, presenting neither the feel of fluctuation, nor that of emphysema, made him suspend his decision. The tumor was dispersed by bleeding, and the application of compresses, dipt in a mixture of spirit of wine and water.

However, even the assemblage of the above symptoms did not deceive Petit. Having been requested to assist at an operation, which was about to be done on a wounded man, about whose armpit, pectoralis major, and latissimus dorsi muscles, a prodigious emphysematous swelling had taken place; whose respiration was painful and difficult; and who spit up frothy blood; Petit gave it as his opinion, that it was unnecessary to make an opening into the chest. He thought it would be sufficient to enlarge the wound, which was at a little distance from the armpit, near the edge of the latissimus dorsi, so as to give vent to the effused air. This advice was followed, the emphysema soon dispersed, and the patient recovered.

The equivocal nature of the symptoms of extravasations of blood in the thorax, has induced practitioners to pay the most scrupulous attention to every circumstance attendant on these cases. In several instances, Valentin remarked, that an echymosis occurred, at the angle of the false ribs, and spread towards the loins. The echymosis is described as being of a clear purple colour, like the spots, which sometimes form on the abdomen, a little while after death. In a case, in which most of the symptoms of extravasation were combined with the above sort of echymosis, Valentin advised a counter-opening to be made. The advice was overruled, and the patient soon afterwards died: more than six pints of blood were found extravasated in the thorax.

Sabatier remarks, that we cannot too highly applaud the zeal of those practitioners, who endeavour to dispel the doubts which still prevail in several parts of surgery. At the same time, he thinks, that all who take interest in the improvement of this science, should endeavour to ascertain the truth of any new observations, which are offered. Hence, he deems it proper to relate a case, which was communicated to him by M. Saucerotte (the father), an eminent military surgeon, and which shows, that the echymosis, observed by Valentin, is, at least, not invariably attendant on extravasations of blood in the chest. A light-horseman, who had received a thrust with a sabre in the right side of the thorax, above the tendon of the pectoralis major, appeared to be going on very well for the first four days after the accident. On the fifth, he complained of difficulty of breathing, uneasiness, and an inability of lying on the left side, without aggravating his complaints. He complained of a great deal of pain in the region of the liver, and at the top of the shoulder. His pulse was small and contracted, and rather hard than weak. The right side of the chest seemed larger than the left. On the eight and ninth day, the symptoms became more urgent, and the patient found no ease, except in leaning on his right side, and supporting himself on a chair placed across his bed. This assemblage of symptoms indicated an extravasation of blood in the right cavity of the thorax; but, as the ecchymosis, which Valentin has described, was not apparent, doubts were entertained about the real nature of the case. When a counter-opening was made on the dead body, a pint of putrid blood flowed out.

When the surgeon feels assured, that an extravasation of blood in the thorax has really occurred, and the symptoms are very urgent, the discharge of the confined fluid appears to promise benefit. However, before the operation is done, the revived state of the pulse, the return of warmth in the extremities, and the cessation of great faintness, ought to denote, that the hemorrhage no longer continues from the vessels; for, if this be not the case, a fresh quantity of blood must soon be extravasated again, and the patient die exhausted.

Authors mention five methods of discharging blood from the thorax; viz. 1st. By placing the patient in a posture which favours the escape of the blood; 2dly. By introducing a syringe for the purpose of sucking it out, or a mere cannula, through which it is to flow; dly. By enlarging the wound; 4thly. By employing injections; 5thly. By making an opening in a depending part of the thorax.

1. Success cannot be expected from merely placing the patient in a posture which is favourable to the escape of the extravasated blood, except when the wound is situated at the inferior part of the chest, and is large and direct in its course. Paré successfully adopted this method in the case of a soldier, who was stabbed in three places with a sword, one of the wounds, which entered the chest, being situated under the right nipple. The man was first dressed by a surgeon, who made several sutures. The patient was soon afterwards attacked with considerable difficulty of breathing, fever, coughing, spitting of blood, and acute pain in the side. Paré, who was consulted the next day, suspected that an extravasation had happened: consequently he cut out the sutures, and placed the patient in a position, in which his feet were much more raised than the head. Paré also recommended him to hold his breath, and then introduced his finger into the wound, in order to take away some clots of blood, which appeared at its orifice. By these steps, the discharge of seven or eight ounces of fetid, coagulated blood was effected.

2. The idea of drawing out of the thorax extravasated blood with a syringe, is rather ancient. The pipes of all syringes for this purpose, should have blunt ends, lest they injure the lungs. Mere tubes containing a stilet, have also frequently been employed. Scultetus relates a case, in which an instrument of the latter sort was successfully employed. No syringe, or any suction with the mouth was requisite; it was found necessary merely to introduce the tube, and then withdraw the stilet.

Lamotte used only a simple cannula, which he introduced into the centre of the extravasation. Then having placed the patient, in what he conceived to be the most favourable posture, and requested him to hold his breadth, he drew off the collection of fluid. The cases numbered 216, 217, 218, show the success which attended this method. Although it might also have answered very well in case 219, Lamotte saw that the high situation of the wound would not have allowed all the blood to be discharged, and therefore he made a counter-opening. Thus the thorax was completely emptied, and a recovery ensued. When a cannula is employed, authors recommend it to be introduced every day, till the bad symptoms cease, and no more fluid escapes through the cavity of the instrument. After having given vent to blood, it allows a bloody serous fluid to escape, and at a latter period pus, which becomes of a thicker and thicker consistence, the nearer the patient is to a recovery.

3. The cases, in which a wound, complicated with an extravasation in the chest, should be dilated, are those, in which the situation of the opening is favourable to the escape of the blood. The operation is performed with a curved bistoury, and a director. The integuments, and external muscles, are to be divided in a perpendicular direction, and the intercostal muscles in a line parallel to the ribs. Care is also to be taken, not to cut too near the lower edge of the upper rib, lest the intercostal artery be wounded. Dionis practised such an operation on a soldier who was wounded at Befort, in 1703, with a sword, below the right nipple, whereby a direct opening was made into the thorax. When the extravasated fluid had been let out, Dionis made the patient lie on the wounded side during the night, and in proportion as the blood continued to be thus evacuated, the breathing became free from oppression.

4. The methods above explained, may be of use, when the blood retains its natural state of fluidity; but, when it is coagulated, as often happens, they can be of no avail. In this circumstance, most authors direct a proper opening to be made, and tepid water then to be thrown into the chest, with a view of loosening and dissolving the coagula, and washing them out of the wound. The French writers, even the modern ones, (*Sabatier*), most absurdly recommend the injection of various detergent vulnerary decoctions, and of solutions of honey of roses, soap, salt, &c. What idea these authors can entertain of the great tendency to inflammation of the lungs and pleura, or what good they can expect from such applications is difficult of conception. I am firmly convinced, that the meanest scribbler on surgery, in this country, would be ashamed of offering such advice.

5. When the wound is narrow, and situated at the upper part of the chest, the extravasated blood cannot be discharged, unless a counter-opening be made at the lower part of this cavity. The best place for making the opening, and the proper manner of executing the operation, are described under the head of *Paracentesis.* As soon as the opening has been made, the blood flows out. Its discharge is then to be promoted by such a posture as will render the opening depending.

The old surgeons, who had much more fear than the moderns, of letting the opening heal up, sometimes employed tents for the purpose of preventing this event, until all danger of another collection of blood, or matter, seemed to be over. However, as in these cases tents are apt to bring on inflammation of the pleura and lungs, hinder the escape of whatever fluid is contained in the chest, and cause great irritation, pain, and even exfoliations from the ribs, their use is now relinquished.

As large tents had the effect of hindering the discharge of blood, or matter from the cavity of the chest, some of the old French surgeons employed a kind of wick; but, in the present state of surgery, I do not consider that it would be at all edifying to enter into a comparison of these contrivances. If any means be ever requisite for keeping the opening from closing, there cannot be a better thing for the purpose, than a short cannula, with a rim to keep it from slipping into the thorax, and two little rings for confining it in its situation with a riband. This should only just enter deeply enough to have its inner orifice on a level, or a very little further inward, than the pleura costalis, so that it may not irritate the lungs.

When the patient has been dressed, he is to be kept in bed, with his head and chest somewhat elevated, and his thighs bent, in which position the breathing will be least oppressed. It is usual also to recommend him to lie, as much as possible, on the side on which the operation has been done. He is to keep himself in as quiet a condition as he can. He is to be put on very low diet, and, if his strength allows, he is to be bled from the arm, and this evacuation must be repeated with other antiphlogistic means, as often as the urgency of the fever and inflammatory symptoms indicate, and the strength allows. Bleeding from the arm, besides counteracting inflammation in the chest, which is a principal source of danger, does good by lessening the force of the circulation in the wounded vessels, and thus diminishing the tendency to internal hemorrhage.

The old practice of keeping open wounds of the chest, is now nearly exploded; but if it ever be advisable, particular caution must be used not to let the tents, and pieces of the dressings, glide into the cavity of the pleura. Tulpius speaks of a Danish gentleman, who had been under a careless surgeon on account of a wound in the thorax, and who coughed up, six months afterwards, a large tent. A similar fact is recorded by Hildanus. A man was stabbed in the right side of the chest, near the axilla, between the second and third ribs. For a fortnight, a great deal of blood was discharged both from the wound and the mouth. The wound healed; but the patient continued to be afflicted with considerable difficulty of breathing, an incessant cough, and to spit up a greenish fetid matter. Three months afterwards, he coughed up two tents which had slipped into the cavity of the thorax.

A relaxation of the antiphlogistic regimen must be made with very great circumspection. Too much nourishment, talking too frequently, and any exertion, are circumstances which may induce a renewal of the hemorrhage, and extravasation. Vesalius saw an accident of this nature happen a fortnight after the wound, and eleven days after the operation for empyema. A soldier, who had been stabbed in two places with a sword above the right nipple, was attacked with fever, difficulty of breathing, restlessness, and acute pain at the bottom of the chest. These symptoms induced Vesalius to infer, that an extravasation had taken place; but he was afraid of making an opening in the chest, for fear the hemorrhage should still continue from the wounded vessels. However, as the patient remained in the same state, the fourth day after the receipt of the wounds, and he still had strength enough, Vesalius undertook the operation, by which a considerable quantity of extravasated blood was discharged. The patient felt great relief at the instant. The oozing of blood continued for a few days, after which a favourable suppuration took place in all the three wounds, and the case was expected to end well. But the patient having regained his strength and taken too much food, the recurrence of hemorrhage caused his death. Lombard saw a soldier die instantaneously of internal hemorrhage, brought on by throwing a bowl at some nine pins, two months after he had been cured of a wound of the lungs.

When the edges of a penetrating wound of the chest are to be brought together, writers state, that the patient should be requested to make a strong inspiration with the wound closed, and then a long, slow expiration with it open, and so on, till as much of the air is discharged from the thorax as possible, and then the wound is to be accurately closed with sticking-plaster. From what has been observed, however, in the article *Emphysema*, it will appear, that when there is a direct opening into the thorax, so as to admit the external air, the lungs on one side collapse, and remain so till the wound is healed, and the air absorbed. When one of these organs is wounded, a collapsed state is, indeed, the best condition in which it can possibly be for a certain time, that is, till the breach of continuity in it is healed. Schemes for making the lung expand by exhausting the air from the cavity of the pleura, may be amusing on paper, but, I apprehend, they will never be of real use in practice.

Fistulæ sometimes continue a long while after wounds of the thorax. Platner mentions an instance, in which there was a fistulous opening, out of which the air rushed with sufficient force to blow out a candle. The patient lived a long while in this state, without suffering any particular inconvenience.

Another occasional consequence of a wound of the chest, is a hernia of the lungs, an affection, of which, Sabatier met with an example. A soldier, thirty years of age, was wounded with a bayonet in the right side of the chest, between the middle part of the fifth and sixth true ribs. The wound healed; but, as the intercostal muscles had been divided to a great extent, and could not be approximated with precision, an empty space was left under the integuments, which allowed a piece of the lungs, as large as a walnut, to protrude between the ribs. The swelling enlarged at the time of inspiration, and grew smaller when expiration took place, occasioning merely a slight pain without any oppression in the chest.

Though so much has been written on the subject of discharging blood from the chest, in cases of extravasation within that cavity, the operation is very rare. During the last twenty-eight years, I have never heard of its being done by any of the surgeons in London. In military surgery, however, the practice is occasionally exemplified. (*Larrey, Mém. de Chir. Mil. T.* 2. 158, *&c.*) No doubt, the true reason of the operation being uncommon, is the obscurity in the diagnosis, the symptoms being all of an equivocal nature. Even Larrey, generally so partial to operations, recommends the immediate closure of all wounds of the chest, excepting such as are complicated with injury of the intercostal artery, because, (says he,) unless very considerable vessels of the lungs are injured, (in which case, nothing can be of any use,) either no extravasation, or only a trivial one, happens, which, under the employment of rigorous antiphlogistic treatment, may be dispersed by absorption. (*P.* 127.) Respecting the general propriety of closing all wounds of the chest, I entirely concur with Larrey, Pelletan, Boyer, and Dr. Hennen. (*On Military Surgery, ed.* 2, *p.* 373.)

Consult, *Sabatier, De la Médecine Opératoire,* *T. 2. Journ. de Méd. Militaire, 7 Tomes. Schmucker, Wahrnehmungen, 2 B. Berlin,* 1774—89. *J. Bell, on the Nature and Cure of Wounds, Ed. 3. D. J. Larrey, Mém. de Chir. Militaire, 8vo. Paris,* 1812—1817, *in various places. John Hennen, Principles of Military Surgery, Ed. 2, 8vo. Edinb.* 1820. *Wm. Maiden, an Account of a Case of Recovery, after an extraordinary Accident, 4to. Lond.* 1812. *The injury here referred to, is one of the most extraordinary on record; the shaft of the gig having been driven with the greatest violence between the sternum and lungs. Sir A. Halliday, in Edinb. Med. and Surg. Journ. Vol.* 11. *p.* 140; *a Recovery from a Gunshot Injury, in which a great part of the Shoulder was carried away, and the Lungs and Pericardium were exposed: to the authenticity of this Case I can bear witness myself, having been at the Field Hospital, when the Soldier arrived from the Trenches, near Antwerp.*

Wounds of the Abdomen.—Here one of the chief causes of danger is the tendency of the peritoneum to inflame. Every penetrating wound of the belly is apt to excite this inflammation, which too often extends itself over all the viscera, and terminates in the death of the patient.

There are (says Mr. John Bell) a thousand occasions, on which the delicacy of the peritoneum may be observed. The wound of the small sword, and the stab of the stiletto, explain to us, how quickly the peritoneum, and all its contained bowels, inflame from the most minute wound, although the injury be almost too small to be visible on the outside, and scarcely within; for, often, upon dissection, no intestines are discovered wounded, and no feces have escaped into the abdomen. In subjects, who die after lithotomy, we find the cavity of the peritoneum universally inflamed. The operation of the Cæsarean section is fatal, not from any loss of blood, for, there is little bleeding; nor, from the parts being exposed to the air, for, patients also die, in whom the womb bursts, and where the air has no possible opportunity of insinuating itself; but, the case proves fatal from the inflammation, which is always disposed to originate from wounds of the peritoneum, small as well as great. (*Discourses on the Nature and Cure of Wounds, p.* 310, *edit.* 3.)

But, although there can be no doubt that the wound, abstractedly considered, is the most frequent occasion of this dreadful inflammation; yet, it sometimes happens, that the imflammatory consequences must be ascribed to another kind of cause. If an intestine be wounded, its contents may, under certain circumstances, be effused in the abdomen; if the liver, spleen, kidney, or any large vessel be injured, blood may be poured out amongst the viscera; if the gall-bladder be wounded, bile may be effused; and, if the bladder be pierced, the urine may escape into the abdomen. Now all these fluids are extraneous substances, with respect to the surfaces, with which they often come into contact, and, as such, they give rise to inflammation of the peritoneum and viscera.

Wounds of the belly are divided, by almost all writers, into such as penetrate the cavity of the abdomen, and into others, which only interest the skin and muscles.

The former differ very much in their nature, and degree of danger, according as they do, or do not, injure parts of importance, contained in the peritoneum. The latter are not remarkably different from the generality of other superficial wounds. The chief indications are to lower inflammation, and to prevent collections of matter. A few particularities, however, in the treatment of superficial wounds of the abdomen, merit attention.

Superficial Wounds.—The most ancient surgeons, and their successors, down to the present day, have recorded, that wounds of tendinous parts frequently give rise to very unpleasant consequences. Almost the whole front of the abdomen is covered with tendinous expansions, and, on this account, it is not unusual to see punctured wounds in this situation followed by extensive inflammation, and the formation of abscesses. At the same time, the patient is affected with a great deal of inflammatory fever. He suffers acute pain, sickness, hiccough, and considerable disturbance of the nervous system. (*Callisen, Syst. Chirurg. Hodiernæ, Vol.* 1, *p.* 698, *Hafniæ,* 1798.) When the tension and swelling of the abdomen abate, shiverings sometimes occur, and indicate the occurrence of suppuration. The matter sometimes accumulates in the tendinous sheath of the rectus muscle, and, when the collection in this situation remains undiscovered until a pointing appears, no sooner does the abscess burst, or it is opened, than an extraordinary quantity of matter is discharged. The surgeon should carefully remember the nature of this kind of case, as there is frequently not sufficient alteration in the appearance of the integuments to denote, either the existence, or the extent of the suppuration.

Such an abscess forms one remarkable exception to the excellent general rule of allowing acute phlegmonous abscesses to burst of their own accord. In the present instance, there is an aponeurotic expansion, intervening between the abscess and the skin, and nothing retards the natural progress of the matter to the surface of the body so powerfully, as the interposition of a tendinous fascia. But, even in this circumstance, the propensity of pus to make its way outward is often seen to have immense influence. Though there is only a thin membrane, (viz. the peritoneum) between matter so situated, and the cavity of the abdomen, the abscess, after a time, mostly points externally.

The proper treatment of this case is to prevent the surprising accumulation of matter, and rapid increase of mischief, by making a depending opening, sometimes at the very lowest part of the sheath of the rectus muscle, and this, as soon as the lodgment of matter is clearly ascertained.

If ever there be a case, in which it is advantageous and justifiable to make an early dilatation of a punctured wound, in order to prevent the above-described ill-consequences, it is unquestionably the present one. Such practice, indeed, is particularly recommended by Callisen, in addition to the strictest antiphlogistic means. (See *Syst. Chir. Hodiernæ*, *Vol.* 1, *p.* 698, *edit.* 1798.)

Sometimes the matter is formed between the external and internal oblique muscles, and spreads to a great extent. The pus may even insinuate itself into the abdomen, and the case end fatally. Such an example is recorded by Dr. Crowther, of Wakefield. In this instance, however, the disease proceeded from a contusion, not a wound. (See *Edinb. Med. and Surgical Journal*, *Vol.* 2, *p.* 129.)

Superficial wounds of the abdomen are to be treated on the same principles, as similar wounds in other situations. The indications are to prevent inflammation as much as possible, and, if suppuration should be inevitable, to let out the matter by a depending opening, as soon as the abscess is known to exist. The inflammation is to be checked by general and topical bleeding, low diet, emollient clysters, diluent beverages, quietude, opening medicines, cold applications, or, fomentations and poultices, and the mildest, and most simple dressings. (See *Inflammation.*)

Whenever the abdominal muscles are wounded, they should be relaxed, and the patient kept quiet in bed. A very important point, in the treatment of wounds of the parietes of the abdomen, is to afford a degree of support to the wounded parts, so that the pressure of the viscera may be resisted. The sides of the abdomen are almost wholly composed of soft parts, which easily yield. No part of the front or sides of the abdomen is supported by a bony structure, and as the viscera are, for the most part, more or less moveable, and closely compressed by the abdominal muscles, and diaphragm, they are liable to protrude, whenever the resistance of the containing parts is not sufficiently powerful. Hence, all wounds of the abdomen, especially those in which both the integuments and muscles have been cut, demand strict attention to the precaution of supporting the wounded part, and this, though the peritoneum itself should not happen to be divided. The patient ought to keep as much as possible in a horizontal position, and suitable compresses and bandages should be applied. And, in order to guard against herniæ, the parts should be supported in this way, a considerable time after the wound is healed.

The peritoneum, being connected by means of cellular substance with the inner surface of the abdominal muscles, there is always some risk of the inflammation of these parts extending to that membrane. The danger must be averted by the rigorous employment of antiphlogistic treatment. What renders the event still more dangerous, is, that when one point of the peritoneum is affected, the inflammation usually spreads with immense rapidity over its whole extent, and too often proves fatal.

As superficial wounds of the abdomen are to be treated on the general principles, applicable to all resembling wounds in other situations, it is hardly necessary to state, that union by the first intention, if possible, is always to be attempted.

Of Wounds penetrating the Cavity of the Abdomen.—The first thing, which the surgeon is generally anxious to know, when he is called to a wound of the belly, is, whether the wound penetrates the cavity of the abdomen, and whether any of the viscera are injured.

When the wound is extensive, and the bowels protrude, the first part of the question is at once decided. But, when the wound is narrow, and the viscera do not protrude, it is more difficult to know, whether the cavity of the abdomen is penetrated or not. An opinion, however, may be formed, by carefully examining the wound with a finger, or a probe; by observing, if possible, how much of the weapon is stained with blood; considering the direction in which it was pushed; the quantity of blood lost, the state of the pulse, and, whether any bile, feces, or other fluids, known to be naturally contained in some of the abdominal viscera, have been discharged from the orifice of the injury.

When the wound is sufficiently large to admit the finger, a surgeon can always learn, whether the injury extends into the abdomen, because the smooth lining of that cavity, and the contained bowels, may be easily felt. There is one chance of deception, however, arising from the possibility of mistaking the inside of the sheath of the rectus muscle for the cavity of the peritoneum; and when the examination is made with a probe, particular caution should be used in forming a judgment of the nature of the case; for the parts are so soft and yielding, that a very little force will make the instrument pass a considerable way inward. Every examination of this kind should always be undertaken, if possible, when the patient is exactly in the same position, in which he was at the time of receiving the wound. Formerly, injections were sometimes employed as tests of the penetration of the cavity of the abdomen. This absurd experiment is now very rightly exploded. It is well known to the moderns, that the space, termed the cavity of the abdomen, is in fact, completely filled with the various viscera, and that in general, an injected fluid would not so easily find its way into the bag of the peritoneum, as an unreflecting person might suppose. And if it were propelled with much force, it would be quite as likely to insinuate itself into the cellular substance of the parietes of the abdomen, or perhaps, into the sheath of the rectus muscle. The least tortuosity of the wound, or a piece of bowel, or omentum, lying against the internal orifice of the injury, would also completely prevent an injection from passing into the abdomen.

When a considerable quantity of blood issues from a wound of the abdomen, we may pronounce, almost with certainty, that some large vessel within its cavity, is injured. Excepting the epigastric artery, which runs on the forepart of the abdomen, along the inner surface of the rectus muscle, no large vessel is distributed to the muscles, and integuments. At the same time, it is deserving of particular notice, that a large artery may be opened in the abdomen, and not a drop of blood be discharged from the wound.

In such cases, the consequent symptoms quickly lead to a suspicion of what has happened. The patient complains of extreme debility and faintness; his pulse falters; he has cold sweats; and if the bleeding should not speedily cease, these symptoms are soon followed by death.

Sometimes, the extension of the wound into the cavity of the abdomen, is from the first quite manifest, being indicated by the escape of chyle, bilious matter, feces, or other fluids. The vomiting up of a considerable quantity of blood, or its discharge by stool, affords also the same information. The urine, however, may flow from a wound, which does not actually penetrate the abdomen; for the kidneys, ureter, and bladder may be said to be out of the abdomen, because they are really on the outside of the cavity of the peritoneum.

When none of the above symptoms occur; when neither the finger, nor the probe, can be introduced; when none of the fluids, known to be contained in the various receptacles in the abdomen, are discharged from the wound; when the pulse remains natural, and the pain is not excessive; there is reason to hope, that the wound has not injured parts of greater consequence, than the integuments, and muscles. (*Encyclopédie Méthodique, Partie Chir. Art. Abdomen.*)

I have now taken a survey of the criteria, commonly noticed by writers, for the purpose of enabling surgeons to discriminate a wound, which penetrates the abdomen, from one which is more superficial. My next duty is to warn the practitioner, that too much solicitude to determine this point, is very frequently productive of serious harm. It may be set down, as an axiom in surgery, that *in general, whenever the probing of a wound is not rendered absolutely necessary by some particular object in view, it may be judiciously omitted.* A narrow, oblique wound may enter the cavity of the abdomen, without there being any particular method of ascertaining whether it has done so, or not. However, this want of positive information is of no practical importance; for when there are no urgent symptoms, evincing the nature of the case, the treatment ought obviously to resemble that of a simple wound; and whether the wound be deep, or superficial, antiphlogistic remedies are indicated.

The edges of a wound, penetrating the abdomen, but unattended with injury of the viscera, are to be brought together with sticking-plaster, in the same way as common wounds. Sutures are not generally necessary. Numerous cases may be found in the records of surgery, proving that wounds of the abdomen may be easily united without sutures, provided the surgeon take care to avail himself of the assistance which may be derived from a suitable position and a proper bandage. But, such cases are less decisive, than relations of the Cæsarean operation, the extensive wound of which admits of being healed by the same simple means. It is not my intention to assert, that in the majority of these examples, sutures were altogether dispensed with; but the ligatures frequently cut their way through the skin and muscles, and the application of others was impossible, either on account of the particular state of the case, or the patient's aversion to them. Still the union of such wounds was accomplished. A bandage, made on the same plan, as that with eighteen tails, would be extremely convenient, for longitudinal wounds of the abdomen. (See *Pibrac in Mém. de l' Acad. de Chir. T.* 3, *4to.*)

In the treatment of wounds of the abdomen, sutures may generally be relinquished, not only without harm, but with benefit; for their employment is sometimes the cause of bad symptoms. In one instance, the hiccough and vomiting could not be appeased by any remedy which was tried. On the fourth day, the wound was inflamed and painful, and it was judged proper to cut away two sutures, and employ only simple dressings, with the view of diminishing the pain and swelling. The symptoms quickly abated, and in a week, were entirely cured, the wound healing up very well. (*Op. cit.*)

However, there are circumstances, in which it would be impossible to dispense with sutures. If, for instance, the belly were torn open from one side to the other with a bullock's horn; or if it were extensively divided with the tusks of a wild boar, a stag's horn, a razor, &c. and the inflated intestines could not be kept from protruding, some stitches would be absolutely necessary; but even then, they should be as few as possible. (*Sabatier, Médecine Opératoire, T.* 1, *p.* 214, *edit.* 2.)

"Our good old surgeon Wiseman (observes Mr. John Bell) has said with great simplicity, as a great many have said after him, 'it frequently happeneth, that a sword passeth through the body, without wounding any considerable part.' He means, that a rapier, or ball, often passes quite across the belly, in at the navel, and out at the back, and that without one bad sign, the patient recovers, and as has very often happened, walks abroad in good health, in eight days; which speedy cure has been supposed to imply a simple wound, in which all the bowels, have escaped. But, we see now, *how* this is to be explained; for we know, that in a thrust across the abdomen, six turns of intestine may be wounded,—each wound may adhere; adhesion, we know, is begun in a few hours, and is perfected in a few days; and when it is perfect, all danger of inflammation is over; and when the danger of inflammation is over, the patient may walk abroad; so that we may do, just as old Wiseman did in the case here alluded to, (*P.* 93, the case of a man, who was wounded across the belly, and well and abroad, in seven days,) 'Bleed him, and advise him to keep his bed and be quiet.' In short, a man, thus wounded, if he be kept low, has his chance of escaping by an adhesion of the internal wounds." (*Discourses on the Nature and Cure of Wounds, p.* 329, 330, *edit.* 3.)

The truth of these observations is well illustrated in a case mentioned by Dr. Hennen, in which a soldier recovered, whose abdomen was pierced with a ramrod, which stuck so fast in the vertebræ, that some force was required to disengage it. (*On Military Surgery, p.* 402, *ed.* 2.)

When a man is stabbed, or shot in the belly, and none of the bowels protrude, the wisest plan is to keep the patient as quiet as possible, have recourse to copious and repeated bleeding, prescribe anodynes, and the lowest fluid diet, and apply light superficial unirritating dressings. In the event of severe pain and swelling of the belly coming on, leeches, fomentations, the warm bath, and emollient poultices, will be necessary, and nothing will now avail, except the most rigorous employment of antiphlogistic remedies. As Dr. Hennen observes, the best means of emptying the bowels are oleaginous clysters, and, if any internal medicine be given, as a purgative, it should be of the mildest nature. (*On Military Surgery, p.* 402, *ed.* 2.) Castor oil is perhaps the best; but, on the whole, for some few days, I would hardly venture beyond the use of clysters for procuring evacuations from the bowels.

Suppuration in the Abdomen, in consequence of Wounds.—Abscesses within the bag of the peritoneum are far from being common. As a late writer well observes, "the containing and contained parts of the abdomen present to each other an uniform and continuous surface of membrane. This membrane is of the serous class, and the species of inflammation, to which it is especially subject, is that, which has been denominated the adhesive. The membrane, lining the intestinal canal, is of the mucous class, and the ulcerative inflammation is the species, to which this class is liable. This beneficent provision is an irresistible evidence of the operation of a salutary principle in disease. If the inflamed peritoneum had run directly into suppuration; ulceration of the surrounding parts would have been required for an outlet; and if the internal surface of the irritated bowel had tended to form adhesions, the canal would have been in constant danger of obliteration." (*Travers on Injuries of the Intestines, &c. p.* 10.)

That collections of matter, however, do sometimes take place in the cavity of the abdomen, in consequence of wounds, is a fact, of which there are too many proofs on record, for the possibility of the case to be doubted. At this moment, be it sufficient to refer to two examples of the occurrence, as related by Mr. B. Bell. (*System of Surgery, Vol.* 5, *p.* 256.)

If the abscess were in any other part of the body, and did not readily point, the wisest practice would undoubtedly be to make an opening sufficient for the evacuation of the matter. But suppuration in the abdomen can seldom be known with certainty in an early stage of the case: for, the abscess is so deep, that no fluctuation, nor swelling, is perceptible, until the quantity of pus is considerable. Nor would it be judicious to expose the patient to the hazard, which might arise from making an opening into the abdomen, merely for the sake of discharging a small quantity of matter.

Many writers impute much of the danger of wounds of the abdomen to the entrance of air into the cavity of the peritoneum. In inculcating such opinions, however, they betray an inaccuracy of observation, which a very little reflection would have set right. Too much stress has long been laid on the introduction of air into the abdomen, as being a cause of inflammation. The fact is, the cavity of the belly is always so completely occupied by the several viscera, that the whole inner surface of the peritoneum is invariably in close contact with them, and, therefore, air cannot easily diffuse itself from the wound, throughout the abdomen. After tapping, in dropsical cases, inflammation seldom arises, though here the air has quite as good an opportunity of entering the abdomen, as in any case of wound. The peritoneum in animals has been inflated, without any inflammation being excited. In cases of tympanitis, the peritoneum is distended with air, and yet both this membrane and the bowels are quite uninflamed. In the human subject, it seems probable, that, if a wound were made in a vacuum, the breach of continuity itself would be an adequate cause of inflammation. It may also be remarked, that collections of matter in the abdomen are almost always completely circumscribed, and separated from the general cavity of the peritoneum, by the adhesion of the viscera to each other, and to the inside of the peritoneum.

I am of opinion, that no surgical writer has succeeded so well, as Mr. John Bell, in exposing the absurd apprehensions, not uncommonly entertained by practitioners, respecting the entrance of air into the abdomen and other cavities of the body. He inquires: 1st, Whether air can really get into the cavity of the abdomen? and, 2dly, Whether, if it were there, it would produce the dreadful effects ascribed to it?

Upon the first question, his arguments run thus:—"Suppose a wound of an inch in length:—suppose the bowel to have sunk, in some strange way, into the pelvis, for example, so as to have left a mere vacuum; what should happen with the flexible parietes of the abdomen? Should they stand rigid, while the air rushed into the cavity to fill it? No, surely. But, on the contrary, the walls of the abdomen would fall together, and the pressure of the outward air, far from making the air rush in by the outward wound, would at once lay the belly flat, and close the wound. But, since the walls of the abdomen are not flaccid, nor the cavity empty, but the abdomen full, and the flat muscles, which cover it, acting strongly, the effect must be much more particular; for, the moment that the belly is wounded, the action of the muscles would force out part of the bowels; the continuance of that action is necessary to respiration: the respiration continues as regular after the wound, as before; and the continual pressure of the abdominal muscles, and the diaphragm against all the viscera of the abdomen, prevents the access of air so effectually, that though we should hold such a wound open with our fingers, no air could pass into the abdomen, further than to that piece of gut which is first touched with the finger, when we thrust it into the abdomen. Nothing is absolutely exposed to the air, except that piece of intestine which is without the abdomen, or that, which we see when we expose a small piece of the bowels, by holding aside the lips of the wound. The pressing forward of that piece, and the protrusion of a portion of the gut, proportioned always to the size of the wound; the pressure from behind, keeping that piece protruded, so that it is with difficulty we can push it back with our finger;

this incessant pressure, in all directions, is an absolute security against the access of air. The intestine comes out, not like water out of a bottle, the place of which must be supplied by air entering into the bottle, in proportion as the water comes out; but, the gut is pushed down by the action of the muscular walls of the abdomen, and that action follows the intestine, and keeps it down, and prevents all access of the air, whether the gut continue thus protruding, or whether it be reduced; for, if it be reduced, the walls of the abdomen yield, allowing it to be thrust back, but admitting no air. Those, who want to know the effect of air, diffused within the cavity of the abdomen, must make other experiments, than merely cutting open pig's bellies;—they must give us a fair case, without this unnecessary wound. We will not allow them to say, when they cut open the belly of any creature, with a long incision, that the inflammation arises from the air; much less shall we allow them to say, when they open the belly with a smaller incision, that, by that little incision, the air gets into the abdomen, and that all the bowels are exposed to the air." (*Discourses on the Nature of Wounds, p.* 343. 384.)

In adverting to the question, whether air is so irritating to the cavities of the body, as many have supposed, Mr. John Bell criticises, with much spirit and success, the opinions, published on this subject, by Dr. A. Monro, in his account of the Bursæ Mucosæ, as the annexed quotations will show. "That the vulgar should believe, the first superficial impression that strikes them, of air hurting a wound or sore, is by no means surprising; but, it is not natural, that men, bred to philosophy, should allow so strange an assertion as this, without some kind of proof. That the air which we breathe, and which we feel upon the surface so bland and delightful, should have so opposite a relation to the internal parts, that it should there be a stimulus, more acrid, and more dangerous than the urine, is not to be believed upon slight grounds. I do affirm, (says Mr. John Bell,) that it remains to be proved, that this fluid, which seems so bland and pleasant to all our senses, and to the outward surface, is yet a horrible stimulus, when admitted, as a celebrated author grandly expresses it, 'into the deep recesses of our body.'" (*Monro's Bursæ Mucosæ.*)

With how much reason Mr. John Bell objects, that this doctrine is unfounded, will be manifest to every man of any discernment, or impartiality.

"The air, for instance, escapes from the lungs, in a fractured rib, and first goes abroad into the thorax; then into the cellular substance; then the emphysematous tumor appears; but often without any scarifications, with very little care and assistance on our part, the air is absorbed, the tumor disappears, and, without inflammation of the chest, or any particular danger, the man gets well. Here then is the air, within the cavity of a shut sac, filling the thorax, and oppressing the lungs, without any dangerous inflammation ensuing.

"That the air may be pushed under the cellular substance over all the body, without causing inflammation, is very plain from the more desperate cases of emphysema, where the patients, after living eight or ten days, have died, not from inflammation, but from oppression merely, the body being so crammed with air, that even the eye-balls have, upon dissection, been found as tense as blown bladders. We have also many ludicrous cases of this kind, which prove this to our perfect satisfaction. Soldiers and sailors sometimes touch the scrotum with a lancet, introduce a blow pipe, and blow it up to an enormous size, imitating herniæ, by which they hope to escape from the service. The old story of a man, who was so wicked as to make a hole in his child's head, and blow it up, that he might show the child in the streets of Paris for a monster, is well authenticated; and, I have little doubt, that a fellow, who knew how to do this, would blow it up every morning, and squeeze it out when he put the child to bed at night. Some villanous butchers, having a grudge at a soldier, found him lying drunk under a hedge; they made a little hole in his neck, and blew him up, till he was like a bladder, or, as Dr. Hunter describes the disease of emphysema, *like a stuffed skin.*" (*P.* 388, 389.)

After many other pertinent observations, blended with appropriate satire on the extravagant notions professed by Monro, on the bad effects of the air, in lithotomy, operations for hernia and hydrocele, the Cæsarean section, &c., Mr. John Bell most justly holds up to ridicule the propositions of Dr. Aitken, *to perform this last operation under the cover of a warm bath, in order to exclude the air.* "This, though it may seem to be a scurvy piece of wit, was really proposed in sober serious earnest. But (adds Mr. John Bell), the admission of atmospheric air, as a stimulus, when compared with the great incisions of lithotomy, of hernia, of hydrocele, of Cæsarean section, of the trepan, is no more than the drop of the bucket to the waters of the ocean. And it is just as poor logic to say, that, after such desperate operations, these cavities are inflamed by the admission of air, as it would be to say, (as Monro did) that, when a man is run through the pericardium with a red-hot poker, that the heart and pericardium are inflamed by the admission of the air." (*P.* 347, *Edit.* 3.)

Enough, I conceive, has been said, to dispel all the idle fear and prejudices, which have prevailed concerning the bad effects of the air in wounds of the abdomen, as well as several other cases. When so justly eminent a man as Dr. Alexander Monro, senior, was disturbed by such apprehensions, it is not wonderful, that many a poor ordinary member of the profession should have been terrified nearly out of his wits upon the subject; and for quieting this alarm, and exposing its absurdities, I really think Mr. John Bell deserving of particular praise.

In general, in all cases of wounds of the abdomen, it is an excellent rule, never to be officious about abscesses, which may take place, nor to exhibit a partiality to such experiments as have been devised for learning precisely what bowel is wounded. It is quite time enough to interfere, when the urgency of the symptoms confirms any suspicions which may be entertained. A great deal of harm is frequently done by handling and disturbing the wounded parts more than is necessary, and, it is well known, that wounds, at first attended with alarming symptoms, frequently have a favourable termination. Swords, balls, and other weapons, sometimes pass completely through the body, without the patient suffering afterwards any threatening symptom, or, indeed, any effects which, abstractedly considered, would authorize the inference, that the viscera had been at all injured. Severe inflammations may not end in suppuration, and when pus is formed, it is sometimes absorbed again. Nothing then indicates the necessity for the discharge of purulent matter in the abdomen, unless the fluctuation and situation of the abscess be very distinct, and the quantity and pressure of the matter clearly productive of inconveniences. Under these circumstances, the surgeon should make a cautious puncture with a lancet.

Protrusion of the Viscera.—The omentum and small intestines are the parts most liable to protrusion; but, in large wounds, the great intestines, the stomach, and even the liver and spleen, may project through the opening. The *general* symptoms, indicating a protrusion of the parts, are sufficiently obvious; but, it deserves attention, that, in fat subjects, the adipose membrane may project from the wound, and put on somewhat of the appearance of omentum. The *special* symptoms are to be collected from a knowledge of the natural situation of the parts, and reflecting what region of the abdomen is wounded. (*Callisen, Syst. Chir. Hodiernæ, T.* 1. 702 *and* 703, *edit.* 1798).

From penetrating wounds considerable portions of the bowels, or omentum, sometimes protrude, and, though these viscera may not have received injury, yet their being displaced, is sometimes productive of fatal consequences.

The best mode of preventing such mischief, is to return the viscera into the cavity of the abdomen, as speedily as possible. Almost all authors recommend fomenting the displaced parts, previously to the attempt at reduction; but, in giving this advice, they seem to forget, that, while time is lost in this preparatory measure, the protruded bowels suffer much more harm from exposure, that is to say, from the very circumstance of their being out of their natural situation, than they can possibly receive good from any application made to them. No kind of fomentation can be half so beneficial, as the natural warmth and moisture of the cavity of the abdomen. In order to facilitate the return of a protruded piece of intestine, or omentum, the abdominal muscles should be relaxed by placing the patient in a suitable posture, and the large intestines emptied with a glyster. In mentioning the last measure, it is not meant, that the surgeon should delay the attempt to reduce the part, until the glyster has operated. No, this means is only enumerated as one that may become serviceable, in case the surgeon cannot immediately accomplish the object in view.—The mesentery ought always to be reduced before the intestine; the intestine before the omentum; but, the last protruded portion of each of these parts ought to be the first reduced.

It is only when the intestine and omentum are free from gangrene and mortification, that they are invariably to be returned into the cavity of the belly, without hesitation. Also, when the protruded parts are covered with sand, dust, or other extraneous matter, they should be tenderly washed with a little tepid water.

For the reduction of the parts, the fore-fingers are the most convenient, and, it is a rule to keep the portion first returned, from protruding again, by one finger, until it has been followed by another portion, introduced by the other finger. The second piece is to be kept up in the same way, by the finger used to return it; and so on, till the displaced parts have all been put into their natural situation.

In attempting to reduce a piece of protruded intestine, the patient should be placed in the most favourable posture; the head and chest should be elevated, and the pelvis raised with pillows. Nothing can be more absurd, than the advice to put the thorax rather lower than the pelvis, in order that the weight of the viscera may tend to draw inward the protruded parts. This is another erroneous idea, arising from the ridiculous supposition, that a great part of the abdomen is actually an empty cavity. The relaxation of the abdominal muscles is a much more rational and useful object. When this is properly attended to, the above directions are observed, and the wound is not exceedingly small, in relation to the bulk of the protruded viscera, the parts may generally be reduced. But, in addition to what has been already stated, it is necessary to remark, that the pressure should be made in a straight direction into the abdomen; for, when made obliquely, towards the edges of the wound, the parts are liable to suffer contusion, without being reduced, and even to glide between the layers of the abdominal muscles, and become strangulated. When the wound is in the front of the abdomen, pressure made in this unskilful way, may force the viscera into the sheath of the rectus muscle, and cause the same perilous symptoms as arise from an incarcerated hernia. (See *Hernia.*)

When the reduction seems complete, the surgeon should assure himself of it, by introducing his finger into the cavity of the abdomen, so as to feel that the parts are all actually reduced, and suffer no constriction between the edges of the wound and the viscera in the abdomen.

A difficulty of reduction may arise from the protruded intestines being distended with feces or air. In this circumstance, the contents of the gut may frequently be made to pass, by degrees, into that portion of the intestinal canal, which is within the abdomen. In order to accomplish this purpose, the surgeon must press the contents of the bowel towards the wound, and if he succeeds in emptying the part, he will commonly experience equal success in his next attempt to replace it in the abdomen.

Sometimes, in cases of narrow stabs, considerable pieces of intestine protrude, and cannot be reduced without doing imprudent violence to the bowel. Under these circumstances, the dilatation of the wound is indispensable. However, when the reduction seems almost a matter of impossibility, on account of the smallness of the wound, if the surgeon be careful to relax the abdominal muscles, draw a little more intestine out of the wound, and gently press the contents of the bowel through the constriction in the abdomen, he will frequently succeed in reducing the parts, without using the knife.

When such operation is unavoidable, the dilatation should be made in a direction, which will not endanger the epigastric artery, and if possible, in the same line as the muscular fibres.

We are also advised to make the incision upward, rather than downward, when it can be done with equal convenience, because it is supposed the first direction will be followed by less danger of hernia. (*Sabatier, Médecine, Opératoire, T.* 1, *p.* 220, *Ed.* 2. *Callisen, Syst. Chir. Hod. T.* 1, *p.* 705.) If, however, the upper angle of the wound correspond to the direction of the suspensory ligament of the liver, writers advise making the dilatation at the lower angle, in order to incur no risk of hemorrhage from the umbilical vein. In the adult, this vessel is generally obliterated, and turned into a ligamentous substance; though it would appear that, in a few instances, it remains pervious to the navel. Hildanus saw a young man die instantly in consequence of a stab in the belly between the false ribs and the umbilicus, and on opening the body, he found blood effused from a wound of the umbilical vein. It has been feared, also, that cutting the suspensory ligament of the liver, might give rise to such a displacement of that viscus, as would interrupt the freedom of respiration, or obstruct the circulation of the blood in the vena cava. But the apprehension is unfounded; for Riolan found this ligament ruptured and retracted towards the liver in a nimble Æthiopian female dancer, whose respiration had not suffered any particular disturbance during her lifetime. (*Sabatier, Méd. Opératoire, T.* 1. *p.* 220, 221, *Ed.* 2.)

The incision should never be larger than absolutely requisite, as hernia is much disposed to occur, wherever the peritoneum has been divided. The operation may be done with a curved bistoury and a director, much in the same way as is done in the cases of strangulated ruptures. (See *Hernia.*)

After the battle of Waterloo, many cases presented themselves, in which the bowels and omentum protruded, and in several of these examples, the reduction could not be effected before the wounds had been enlarged. So tightly also were the parts girt, that the operation was sometimes far from being easy.

Instead of enlarging wounds of the abdomen, it has been proposed to let out the air from the protruded intestines, by making small punctures with a needle, so as to lessen their volume sufficiently to make them reducible. The suggestion first originated with Paré, who declares, that he has practised the method with success. Rousset, his contemporary, also informs us, that the plan was adopted by another surgeon, in an instance where the epigastric region was wounded, and a large portion of the intestines protruded in a strangulated state. Peter Lowe, an English surgeon, likewise assures us, that he frequently adopted the practice, when other means failed. Garengeot, Sharp, and Van Swieten, are all advocates for Paré's proposal; but they recommend the employment of a round needle, which will merely separate the fibres of the intestinal canal, without cutting them, as a flat, triangular, sharp-edged needle would unavoidably do. These last writers, however, only sanction the practice, when the quantity of protruded intestine is great, and the bowel is so enormously distended with air, that it would be impossible to reduce the part, though the wound were enlarged, and every thing else put in practice, likely to bring about the reduction. But, as Sabatier remarks, the punctures must be entirely useless, if made with a fine needle, since they will be immediately stopped up with mucous secretion; with which the bowel is constantly covered; and if the punctures are made with a broad triangular needle, or a very large round one, as Desault and Chopart advise, they must be highly dangerous, inasmuch as they are likely to give rise to inflammation, and even to extravasation within the abdomen. (*Médecine Opératoire, T.* 1. *p.* 10.)

That small punctures in the bowel would not answer the purpose, but be obstructed by the villous, or mucous coat, is a fact which has been for a long time well known to surgeons. Callisen, amongst others, has particularly noticed it: "acupuncturæ enim flatibus exitum parare nequeunt, siquidem tunica villosa foraminula obstruit," &c. (*Syst. Chir. Hod. T.* 2, *p.* 704.)

It was the circumstance of small punctures being unavailing, that led Desault and Chopart to recommend the use of a large round needle, "*pour que l'ouverture ne soit point bouchée par les mucosités dont les intestines sont enduits.*" But they were also aware of the danger of employing such an instrument, since they give us directions how to proceed, in order to prevent extravasation and inflammation: "*On préviendra l'epanchement des matières stercorales en passant, avant de reduire l'intestin, une anse de fil dans la portion de mesentère qui répond à la piqure pour la fixer contre les bords de la plaie extérieure, et l'on combattra par les remèdes généraux l'inflammation que cet piqure peut attirer.*" (*Traité des Maladies Chirurg. T.* 2, *p.* 135.) Richerand is still an advocate for puncturing the bowel, for which operation he boldly recommends a small hydrocele trocar. *Nosogr. Clin. T.* 3. *p.* 336, *ed.* 4.)

Mr. Travers, one of the latest and best writers upon this subject, most properly joins in the condemnation of the plan of pricking the protruded bowels. "Blancard and others protested against this practice, on the very sufficient ground of its inefficacy. La Faye very truly says, it is a useless as well as dangerous practice; for the opening made by a round needle, cannot give issue to the contained air." Mr. Travers then cites two cases, showing that even small stabs in a bowel, will not prevent its becoming distended with air.

"A man was brought to St. Thomas's hospital, on Saturday, the 30th of June last (1811), who had been stabbed in the direction of the epigastric artery, on the left side of the abdomen, by a case knife. He died in eighteen hours, apparently from the sudden and copious hemorrhage, which had taken place within the belly. About half a yard of ileon was protruded. The gut was highly discoloured, and so much distended, notwithstanding it was pierced in three places, that the wound of the integuments required to be freely dilated, before it could be returned. *The apertures were in fact obliterated by the mucous coat.*"

"It appeared upon the trial of Captain Sutherland (Ann. Reg. June 1809) for the murder of his cabin boy, that the intestines had been extensively protruded through a wound near the left groin, and had lain exposed for four or five hours—that the dirk had pierced through one fold of intestine, and entered another—that the wound of intestine was *half an inch* long, that the reduction could not be accomplished until the parietal wound was dilated; and that the intestine was then returned, and the integuments sewed up." (*Travers on Injuries of the Intestines*, p. 174, 176.)

With respect to this last case, however, I must observe, that it does not satisfactorily prove what the author intends, namely, *that the bowel was distended with air, though there was a wound in it half an inch long*, for the evidence does not inform us, that the difficulty of reduction was owing to this cause. I have seen a very small portion of omentum protrude through a wound, and baffle all endeavours to reduce it for nearly an hour. The first case adduced by Mr. Travers, however, is more explicit and interesting; and we are to infer from it, and the observations of Haller, Callisen, &c. that the punctures made in an intestine, are not closed by mucus, as Sabatier and Desault have asserted, but by the mucous coat itself.

As the above expedient has been recommended by writers of some weight, I thought that the subject should not be passed over in silence, and without a caution to the reader, never to put any confidence in the method. The plan does not facilitate the business of the operator; there is not even this solitary reason in favour of the practice; and though it may have answered when large needles were used, and some patients so treated, may have recovered, every person who has the least knowledge of the animal economy, will easily comprehend, how even the smallest opening, made in parts so irritable and prone to inflammation as the bowels, must be attended with greater danger, than would result from enlarging a wound of the skin and muscles. Besides the air may frequently be pressed out of the intestine in a safer way, as I have already described.

A wound of the abdomen, attended with one of the most considerable protrusions of the viscera, that I have ever read of, is recorded by Mr. Hague, surgeon at Ripon: "August 30th 1808 (says this gentleman), I went to Norton Mills, about four miles from hence, to see John Brown, æt. 12 years, who had received a wound in the abdomen from a pair of wool shears. On my arrival, which was little more than an hour after the accident, I found the poor lad in a very distressing situation; the *great arch of* the stomach, and the *whole of the intestinal canal*, (dudenum excepted) contained within the abdomen, having protruded through the wound. The incision was on the left side of the body, commencing at about two inches below the scrobiculus cordis, and extending in a straight line near four inches in length, distant from the navel two inches, and he was quite sensible, and had vomited so as to empty the stomach; very little blood was lost. I immediately proceeded very carefully to examine the protruded viscera, none of which were wounded, and reduced them as quickly as possible, beginning with the stomach, and following the regular course of the intestines, in the latter portion of which, I distinctly felt feces, of rather firm consistence. He complained of some pain during the reduction, though not much, and expressed great relief when the parts were completely returned. I now desired an assistant to lay the palm of his hand over the wound, and make some pressure upon it: for, I found, that without this, the parts would soon have protruded again by the action of respiration, which was oppressed and laborious. I brought the sides of the wound together by five sutures, beginning from above downwards, and passed the needle on each side, quite through the integuments with the peritoneum, &c. The wound was also dressed with adhesive plaster, and covered with a bandage." (Vide *Edinburgh Medical and Surgical Journal*, *Vol.* 5, *p.* 129, *&c.*)

This case is interesting; for notwithstanding so unlimited a protrusion of the viscera, and the circumstance of the parts being left unreduced for more than an hour, a recovery ensued, under the judicious employment of bleeding, purging, anodynes, &c.

In la Caserne de St. Elizabeth, at Brussels, after the battle of Waterloo, the number of protrusions of the viscera, which fell under my notice, was much more considerable than what I previously had any idea of ever meeting with. I well remember, in my own part of the hospital, two protrusions of a large portion of the stomach; three of the bladder; and ten or twelve of the mesentery, omentum, or intestines.

Whether a suture should be used, when the protruded intestine is wounded, is a subject, which will be noticed in considering wounds of the intestines.

Some of the exposed intestine may have mortified, before the arrival of surgical assistance. In cases of wounds, this event is rare; but, in those of strangulated herniæ, it is not uncommon. The treatment is explained in the article *Hernia.*

When the protruded intestine is in a state of inflammation, its immediate reduction is, beyond all dispute, the means most likely to set every thing right. Even when the inflammation is considerable, a timely reduction of the displaced part, and the employment of antiphlogistic means, will often prevent gangrenous mischief. The dull, brown, dark red colour of the intestine may induce the practitioner to suppose, either that the part is already mortified, or must inevitably become so, and consequently, he may delay returning it into its natural situation. But, notwithstanding this suspicious colour of the intestine, its firmness will evince, that it is not in a state of gangrene. The ultimate recovery of a portion of intestine, so circumstanced, is always a matter of uncertainty; but, the propriety of speedily replacing the part in its natural situation, is a thing most certain. "Partes egressæ sanæ (observes Callisen) citissime sunt reponendæ, neque obstat mutatio coloris nativi in rubrum subfuscum." (*Syst. Chir. Hod. T.* 1, *p.* 703, *edit.* 1798.) In case the bowel mortify after its reduction, all hopes of the preservation of life are not to be abandoned; as I have noticed in the articles *Anus artificial*, and *Hernia*, in which last part of the book, many things, necessary to be known, concerning the mode of reducing protruded omentum, will also be found.

When a piece of intestine cannot be reduced, granulations and new skin sometimes grow over it, and a cure follows, as the experience of Callisen confirms. (*Op. cit. p.* 706.)

The protruded viscera having been reduced, the next object is to retain them in the abdomen, until the wound is completely healed. When the wound is small, this is a matter of no difficulty; for it is enough to put the patient in a position which will relax the fibres of the wounded muscles, while the edges of the wound are maintained in contact with sticking-plaster, and supported by a compress and bandage. Costiveness is be removed by the mildest purgatives, such as the oleum ricini, or by laxative clysters, which are still preferable. But, in cases of extensive wounds, even when the treatment is conducted with all possible judgment, it is occasionally difficult, and even impossible, to hinder the protrusion of the bowels by common dressings, and a bandage. In this circumstance, the edges of the wound must be sewed together. (See *Gastroraphe.*) In modern times, however, sutures are much more seldom employed than formerly, and, in the above article, some remarks are offered, proving that the generality of wounds of the abdomen do not require the practice.

When the omentum protrudes, and is strangulated by the narrowness of the opening, it soon contracts adhesions to it, unless speedily reduced. Should such connexion be already formed, when the surgeon is first consulted, we are advised to cut off the portion, which exceeds the level of the integuments, and to leave the rest in the wound. The latter will block up the opening, and have the good effect of preventing hernia. (*Richerand, Nosogr. Chir. T.* 3, *p.* 339, *edit.* 4.) When the protruded omentum is sound and free from adhesions, it ought to be reduced without delay. But, when the protrusion is large, and there is reason to fear, from the vomiting and the pains shooting from the wound to the epigastric region, that the stomach is dragged, the diplaced part must be made free, and, if sound, reduced. Should it be in a mortified state, the dead part must be previously cut away, and any vessels, which bleed, tied separately with a piece of fine thread, or silk, both ends of which may either be cut off close to the knot, and the part then reduced; or one end of the silk may be left out of the wound, and the other cut away. Practitioners, who apprehend ill effects from leaving within the abdomen so small a particle of extraneous matter, as the little knot of fine thread, will prefer the last method, and withdraw the ligature altogether, as soon as it becomes loose.

Extravasation in the abdomen.—Wounds of the abdomen may be complicated with extravasations of blood, chyle, excrement, bile, or urine. None of these complications, however, are half so frequent as an inexperienced practitioner would apprehend. The employment of the phrase *cavity of the abdomen* has paved the way to much erroneous supposition upon this subject, and has induced many absurd notions, which even the sensible observations, long ago published by J. L. Petit, have scarcely yet dispelled.

As a modern writer has observed: "There is not truly any cavity in the human body, but, all the hollow bowels are filled with their contents, all the cavities filed with their hollow bowels, and the whole is equally and fairly pressed. Thus, in the abdomen, all the viscera are moved by the diaphragm and the abdominal muscles upwards and downwards, with an equable continual pressure, which has no interval; and one would be apt to add, the intestines have no repose, being kept thus in continual motion; but, though the action of the diaphragm, and the reaction of the abdominal muscles are alternate, the pressure is continual; the motion, which it produces, (they produce) is like that which the bowels have, when we move forwards in walking, having a motion, with respect to space, but none with regard to each other, or to the part of the belly, which covers them; the whole mass of the bowels is alternately pressed, to use a coarse illustration, as if betwixt two broad boards, which keep each turn of intestine in its right place, while the whole mass is regularly moved. When the bowels are forced down by the diaphragm, the abdominal muscles recede: when the bowels are pushed back again, it is the reaction of the abdominal muscles, that forces them back and follows them; there is never an instant of interruption of this pressure, never a moment, in which the bowels do not press against the peritoneum; nor is there the smallest reason to doubt, that the same points in each are continually opposed. We see, that the intestines do not move, or, at least, do not need to move in performing their functions; for, in hernia, where large turns of intestines are cut off by gangrene, the remaining part of the same intestines is closely fixed to the groin, and yet the bowels are easy, and their functions regular. We find the bowels regular, when they lie out of the belly, in hernia, as when a certain turn of intestine lies in the scrotum, or thigh, or, in a hernia of the navel; and where yet they are so absolutely fixed, that the piece of intestine is marked by the straitness of the rings. We find a person, after a wound of the intestine, having free stools for many days; and what is it that prevents the feces from escaping, but merely this regular and universal pressure? We find a person, on the fourth or fifth day, with feces coming from the wound! a proof, surely, that the wound of the intestine is still opposite, or nearly opposite, to the external wound. We find the same patient recovering without one bad sign! What better proof than this could we desire, that none of the feces have exuded into the abdomen?

"If, in a wound of the stomach, the food could get easily out by that wound, the stomach would unload itself that way, there would be no vomiting, the patient must die; but, so regular and continual is this pressure, that the instant a man is wounded in the stomach, he vomits, he continues vomiting for many days, while not one particle escapes into the cavity of the abdomen. The outward wound is commonly opposite to that of the stomach, and, by that passage, some part of the food comes out; but when any accident removes the inward wound of the stomach from the outward wound, the abdominal muscles press upon the stomach, and follow it so closely, that if there be not a mere laceration extremely wide, this pressure closes the hole, keeps the food in, enables the patient to vomit, and not a particle, even of jellies, or soups, is ever lost, or goes out into the cavity of the belly.

"How (proceeds Mr. J. Bell) without this universal and continual pressure, could the viscera be supported? Could its ligaments, as we call them, support the weight of the liver? Or, what could support the weight of the stomach when filled? Could the mesentery, or omentum, support the intestines; or could its own ligaments, as we still name them, support the womb? How, without this uniform pressure, could these viscera fail to give way and burst? How could the circulation of the abdomen, go on? How could the liver and spleen, so turgid as they are with blood, fail to burst? Or what possibly could support the loose veins and arteries of the abdomen, since many of them, e. g. the splenic vein, is (are) two feet in length, is (are) of the diameter of the thumb, and has (have) no other, than the common pellucid and delicate coats of the veins? How could the viscera of the abdomen bear shocks and falls, if not supported by the universal pressure of surrounding parts? In short, the accident of hernia being forced out by any blow upon the belly, or by any sudden strain, explains to us how perfectly full the abdomen is, and how ill it is able to bear any pressure, even from its own muscles, without some point yielding, and some one of its bowels being thrown out. And the sickness and faintness, which immediately follow the drawing off of the waters of a dropsy, explain to us, what are the consequences of such pressure being even for a moment relaxed. But, perhaps, one of the strongest proofs is this, that the principle must be acknowledged, in order to explain what happens daily in wounds; for, though in theory we should be inclined to make this distinction, that the hernia, or abscess of the intestines, will adhere and be safe, but, that wounded intestines, not having time to adhere, will become flaccid, as we see them do in dissections, and so, falling away from the external wound, will pour out their feces into the abdomen, and prove fatal; though we should settle this, as a fair and good distinction in the theory, we find, that it will never answer in practice. Soldiers recover daily from the most desperate wounds; and the most likely reasons, that we can assign for it, are the fulness of the abdomen, the universal, equable, and gentle pressure; and the active disposition of the peritoneum, ready to inflame with the slightest touch. The wounded intestine is, by the universal pressure, kept close to the external wound, and the peritoneum and the intestine are equally inclined to adhere. In a few hours that adhesion is begun, which is to save the patient's life, and the lips of the wounded intestine are glued to the lips of the external wound. Thus, is the side of the intestine united to the inner surface of the abdomen; and, though the gut casts out its feces, while the wound is open; though it often casts them out more freely, while the first inflammation lasts; yet, the feces resume their regular course, whenever the wound is disposed to close." (*John Bell's Discourses on Wounds*, *p.* 323, 327. *Edit.* 3.)

The foregoing extract, though drawn up in a careless style, contains such observations as are well calculated to make the reader understand, that the abdomen is in reality not a cavity, but a compact mass of containing and contained parts; that the close matter, in which the various surfaces are constantly in contact, most powerfully oppose extravasations; and that, in fact, it often entirely prevents them. The passage cited impresses us with the utility of that quick propensity to the adhesive inflammation, which prevails throughout every peritoneal surface, and which not only often has the effect of permanently hindering effusion of the contents of the viscera, by agglutinating the parts together, but which, even when an extravasation has happened, beneficially confines the effused blood in one mass, and surrounds it with such adhesions of the parts to each other, as are rapid in their formation, and effectual for the purposes of limiting the extent of the effusion, and preventing the irritation of the extravasated matter from affecting the rest of the abdomen.

It is to Petit that surgeons are indebted for more correct modes of thinking upon the foregoing subject, and it is with great pleasure, that I here refer to his valuable observations. (See *Mem. de l'Acad. de Chir.*)

But, notwithstanding the reciprocal pressure of the containing and contained parts against each other, and the useful effect of the quickly arising adhesive inflammation; in all penetrating wounds of the belly, complicated with injuries of the viscera, we are not to suppose, that extravasation never happens; but only that it is much less frequent, than has been commonly supposed. Mr. Travers, with much laudable industry, has endeavoured to trace more minutely, than any preceding writer, the particular circumstances, under which effusions in the abdomen are likely or unlikely to happen. "It being admitted (says he) that there are cases, in which effusion does take place, it is easy to conceive circumstances, which must considerably influence this event. If, for example, the stomach and bowels be in a state of emptiness, the nausea, which follows the injury, will maintain that state. If the extent of the wound be considerable, the matter will more readily pass through the wound, than along the canal. A wound of the same dimensions in the small and large intestines, will more readily evacuate the former, than the latter, because it bears a larger proportion to the calibre. Incised and punctured wounds admit of the adhesion of the cut edges, or the eversion of the internal coat of the gut, so as to be in many instances actually obliterated; whereas, lacerated, or ulcerated openings, do not admit of these salutary processes. Again, in a transverse section of the bowel, contraction of the circular fibre closes the wound, whereas in a longitudinal section, the contraction of this fibre enlarges it. Such (says Mr. Travers) are the circumstances, which combined, in a greater or less degree, increase or diminish the tendency to effusion." (*On Injuries of Intestines, &c. p.* 13—14.)

After the details of some experiments and cases, the preceding author makes, among other conclusions, the following:

1. That effusion is not an ordinary consequence of penetrating wounds.

2. That if the gut be full and the wound extensive, the surrounding pressure is overcome, by the natural action of the bowel tending to the expulsion of its contents.

3. That if food has not recently been taken, and the wound amounts to a division of the gut, or nearly so, the eversion and contraction of the orifice of the tube prevent effusion.

4. That if the canal be empty at the time of the wound, no subsequent state of the bowel will cause effusion, because the supervening inflammation agglutinates the surrounding surfaces, and forms a circumscribed sac; nor can effusion take place from a bowel at the moment full, provided it retain a certain portion of its cylinder entire, the wound not amounting nearly to a semidivision of the tube, for then the eversion and contraction are too partial to prevent an extravasation.

5. That when, however, air has escaped from the bowel, or blood has been extravasated in quantity within the abdomen at the time of the injury, the resistance, made to effusion, will be less effectual, although the parietal pressure is the same, as such fluids will yield more readily, than the solids naturally in contact. (*P.* 25—26, 100.)

6. That though extravasation is not common in penetrating wounds, it follows more generally in cases, where the bowel is ruptured by blows, or falls upon the belly, while the integuments continue unwounded. (*P.* 36.)

7. That when the bowels are perforated by ulceration, there is more tendency to effusion, than in cases of wounds. (*P.* 38, &c.)

Mr. Travers attempts to explain the reason of the greater tendency to effusion, in cases of intestine burst by violence, than in those of ulceration, "by the difference in the nature of the injury, which the bowel sustains, when perforated by a sword or bullet, as in one case, or burst or ulcerated in the other. A rupture by concussion could only take place under a distended state of the bowel, a condition most favourable to effusion, and from the texture of the part, a rupture, so produced, would seldom be of limited extent. The process of ulceration, by which an aperture is formed, commences in the *internal* coat of the bowel, which has always incurred a more extensive lesion, than the peritoneal covering. The puncture, or cut, is merely a solution of continuity in a point, or line; the ulcerated wound is an actual loss of substance. The consequence of this difference is, that while the former, if small, is glued up by the effusion from the cut vessels, or, if large, is nearly obliterated, by the full eversion of the villous coat, the latter is a permanent orifice." (*P.* 46.)

How much Mr. Travers and Mr. John Bell differ in opinion, upon these latter points, will appear from the following passage: after adverting to the adhesion, which takes place between the viscera and the peritoneum, under a variety of circumstances attending disease, Mr. John Bell observes: "This it is, which makes the chief difference, in point of danger, betwixt an ulcerated and a wounded intestine; for, in a wound, there is, as we should suppose, no time for adhesion, nothing to keep the parts in contact, no cause by which the adhesion might be produced. But in an ulcer, there is a slow disease, tedious inflammation, adhesion first, and abscess and bursting afterwards; sometimes a fistula remains discharging feces, and sometimes there is a perfect cure. If a nutshell, a large coin, a bone, or any dangerous thing be swallowed, it stops in the stomach, causing swelling and dreadful pain; at last, a hard firm tumor appears, and then it suppurates, bursts, the bowel opens, the food is discharged at every meal, till the fistula gradually lessens, and heals at last. But, where the stomach is cut with a broad wound of a sabre, the blood from the wounded epiploic vessels, or the food itself, too often pours out into the abdomen, and the patient dies, &c." (*Discourses on Wounds, p.* 321, *edit.* 3.) The author afterwards proceeds to explain, how, in cases of penetrating wounds, the compact state of the containing and contained parts, and the incessant and equable pressure, which the viscera sustain, frequently hinder effusion.

Which of these gentlemen is most correct, I cannot presume to determine, and whether Mr. Travers's cases are deviations from what is most common, can only be decided by a comparative examination of a greater number of facts. When the intestines ulcerate, and thus rid themselves of foreign bodies, the general tenor of the cases on record undoubtedly affords us little reason to be apprehensive of extravasation. Yet, with respect to ulceration of the intestines from other causes, circumstances may be very different. And it is but justice to state, that Mr. Travers's opinions have received some confirmation from an interesting case, published by Dr. J. Crampton, of Dublin. It is an instance of rupture of the stomach, and fatal effusion of its contents into the cavity of the abdomen. The patient was a young lady, aged

29. She was suddenly taken ill with spasm in her stomach, and other severe symptoms, and died in about twelve hours. "On opening the abdomen, the stomach was observed to be pale, flaccid, and empty. Its contents, amongst which were recognized, oatmeal and castor oil, had escaped into the cavity of the abdomen, through a round aperture situated on its anterior surface, at the union of the cardiac and pyloric portions. This perforation of the stomach was perfectly circular, about the size of a pea, and appeared to be the result of an ulcer on the mucous surface, which had gradually penetrated the other coats. This ulcer was hollow and circular, nearly the size of a shilling, and had the appearance, as if it had been made with caustic, with the orifice in its centre." (*J. Crampton, Med. Chir. Trans. Vol.* 8, *p.* 230.) To the preceding, Mr. Travers has annexed some additional facts: one is an example of a rapidly fatal effusion of the intestinal contents, through an ulcerated opening about a finger's breadth below the pylorus. The foramen had a peritoneal margin, and proved to be the centre of an irregular superficial ulcer of the mucous coat. Another case is that of a similar ulceration of the small intestines, and fatal extravasation of their contents. In another example, a circular aperture of the peritoneum, large enough to admit a crow's quill, was found after death at the junction of the duodenum and stomach. It also was the centre of an ulcer, that had destroyed the villous and muscular coats of the bowel to the extent of half an inch. For many other ingenious observations, I must refer the reader to Mr. Travers's paper, who concludes with remarking, that the chief diagnostic symptoms of these hopeless cases appear to be:

1. Sudden, most acute, and unremitting pain, radiating from the scrobiculus cordis, or the navel, to the circumference of the trunk, and even to the limbs. A peculiar pain, the intensity of which, like that of parturition, absorbs the whole mind of the patient, who, within an hour from the enjoyment of perfect health, expresses his serious and decided conviction, that if the pain be not speedily alleviated, he must die.

2. Coeval with the attack of pain, remarkable rigidity and hardness of the belly, from a fixed and spastic contraction of the abdominal muscles.

3. A natural pulse for some hours, until the symptoms are merged in those of acute peritonitis, and its fatal termination in the adhesive stage. (*Med. Chir. Trans. Vol.* 8, *p.* 231, *et seq.*)

Blood is more frequently extravasated in the abdomen, than any other fluid, but it does not always take place, unless the wounded vessels be above a certain magnitude. The compact state of the abdominal viscera, in regard to each other, and their action on each other, oppose this effect. The action alluded to, which depends on the abdominal muscles and diaphragm, is rendered very manifest by what happens, in consequence of operations for herniæ, attended with alteration of the intestines, or omentum. If these viscera burst, or suppurate, after being reduced, the matter which escapes from them, or the pus, which they secrete, is not lost in the abdomen; but is propelled towards the wound in the skin, and there makes its exit. The intestinal matter, effused from a mortified bowel, has been known to remain lodged the whole interval, between one time of dressing the wound and another, in consequence of the surgeon stopping up the external wound with a large tent. When the above-mentioned action or pressure of the muscles, is not sufficient to keep the blood from making its escape from the vessels, still it may hinder it from becoming diffused among the convolutions of the viscera, and thus the extravasation is confined in one mass. The blood, effused and accumulated in this way, is commonly lodged at the inferior and anterior part of the abdomen, above the lateral part of the pubes, and by the side of one of the recti muscles. The weight of the blood may propel it into this situation, or perhaps, there may be less resistance in this direction, than in others. In opening the bodies of persons, who have died with such extravasations, things may put on a different aspect, and the blood seem to be promiscuously extravasated over every part of the abdomen. But when such bodies are examined with care, it will be found, that the blood does not insinuate itself among the viscera, till the moment when the abdomen is opened, and the mass previously lies in a kind of pouch. This pouch is frequently circumscribed, and bounded by thick membranes, especially when the extravasation has been of some standing. (*Sabatier Médecine Opératoire, T.* 1, *p.* 28—30.)

Every practical surgeon should remember well, that all the abdominal viscera closely touch either each other, or the inner surface of the peritoneum. This is one grand reason, why extravasations are seldom extensively diffused; but, commonly lie in one mass, as Petit, Sabatier, and all the best moderns have noticed. The pressure of the elastic bowels, diaphragm, and abdominal muscles, not only frequently presents an obstacle to the diffusion of extravasated matter, but often serves to propel it towards the mouth of the wound. The records of surgery furnish numerous instances, in which persons have been stabbed through the body, without fatal consequences, and sometimes without the symptoms being even severe. In Mr. Travers's publication many cases, exemplyfying this observation, are quoted from a variety of sources: Fab. Hildan. Obs. Chirurg. Cent. 5. Obs 74. Œuvres de Paré, liv. 10. Chap. 35. Wiseman's Surgery, p. 371. La Motte's Traité Complet de Chirurgie; &c. &c. In such cases, the bowels have been supposed to have eluded the point of the weapon, and, perhaps in a few instances, this may actually have been the fact; but, in the generality of such examples, the bowels must have been punctured, and the extravasation of intestinal matter prevented by the pressure of the viscera against each other.

The pouch, or cyst, in which the extravasated blood, or matter lies, as mentioned by Sabatier, is formed by the same process, which circumscribes the matter of abscesses. (See *Suppuration.*) It is, in short, the adhesive inflammation. All the surfaces in contact with each other, and surrounding the extravasation, and track of the wound, generally soon become so intimately connected together by the adhesive inflammation, that the place in which the extravasation is lodged, is a cavity entirely destitute of all communication with the cavity of the peritoneum. The track of the wound leads to the seat of the effused fluid, but has no distinct opening into the general cavity of the abdomen. The rapidity, with which the above adhesions frequently form, is almost incredible.

It should be known, however, that extravasations are occasionally diffused in various degrees among the viscera, owing to the patient being subjected to a great deal of motion, or affected with violent spasmodic contractions of the intestines. Urine and bile are also generally dispersed to a great extent. As for blood, its disposition to coagulate must often tend both to stop further hemorrhage, and confine the extravasation in one mass.

Symptoms and Treatment of Extravasations in the Abdomen. 1. *Blood.*—Wounds of the spleen, and of very large veins and arteries, in the abdomen, almost always soon prove fatal from internal hemorrhage. The blood generally makes its way downwards, and accumulates at the inferior part of the abdomen, unless the presence of adhesions happen to oppose the descent of the fluid to the most depending situation. The belly swells, and a fluctuation is perceptible. The patient grows pale, loses his strength, is affected with syncope, and his pulse becomes weak and scarcely distinguishable. In short, the symptoms, usually attendant on profuse hemorrhage, are observable. As the viscera and vessels in the abdomen are compressed on all sides, by the surrounding parts, the blood cannot be effused, without overcoming a certain degree of resistance; and unless a vessel of the first magnitude, like the aorta, the vena cava, or one of their principal branches, has been wounded, the blood escapes from the vessel slowly, and several days elapse, before any considerable quantity accumulates.

In these cases, the symptoms which, perhaps, had disappeared, under the employment of bleeding and anodyne medicines, now recur. A soft fluctuating tumor may be felt at the lower part of the abdomen; sometimes on the right side; sometimes on the left; but, occasionally on both sides. The pressure made by the effused blood on the urinary bladder, excites distressing inclinations to make water; while the pressure, which the sigmoid flexure of the colon suffers, is the cause of obstinate constipation. In the mean time, as the quantity of extravasated blood increases, the peritoneum inflames. The pulse grows weaker; debility ensues; the countenance becomes moistened with cold perspirations; and, according to some writers, unless the surgeon practise an incision for the discharge of the fluid, the patient falls a victim to the accident.

In the year 1733, Vacher adopted this treatment with success. Petit afterwards tried the same plan, though it did not answer, (as is alleged,) in consequence of the inflammation having advanced too far, before the operation was performed. Long before the time of Vacher and Petit, a successful instance of similar practice was recorded by Cabrole, in a work which this author published under the title of Αλφαβητον ανατομικον, id est, Anatomes elenchus accuratissimus, omnes humani corporis partes eâ quâ solent secari methodo, delineans. Accessêre osteologia, observationesque Medicis ac Chirurgicis perutiles. Genevæ 1604. The method, pursued by Vacher, was therefore not so new as Petit imagined.

Indeed, when the symptoms leave no doubt of there being a large quantity of blood extravasated in the abdomen; when the patient's complaints are of a very serious nature, and are evidently owing to the irritation and pressure of the blood on the surrounding viscera; and when a local swelling denotes the seat of the extravasation, there cannot be two opinions about the propriety of making an incision for its evacuation.

Surgeons should recollect, however, that if no opening be made, a small extravasation of blood may not produce any considerable irritation. On the contrary, when the cyst including the blood, is opened, the air then has access, and that part of the fluid which cannot be discharged, putrifies and becomes so irritating, as to be a true cause of inflammation. The bad symptoms are also sometimes chiefly owing to the injury done to parts within the abdomen, and still more commonly to inflammation within that cavity, arising rather from the wound, than from the presence of effused blood. On the whole, I am disposed to join a late writer in the belief, that the practice of discharging extravasated blood from the abdomen can rarely be advisable.—(See *Hennen's Mil. Surgery, p.* 412, *ed.* 2.)

2. *Chyle and Feces.*—These are not so easily extravasated in the abdomen as blood, because they do not require so much resistance on the outside of the stomach and intestines, to make them continue their natural route through the alimentary canal, as blood requires to keep it in the vessels. However, when the wound is large, and the bowel distended at the moment of the injury, or when, as Mr. Travers has explained, air is extravasated, or blood effused in the abdomen, which fluids are incapable of making effectual resistance to the escape of the intestinal matter, the latter may be effused. (See *an Inquiry into the Process of Nature in repairing Injuries of the Intestines, &c. p.* 26.) Nothing is a better proof of the difficulty with which chyle and feces are extravasated, than the operation of an emetic, when the stomach is wounded and full of aliment. In this instance, if the resistance to the extravasation of the contents of the stomach were not considerable, they would be effused in the abdomen, instead of being vomited up. A peculiarity in wounds of the stomach and intestines is, that the opening, which allows their contents to escape, may also allow them to return into the wounded viscus.

Extravasation of intestinal matter in the abdomen is attended with severe febrile symptoms; considerable pain and swelling of the belly; convulsive startings; and hiccough and vomiting, with which the patients are generally attacked the day after the receipt of the wound. (*Sabatier, Méd. Opératoire, T.* 1, *p.* 34.)

In these cases, only general means can be employed; venesection, leeches, fomentations, low diet, perfect rest, anodynes, &c. All solid food must be strictly prohibited. If pressure can be borne without inconvenience, as is sometimes the case in the early stage, the close state of the viscera may be increased by the application of a bandage round the body.

If the symptoms are not speedily assuaged, the inflammation spreads over the whole cavity of the abdomen, gangrenous mischief takes place, and the patients die in the course of a few days.

3. *Bile.*—Bile, on account of its great fluidity, is more apt to be widely extravasated in the abdomen, than either blood, or the contents of the stomach and intestines. However, on account of the small size of the gall bladder, and its deep guarded situation, between the concave surface of the liver, and upper part of the transverse arch of the colon, wounds of it are uncommon.

Sabatier informs us, that he has only been able to find one example on record. This case was communicated to the Royal Society of London, by Dr. Stewart (No. 414, pag. 341. Abridgm. Vol. 7, pag. 571, 572.) A wound penetrated the cavity of the abdomen, and entered the fundus of the gall bladder, without doing any material injury to the adjacent parts. The abdomen was immediately distended, as if the patient had been afflicted with an ascites, or tympanitis; nor did the swelling either increase or diminish, till the patient's death, which happened in a week.

Though there was a great deal of tension, there was no rumbling noise in the abdomen. No stools, and very little urine were discharged, notwithstanding purgatives and clysters, and a good deal of liquid nourishment, were given, Anodynes failed to procure one instant of sound sleep, and the patient was incessantly in a most restless state. There was no appearance of fever, and the pulse was always natural till the last day of the patient's life, when it became intermittent. After death, the intestines were found much distended, the gall bladder quite empty, and a large quantity of bile extravasated.

Sabatier had an opportunity of noticing the symptoms of an extravasation of bile, in consequence of a wound of the gall bladder. The patient's abdomen swelled very quickly; his respiration became difficult, and he soon afterwards complained of tension, and pain in the right hypochondrium. His pulse was small, frequent and contracted; his extremities were cold, and his countenance very pale. The bleedings which were practised the first day, gave him a little relief; but the tension of the abdomen, and the difficulty of breathing still continued. A third bleeding threw the patient into the lowest state of weakness, and he vomited up a greenish matter. On the third day, the lower part of the belly was observed to be more prominent, and there was no doubt of an extravasation. Sabatier introduced a trocar, and gave vent to a green blackish fluid, which had no smell, and was pure bile, that had escaped from the wound of the gall bladder. After the operation, the patient grew weaker and weaker, and died in a few hours. On opening the body, a large quantity of yellow bile was found between the peritoneum and intestines; but it had not insinuated itself among the convolutions of the viscera. A thick gluten connected the bowels together, and they were prodigiously distended. The gall bladder was shrivelled, and almost empty. Towards its fundus, there was a wound, about a line and a half long, corresponding to a similar wound in the peritoneum. The wound which had occurred at the middle and lower part of the right hypochondrium, between the third and fourth false ribs, had glided from behind forward, and from above downward, between the cartilages of the ribs, until it reached the fundus of the gall bladder.

Sabatier takes notice, that the symptoms of the two cases, which have just now been related, were very similar. Both the patients were affected with an exceedingly tense swelling of the belly unattended with pain, or borborygmus, and they were both obstinately constipated. Their pulse was extremely weak the latter days of their indisposition, and they were afflicted with hiccough, nausea, and vomiting.

Sabatier seems to think one thing certain, viz. that wounds of the gall bladder, attended with effusion of bile, are absolutely mortal, and that no operation can be of any avail. (*Médecine Opératiore, T.* 1, *p.* 34—37.)

A contrary inference, however, may be drawn from a case detailed by Paroisse, in which a bullet had lodged in the gall bladder two years. (*Opuscules de Chir. p.* 255.) The recovery published by Mr. Fryer, of Stamford, tends also to prove, that every effusion of bile is not unavoidably fatal. A boy, about thirteen years old, received a violent blow from one of the shafts of a cart, on the region of the liver. The injury was succeeded by pain, frequent vomiting of bilious matter, great sinking, coldness of the extremities, and a weak, small, fluttering pulse. The belly was fomented and purging clysters thrown up. On the third day symptoms of inflammation began, attended with considerable pain about the liver, great tension and soreness of the abdomen, and frequent vomiting. The pulse was quick, small, and weak; the skin hot and dry; the tongue much furred; the urine high-coloured; and there was some difficulty of breathing; and great thirst. Eight ounces of blood were taken away, the fomentations continued, and a few grains of calomel were directed to be given every four hours until the bowels were properly opened. Afterwards, the effervescing mixture, with ten drops of laudanum, was exhibited every four hours.

On the following day, the patient had some motions, and was much better; but as his sickness continued, he was ordered a grain of opium every four hours. About a week afterwards, he complained of a great increase of pain, which was somewhat relieved by a blister. He was now completely jaundiced, and his stools were white, but the tension, pain and sickness were abated.

Two days afterwards, a fluctuation was perceived in the abdomen, which in another week became considerably distended with fluid. The patient now did not complain of much pain; but appeared to be sinking fast: a puncture was made in the swelling, and thirteen pints of what appeared to be pure bile were evacuated. The bowels then soon became regular, and the appetite good. In twelve days the operation was repeated, and fifteen pints of the same bilious fluid were drawn off. Nine days afterwards another puncture was made, and thirteen pints more let out; and six were discharged in another fortnight. From this period the boy went on well, and perfectly recovered under the use of light tonic medicines. (See *Med. Chir. Trans. Vol.* 5. *p.* 330.)

A previous accidental adhesion of the gall bladder to the peritoneum might also prevent the extravasation of bile, and its dangerous effects. (*Callisen, Syst. Chir. Hodiernæ, T.* 1, *p.* 718.)

According to Dr. Hennen, a deep wound of the liver is as fatal as if the heart itself was engaged. The slighter injuries are recoverable. He states, that the usual symptoms of a wound of the liver are yellowness of the skin and urine; derangement of the alimentary canal, and great and distressing itching of the skin. The discharge from the wound is generally yellow and glutinous; though sometimes either serous, or like unmixed bile. (*On Military Surgery, Ed.* 2, *p.* 429.) For some other interesting observations on wounds of the liver, I have great pleasure in referring to the latter work. (See also *Wedekind de Vulnere Hepatis Curato, Jenæ,* 1735; and *Thomson's Report of Obs. made in the Military Hospitals in Belgium,* 8*vo.* 1816.)

4. *Urine.*—Urine being of a very fluid nature, may, like the bile, be extensively diffused in the abdomen, when the bladder is wounded at any part, connected with the peritoneum. If, in this kind of case, the urine be not drawn off with a catheter, so as to prevent its extravasation, the patient soon perishes. Many instances are recorded of the bladder being injured even by gun-shot wounds, which were not mortal.

Wounds of the bladder are attended with a discharge of bloody urine and difficulty of making water. They are always dangerous cases, both on account of the risk of the effusion of so irritating a fluid in the abdomen, and of the chance of extravasation in the cellular membrane. Under proper treatment, however, they often admit of cure. (See *Gunshot Wounds.*) If possible, the effused fluid should be discharged by a depending posture, or suitable punctures, or incisions, and the recurrence of extravasation prevented by the introduction of a catheter, which is to be left in the urethra. The patient must also be allowed little drink. As for the tension and pain of the belly, the common attendants of a wounded bladder, they may be greatly relieved by the use of the warm bath, (*Callisen, T.* 1, *p.* 719,) bleeding, low diet, and other antiphlogistic means not being omitted.

Wounds of the Stomach.—As Dr. Hennen has observed, these cases are extremely dangerous, though not always mortal. "Baron Percy calculates, that, of twenty cases, four or five only have escaped; this, however, is a most favourable average." Two cures of wounds of the stomach are reported by Dr. Thomson. (*Obs. made in the Military Hospitals in Belgium, &c.*) With respect to the chances of recovery, Dr. Hennen justly remarks, that, in the histories of the Bohemian, Prussian, (*D. Beckher de Cultrivoro Prussiaco,* 12*mo. Lugd.* 1638), and English "Cultrivores," in some of whom the knives have been cut out, and, in others, discharged spontaneously through the coats of the stomach and parietes of the abdomen, are very encouraging. In France, a silver fork was lately extracted from a young man's stomach, by Mr. Renaud, of Romans, in the department of the Drôme, who performed gastrotomy for the purpose, with complete success. (See *Quarterly Journ. of Foreign Med. No.* 18, *p.* 301.) Hevin has collected many instances of recovery both from incised and gun-shot wounds of the stomach. (*Mém. de l'Acad. de Chir. T.* 1.) But, according to Dr. Hennen, Ploucquet, in the articles "Ventriculus" and "Pantophagi," has brought together the largest number of cases. Dr. Hennen, also refers to *Lowthorpe's Abridgment of the Phil. Trans. Vol.* 6, *p.* 192. for instances, in which the stomach of a horse was wounded and sewed up, and the same practice extended to the human subject, with success. It appears also from the "Annales de Litterature," &c. T. 2, by Kluyskens, from Schlichting's "Traumatologia," and the "*Bulletin de la Faculté,*" *&c. T.* 5, *p.* 386, that wounds of the human stomach have been stitched with success in various cases of recent date. (See *Hennen's Military Surgery, Ed.* 2, *p.* 438.) As the latter author observes, wounds of the stomach not unfrequently become fistulous and remain open. In a case, recorded by Richerand, the fistula continued open nine years; and in another instance, related by Ettmuller, ten years. (*De Vulnere Ventriculi Programma, Lip.* 1730.) And Wencker has detailed a case, in which the opening continued twenty-seven years. (See *Halleri Dissert. Chir. Vol.* 5, *art.* 19.) For farther information, connected with this subject, the reader may also consult, *Jungen, de Lethalitate Vulnerum Ventriculi, Helmst.* 1751; and *Ludov. Horn, de Ventriculi Ruptura,* 8*vo. Berol.* 1817. Also *Med. Chir. Journ. Vol.* 5, *p.* 72.

Wounds of the Intestines.—The vomiting of blood, or discharge of it by stool; the escape of fetid air, or of intestinal matter, from the mouth of the wound; an empty collapsed state of a portion of bowel, protruded at the opening in the skin, are the common symptoms attending a wound of this kind. When the wound is situated in the protruded portion, it is obvious to the surgeon's eye; but when it affects a part of the intestinal canal within the abdomen, the nature of the case can be known only by a consideration of other symptoms. In addition to such as I have already described, there are some others, which ordinarily accompany wounds of the bowels; as, for instance, oppression about the præcordia, acute or griping pain in the belly, cold sweats, syncope, &c. But, unless the wounded intestine protrude, there is no practical good in knowing whether the bowel is injured or not, since, if it be in the abdomen, the treatment ought not to be materially different from that of a simple penetrating wound of the belly, unattended with a wound of any of the viscera. Large wounds of the small intestines, particularly of the duodenum and jejunum, are attended with acute fever, anxiety, paleness of the countenance, syncope, cold perspirations, a small, intermitting, tremulous pulse, and they frequently prove fatal. Injuries of the small intestines are also more often, than those of the large ones, followed by extravasation. A total division of the upper part of the intestinal canal, towards the pylorus, will deprive the body of the nourishment requisite for its support. If the chyle escape from the wound, the patient will die of a slow marasmus; and if it become extravasated, it will be likely to excite such irritation as will prove fatal. The escape of excrement, or of fetid air from the wound, indicates an injury of one of the large intestines. In these cases, the symptoms are generally milder, and the passage of the intestinal contents outward through the wound more easy, on account of the bowel being less moveable. For the same reason, the wounded intestine more readily contracts an adhesion to the adjacent parts. (*Callisen, Syst. Chirurgiæ Hodiernæ, T.* 1, *p.* 717.)

A wounded intestine is said to present some particular appearances, to which the generality of writers have paid no attention: "If a gut be punctured, the elasticity of the peritoneum, and the contraction of the muscular fibres, open the wound, and the villous, or mucous coat, forms a sort of hernial protrusion, and obliterates the aperture. If an incised wound be made, the edges are drawn asunder, and everted so that the mucous coat is elevated in the form of a fleshy lip. If the section be transverse, the lip is broad and bulbous, and acquires tumefaction and redness from the contraction of the circular fibres behind it, which produces, relatively to the everted portion, the appearance of a cervix. If the incision be according to the length of the cylinder, the lip is narrow, and the contraction of the adjacent longitudinal fibres, resisting that of the circular fibres, gives the orifice an oval form. This eversion and contraction are produced by that series of motions, which constitutes the peristaltic action of the intestines." (*Travers on Injuries of the Intestines, p.* 85.)

According to this gentleman, some of these appearances were described by Haller, in *Element. Physiol. lib.* 24, *sect.* 2; *and Opera Minora, T.* 1, *sect.* 15.

Having witnessed the facility, with which considerable injuries of the intestinal tube were repaired, Mr. Travers was desirous of ascertaining more fully the powers of nature in the process of spontaneous reparation, and of determining, under how great a degree of injury, it would commence, as well as the mode of its accomplishment. For these purposes, he divided the small intestine of several dogs as far as the mesentery. All these animals died, in consequence of the intestinal matter being extravasated, if they had been lately fed, or if they had been fasting in consequence of inflammation, attended with a separation of the ends of the divided bowel, eversion of the mucous coat, and obliteration of the cavity, partly, by this eversion, and partly by a plug of coagulated chyle.

In one particular instance, in which Mr. Travers made a division of the bowel, half through its diameter, a sort of pouch was formed round the injured intestine. "A pouch, resembling somewhat the diverticulum in these animals, was formed opposite to the external wound on the side of the parietes, by the lining peritoneum, on the other side, by the mesentery of the injured intestine, that intestine itself, and an adjacent fold, which had contracted with it a close adhesion. The pouch, thus formed and insulated, included the opposed sections of the gut, and had received its contents, &c. The tube, at the orifices, was narrowed by the half eversion, but offered no impediment to the passage of fluids." (*P.* 96.) Whether, under these circumstances, the functions of the alimentary canal could have been continued, Mr. Travers professes himself incapable of deciding. Among the inferences, which this gentleman has drawn from the experiments, detailed in his publication, the tendency of the two portions of a divided bowel to recede from each other, instead of coalescing to repair the injury, merits notice, inasmuch as it tends to show, that the only means of spontaneous reparation consist in the formation of an adventitious canal, by the encircling bowels and their appendages. The everted mucous coat, which is the part opposed to the surrounding peritoneum, is also indisposed to the adhesive inflammation.

When, however, the wound of the intestine is smaller, the obstacles to reparation are not absolutely insurmountable. Here, retraction is prevented, and the processes of eversion and contraction modified by the limited extent of the injury. If, therefore, the adhesive inflammation unite the contiguous surfaces, effusion will be prevented, and the animal escape immediate destruction. But, union can only take place through the medium of the surrounding parts.

According to Mr. Travers, it is the retraction, immediately following the wound, that is a chief obstacle to the reparation of the injury; for, if the division be performed in such a way, as to prevent retraction, the canal will be restored in so short a time, as but slightly to interrupt the digestive function. In confirmation of this statement, a ligature was tightly applied round the duodenum of a dog, which became ill, but entirely recovered, and was killed. "A ligature, fastened around the intestine, divides the interior coats of the gut, in this effect resembling the operation of a ligature upon an artery. The peritoneal tunic alone maintains its integrity. The inflammation, which the ligature induces on either side of it, is terminated by the deposition of a coat of lymph, which is exterior to the ligature, and quickly becomes organized. When the ligature, thus enclosed, is liberated by the ulcerative process, it falls of necessity into the canal, and passes off with its contents." (*P.* 103—104.)

It appears also from Mr. Travers's experiments and observations, that longitudinal wounds of the bowels are more easily repaired, than such as are transverse. In a dog, a longitudinal wound, of the extent of an inch and a half, was repaired by the adhesive inflammation. Here the process of eversion is very limited; the aperture bears a smaller proportion to the cylinder of the bowel; and the entire longitudinal fibres resist the action of the circular, which are divided, and can only slightly lessen the area of the canal. (*P.* 108.)

We come now to the consideration of the treatment of wounds of the intestines; a subject, in which much difference of opinion has prevailed; principally, however, concerning the circumstances, in which sutures are necessary, and the most advantageous way of applying them.

When the wounded bowel lies within the cavity of the abdomen, no surgeon of the present day would have the rashness to think of attempting to expose the injured intestine, for the purpose of sewing up the breach of continuity in it. In fact, the surgeon seldom knows at first what has happened; and when the nature of the case is afterwards manifested, by the discharge of blood per anum, an extravasation of intestinal matter, &c., it would be impossible to get at the injured part of the bowel, not only because its exact situation is unknown, but more particularly, on account of the adhesions, which are always formed with surprising rapidity. But, even if the surgeon knew, to a certainty, in the first instance, that one of the bowels was wounded, and the precise situation of the injury, no suture could be applied, without considerably enlarging the external wound, drawing the wounded intestine out of the cavity of the abdomen, and handling and disturbing all the adjacent viscera. Nothing would be more likely, than such proceedings, to render the accident, which might originally be curable, unavoidably fatal. I entirely agree upon this point with Mr. John Bell, who says, "When there is a wounded intestine, which we are warned of only by the passing out of the feces, we must not pretend to search for it, nor put in our finger, nor expect to sew it to the wound; but we may trust, that the universal pressure, which prevents great effusion of blood, and collects the blood into one place, that very pressure which always causes the wounded bowel and no other to protrude, will make the two wounds, the outward wound and the inward wound of the intestine, opposite each other, point to point; and if all be kept there quiet, though but for one day, so lively is the tendency to inflame, that the adhesion will be begun, which is to save the patient's life." (*Discourses on Wounds, p.* 361, *Edit.* 3.)

When the extravasation, and other symptoms, a few days after the accident, show the nature of the case, a suture can be of no use whatever, as the adhesive inflammation has already fixed the part in its situation, and the space, in which the extravasation lies, is completely separated from the general cavity of the abdomen, by the surrounding adhesions.

When the bowel does not protrude, and the opening in it is situated closely behind the wound in the peritoneum, a suture is not requisite; for the contents of the gut not passing onward, will be discharged from the outer wound, and not be diffused among the viscera, if care be taken to keep the external wound open. There is no danger of the wounded bowel changing its situation, and becoming distant from the wound in the peritoneum, for the situation, which it now occupies, is its natural one. Nothing but violent motion, or exertions, could cause so unfavourable an occurrence, and these should always be avoided. The adhesions, which take place in the course of a day or two, at length render it impossible for the bowel to shift its situation.

Things, however, are far different when the wounded part of the bowel happens to protrude. Here we have the authority of all writers, in sanction of the employment of a suture. No enlargement of the outer wound is requisite to enable the practitioner to adopt such practice; there is no disturbance of the adjacent parts; there is no doubt concerning the actual existence of the injury; no difficulty in immediately finding out its situation.

But, though authors are so generally agreed about the propriety of using a suture, in the case of a wounded and protruded bowel, they differ exceedingly, both as to the right object of the method, and the most advantageous mode of sewing the injured part of the intestine. Some have little apprehension of extravasation, advise only one stitch to be made, and use the ligature chiefly with the view of confining the injured bowel near the external wound, so that, in the event of an extravasation, the effused matter may find its way outward. Other writers wish to remove the possibility of extravasation, by applying numerous stitches, and attach little importance to the plan of using the ligature principally for the purpose of keeping the intestine near the superficial wound.

When the wound of a bowel is so small, that it is closed by the protrusion of the villous coat, the application of a suture must evidently be altogether needless; and since the ligature would not fail to cause irritation, as an extraneous substance, the employment of it ought unquestionably to be dispensed with.

Supposing, however, the breach in the intestine to be small, yet sufficient to let the feces escape, what method ought to be adopted? The following practice seems rational. As Sir Astley Cooper was operating on a strangulated hernia, at Guy's Hospital, an aperture, giving issue to the intestinal contents, was discovered in a portion of the sound bowel, just when the part was about to be reduced. The operator, including the aperture in his forceps, caused a fine silk ligature to be carried beneath the point of the instrument, firmly tied upon the gut, and the ends cut off close to the intestine. The part was then replaced, and the patient did well. Mr. Travers, who has related this fact, approves of the plan of cutting away the extremities of the ligature, instead of leaving them hanging out of the external wound. It appears, that when the first practice is followed, the remnant always makes its way into the intestine, and is discharged with the stools, without any inconvenience. But, when the long ends are drawn through the outer wound, and left in it, they materially retard the process of healing. (*On Injuries of the Intestines, &c. p.* 112, 113.)

Let us now inquire what ought to be the conduct of a surgeon, should he be called to a patient, whose bowel is divided through its whole cylinder, and protruded out of the external wound.

Various have been the schemes and proposals, for the treatment of this sort of accident; and since experience has furnished few practitioners with an opportunity of seeing such a case in the human subject, a variety of experiments have been made on animals, in order to determine what treatment would be the most successful. Ramdohr, indeed, is stated by Moebius to have had occasion to try on the human subject a plan, of which a vast deal has been said and written. He cut off a large part of a mortified intestine, and joined the two sound ends together, by inserting the upper within the lower one, and fixing them in this position with a suture, the ligature being also employed to keep them at the same time near the external wound. The patient recovered, and the feces continued to pass entirely by the rectum in the natural way. (See *Halleri Disput. Anat. Vol.* 6, *Obs. Med. Miscellan.* 18.)

About a year after the operation, the patient died, when the anatomical preparation of the parts was sent to Ramdohr by Heister. They were preserved in spirit of wine, and exhibited, according to the latter author, an union of the two ends of the bowel together, and *their consolidation with a part of the abdomen.* Now it has been questioned by a late writer, whether the union here spoken of ever really happened. When the upper end of the bowel is introduced into the lower, the external surface of the former is put in contact with the inner one of the latter; a serous membrane is placed in contact with a mucous one. These heterogeneous structures, he alleges, are not disposed to unite. The mucous membrane, when inflamed, more readily secretes a kind of mucus, which would be an invincible obstacle to adhesion. He thinks it therefore more than probable, that, in the case related by Heister, the invagination was maintained by the union of the intestine with the corresponding part of the abdominal parietes. Several experiments on living animals have convinced him, that this happens, and that the mucous membrane will not unite with the external peritoneal coat. This impossibility of producing an immediate union between the mucous and serous membranes may of course be urged as an objection to Ramdohr's practice. (*Richerand, Nosographie Chir. T.* 3, *p.* 344—345, *Edit.* 4.) Another equally strong objection is, that the upper end of the bowel cannot be put into the lower one, unless it be separated from a part of the mesentery. Here the division of the mesenteric arteries may cause a dangerous bleeding. In vain did Boyer tie seven or eight of these vessels: his patient died with an extravasation in the abdomen. (*Richerand, T.* 3, *p.* 343, *Edit.* 4.)

Moebius attempted to repeat Ramdohr's operation upon a dog; but he could not succeed in insinuating the upper part of the divided bowel into the lower one, on account of the contraction of the two ends of the intestinal tube, and the smallness of the canal. Moebius, therefore, was obliged to be content with merely bringing the ends of the bowel together with a suture: the animal soon afterwards died of an extravasation of the feces.

Dr. Smith, of Philadelphia, also tried to repeat Ramdohr's method, but could not succeed. He divided the intestine of a dog transversely, and having inserted a piece of candle into that portion of the bowel, which was supposed to be uppermost, he endeavoured to introduce the superior within the inferior; but the ends became so inverted, that it was found utterly impossible to succeed. The scheme was therefore given up, and only one stitch made, the ligature being then attached to the external wound, in the manner advised by Mr. John Bell. The dog died, and on examination, there was found a considerable quantity of feces and water in the abdominal cavity.

Two more trials were made of Mr. John Bell's plan by Dr. Smith, on the intestines of dogs: in both instances the animals died, the intestines being much inflamed, and feces effused in the abdomen. (See *Dr. Smith's Thesis.*)

Mr. Travers likewise tried the same experiment. "I divided the small intestine of a dog, which had been for some hours fasting, and carried a fine stitch through the everted edges, at the point opposite to their connexion with the mesentery. The gut was then allowed to slip back, and the wound was closed. The animal survived only a few hours. *Examination.* The peritoneum appeared highly inflamed. Adhesions were formed among the neighbouring folds, and lymph was deposited in masses upon the sides of the wounded gut. This presented two large circular orifices. Among the viscera were found a quantity of bilious fluid and some extraneous substances, and a worm was depending from one of the apertures. By the artificial connexion of the edges in a single point of their circumference, and their natural connexion at the mesentery, they could recede only in the intervals, and here they had receded to the utmost." In another experiment, Mr. Travers increased the number of points of contact, by placing three single stitches upon a divided intestine, cutting away the threads, and returning the gut. The animal died on the second day. *Examination.* Similar marks of inflammation presented themselves. The omentum was partially wrapped about the wound; but one of the spaces, between the sutures, was uncovered, and from this the intestinal fluids had escaped. On cautiously raising the adhering omentum, the remaining stitches came into view. Here again the retraction was considerable, and the intervening elliptical aperture proportionably large. On the side, next to the peritoneum, however, the edges were in contact and adhered, so as to unite the sections at an angle.

From such experiments, the conclusion, drawn by Mr. Travers, is, that apposition, at a point, or points, is, as respects effusion, more disadvantageous, than no apposition at all; for, it admits of retraction, and prevents contraction, so that each stitch becomes the extremity of an aperture, the area of which is determined by the distance of the stitches. (*P.* 116, 119.) This gentleman, therefore, maintains, *that the absolute contact of the everted surfaces of a divided intestine, in their entire circumference, is requisite to secure the animal from the danger of abdominal effusion.* (*P.* 121.) The species of suture employed (says Mr. Travers) is of secondary importance, if it secures this contact. (*P.* 134.) And among other observations, I find "wounds amounting to a *direct* division of the canal are irreparable, and therefore invariably fatal." (*P.* 133.)

These inferences do not appear to me satisfactorily established. We are told that, apposition at a point, or points, is, as respects effusion, more disadvantageous, than no apposition at all, and that the absolute contact of the divided surfaces, in their entire circumference, is requisite to secure the animal from the danger of abdominal effusion. The foundation of these unqualified conclusions is five experiments, made on dogs, in four of which experiments, the divided bowel was brought together with one stitch, on Mr. John Bell's plan, while, in another, three stitches were made; and yet, in all these instances, the animals died with the contents of the bowels effused. So far the inferences seem established. Unfortunately, for their stability, however, Mr. Travers immediately afterwards proceeds to relate other experiments, instituted by Sir Astley Cooper, Dr. Thomson, and Dr. Smith, which, though Mr. Travers seems unaware of the fact, tend most completely to overturn the conclusions, which he had been previously making.

"Sir A. Cooper repeated the experiments of Duverger, who had succeeded, in uniting by suture, the divided intestine of a dog, including in it a portion of the trachea of a calf. In place of the uninterrupted suture, three distinct stiches were inserted. On the sixteenth day, the animal was killed, and the union was complete." (*P.* 123.)

Here are two facts, proving that a wounded intestine may be united, though the suture was not such as to maintain the divided surfaces in contact, in the whole of their circumference.

Sir Astley Cooper then made the experiment, without including the foreign substance. The animal recovered, being a third fact tending to prove, that the absolute contact of every point of the ends of the divided bowel is not essential to the cure. (See *A. Cooper on Inguinal and Congenital Hernia, Chap.* 2.)

After dividing the small intestine of a dog, Dr. John Thomson, of Edinburgh, applied five interrupted stitches, at equal intervals, the ends of the ligatures were cut off, and the external wound was closed with a suture. This animal did not die of the operation, and, when he was afterwards killed, it appeared that the threads had made their way into the interior of the intestinal canal. Dr. Thomson repeated this experiment, and did not kill the animal till six weeks afterwards, when the same tendency of ligatures to pass into the bowels, and be thus discharged, was exemplified.

These two last cases make five in proof that the absolute contact of every part of the ends of a divided bowel is not essential to prevent effusion, or the consequences of the wound from proving fatal; and several other experiments were made by Dr. Smith of Philadelphia, who employed four stiches, with similar success.

As far then as the majority of such facts ought to have weight, we are bound to receive the conclusions of Mr. Travers as incorrect and unestablished. I am only surprised that Mr. Travers himself, who has cited the particulars of all these last experiments, did not perceive, that they struck directly at his own inferences They are not only irrisistible arguments against Mr. Travers's conclusion, that the union of a divided bowel requires the contact of the cut extremities in their entire circumference; but they are a plain denial of another position, advanced by this author, viz. that wounds, amounting to a direct division of the canal, are irreparable, and therefore invariably fatal.

With respect to the species of suture being of secondary importance, provided it secure the complete contact of every part of the everted ends of the divided bowel, I regret, that Mr. Travers has omitted to institute experiments, in order to prove, that any such suture can be practised, and if he has the ingenuity to apply it, whether the result would be for or against the conclusions which he has formed. The fact of the sutures always making their way into the cavity of the bowel, and being thus got rid of, appears to me highly interesting, since it shows the safety of cutting away the ends, instead of leaving them hanging out of the external wound, so as to create the usual irritation and inconveniencies of extraneous substances. It seems, that Mr. Benjamin Bell first recommended cutting the ends of the ligatures away, and reducing the bowel in this state into the abdomen, as he says, a considerable part of the remainder of the ligature will fall into the cavity of the gut. (*System of Surgery, Vol.* 2, *p.* 128, *edit.* 7.) We have seen, that the experiments of Dr. Thomson confirm the observation, and those instituted by Mr. Travers tend to the same conclusion.

According to the latter writer, the following is the process by which a divided intestine is healed when sutures are employed. "It commences with the agglutination of the contiguous mucus surfaces, probably by the exudation of a fluid, similar to that which glues together the sides of a recent flesh wound, when supported in contact. The adhesive inflammation supervenes, and binds down the everted edges of the peritoneal coat, from the whole circumference of which a layer of coagulable lymph is effused, so as to envelop the wounded bowel. The action of the longitudinal fibres, being opposed to the artificial connexion, the sections mutually recede, as the sutures loosen by the process of ulcerative absorption. During this time the lymph deposited becomes organized, by which further retraction is prevented, and the original cylinder, with the threads attached to it, is encompased by the new tunic.

"The gut ulcerates at the point of the ligatures, and these fall into its canal. The fissures, left by the ligatures, are gradually healed up; but, the opposed villous surfaces, so far as my observation goes, neither adhere, nor become consolidated by granulation, so that the interstice, making the division internally, is probably never obliterated." (*Travers on Injuries of the Intestines, &c. p.* 128.)

Notwithstanding I have carefully read all the arguments adduced by Mr. Travers in favour of stitching a divided bowel at as many points as possible, I still remain unconvinced of the advantage of such practice, for reasons already suggested. If a case were to present itself to me, in which a bowel, partly cut through, protruded, I should apply only a single suture, made with a small sewing-needle, and a piece of fine silk. If the bowel were completely cut across, I should have no objection to attach its ends together by means of two or three stitches of the same kind. I coincide with Mr. Travers, respecting the advantage of cutting off the ends of the ligature, instead of leaving them in the wound, as I believe he is right, in regard to the little chance there is of the injured intestine receding far from the wound, and if the ends of the ligature are then of no use in keeping the bowel in this position, they must be objectionable, as extraneous substances.

As confirming some of the foregoing observations, I would refer to the valuable writings of Scarpa, and those of Dr. Hennen. The parts of the former to which I allude being contained in the last edition of the First Lines of Surgery need not be repeated. "The older practitioners, (says Dr. Hennen,) were very much averse from leaving any thing to nature in cases of abdominal injuries, although their universal employment of sutures ought to have convinced them, how much she could bear with impunity; for there can be very little doubt, that their uniform performance of the operation of gastroraphe was at least superfluous, if not positively hurtful. In the course of a very extensive practice, two cases only have come under my notice, where it was required to a wounded intestine, though frequently it may be needed for injuries to the parietes." (*On Military Surg. ed.* 2, *p.* 411.)

When the protruded intestine is mortified, which must be a very rare occurrence in cases of wounds, the treatment should be the same as that of a mortified enterocele. (See *Hernia*.)

As Dr. Hennen observes, in the treatment of wounds of the abdomen, the violence of symptoms is to be combated more by general means, than by any of the mechanical aids of surgery. The search for extraneous bodies, unless superficially situated, or they can be felt with a probe, is entirely out of the question. "Enlargement, or contraction of the wound, as the case may require, for returning protruded intestine, securing the intestine itself, and promoting the adhesion of the parts, is all that the surgeon must do in the way of operation; and, even in this, the less he interferes the better." (*On Military Surgery, ed.* 2, *p.* 401.)

The principal indication is to prevent a dangerous degree of inflammation. Hence bleeding and the antiphlogistic treatment are highly indispensable. Let not the surgeon be deterred from such practice by the apparent debility of the patient, his small concentrated pulse, and the coldness of his extremities; symptoms, common in acute inflammation of the bowels, and, in fact, themselves indicating the propriety of repeated venesection. Wounds of the small intestines are attended with more dangerous symptoms, than those of the large ones. All flatulent, stimulating, and solid food, is to be prohibited. The bowels are to be daily emptied with glysters, by which means, no matter will be suffered to accumulate in the intestinal canal, so as to create irritation and distention.

When excrementitious matter is discharged from the outer wound, it is highly necessary to clean and dress the part very frequently. Gentle pressure should also be made, with the fingers, at the circumference of the wound, at each time of applying the dressings, for the purpose of promoting the escape of any extravasated matter. For the same reason, the patient should always lie, if convenient, in a posture, that will render the external opening depending.

After a day or two, the surgeon need not be afraid of letting the outer wound heal up; for the adhesive inflammation, all around the course of the wound, will now prevent any extravasated matter from becoming diffused among the viscera. If the case should end well, the intestine generally undergoes a diminution in its diameter at the place where the wound was situated. When this contraction is considerable, the patient occasionally experiences colic pains at the part, especially after eating such food as tends to produce flatulence. As these pains usually go entirely off after a certain time, and no inconvenience whatsoever remains, the intestine may possibly regain its wonted capacity again. A more considerable constriction of the above sort has been known to occasion a fatal miserere. Even the intestine itself has been known to burst in this situation, after its contents had accumulated behind the contracted part. Patients who have recovered from wounds in the intestines, should ever afterwards be particularly careful not to swallow any hard substances, or indigestible flatulent food. On this subject, the writings of Scarpa are particularly interesting.

In some instances, intestinal matter continues to be discharged from the outer wound, either in part, or entirely, so that either a fistula, or an artificial anus, is the consequence. A fistula is more apt to follow, when an intestine has been injured by a ball, has been quite cut through, or has mortified. But, numerous cases prove, that this is not invariably the consequence, and that a perfect cure has frequently followed each of these occurrences. (See *Anus, Artificial.*)

When an intestine is completely cut through, and the lower portion of the canal lies inaccessibly concealed in the abdomen, writers insist upon the necessity of promoting the formation of an artificial anus. In this particular case, they recommend fixing the extremity of the intestine with a fine suture, to the edges of the outer wound. In order to distinguish the upper end of the intestine from the lower, the proposal is sometimes made to give the patient a little milk, and to observe whether the fluid, after a time, issues from the mouth of the protruded gut. In the mean while, fomentations are employed. If the upper end of the intestine be in the abdomen, these speculative authors even deem it justifiable, when the accident is quite recent, to dilate the outer wound, search for the hidden continuation of the bowel, and then sew the two ends together.

Practical surgeons, I believe, are right in attaching little value to such directions. "Indeed, (says a modern writer,) the surgical world have long since dismissed their fears about the intestine falling inwards, and about the difficulties of distinguishing between the right and the wrong end of it. The apprehensions of abdominal effusions are now all pretty well subdued. The occurrence is extremely rare, and when it does happen, we leave the poor wretch to die in peace, without searching after effused fluids, the nature of which cannot be known, or if known, the information cannot, in the most remote degree, lead to recovery. I have never witnessed a case, where any possible good effects could follow the paracentesis; for peritonitis, in its most exquisite form, has always preceded the symptoms, which would lead to the performance of that operation." (*Hennen on Military Surgery, Ed.* 2, *p.* 411.)

In some instances, musket-balls pass into the abdomen, lodge there a considerable time, and are then voided through the intestinal canal; while, in other examples, they become encysted, and continue lodged the rest of the patient's life, without producing much, or indeed, any inconvenience.

Contusions and other Injuries of the Abdomen.—A violent contusion of the abdomen may injure the contained viscera, without the occurrence of any external wound. It was in this way, that the liver, or gall bladder, was ruptured in the boy mentioned by Mr. Fryer (*Med. Chir. Trans. Vol.* 4); and that the vena cava was lacerated in the case, which fell under the observation of Richerand, where a cart-wheel passed over a child's belly. (*Nosographie Chir. T.* 3, *p.* 353.) In other instances, the mischief is done to the intestines; and, still more frequently, the viscera, as well as the parietes of the abdomen, have only suffered a more or less forcible contusion. The effects of such violence are inflammation of the injured bowels, and their adhesion to the inside of the peritoneum. Thus, the stomach and intestines, the liver, and the gall bladder, when inflamed from a blow upon the front of the belly, contract adhesions to the corresponding portion of the parietes, which has been also bruised, and is itself inflamed. When such inflammations suppurate (and, according to Richerand, it is their most usual course), on opening the abscess, the pus is found blended with the matter, which the viscera contain or secrete. Thus, the alimentary matter, and even intestinal worms, have been discharged with the pus on opening certain abscesses, which communicated with the cavity of the stomach or bowels; and bile has been found blended with the matter of abscesses in the right hypochondrium.

When, in consequence of a blow upon the anterior part of the belly, the patient experiences in the situation of the injury a deeply-seated pain; when a tumor forms, and the symptoms indicate violence done to some of the adjacent viscera; the inflammation is to be opposed by every possible antiphlogistic means. But when, notwithstanding such treatment, the swelling increases and suppurates, the abscess is not to be opened until it is perfectly mature. The inflammatory symptoms, which preceded its formation, indicate that there is an adhesion between the injured organ and the parietes of the abdomen. Without this adhesion, opening the abscess would be attended with more risk, because the pus, or other matter, might become extravasated in the cavity of the peritoneum. For the same reason, in the examples of tumors, caused by bile in the gall bladder, J. L. Petit recommends deferring the operation of opening them, until the inflammatory symptoms evince that an adhesion has taken place between the fundus of the gall bladder, and the corresponding point of the parietes of the abdomen.

An adhesion of the abdominal viscera to the inner surface of the peritoneum may be induced by other causes, besides the action of contusing bodies. A knife, a fork, a shoemaker's awl, a needle, and other extraneous substances incapable of passing throughout the alimentary canal, have been known to irritate the stomach, or bowel, and to bring on adhesion of them to the parietes of the abdomen, where a tumor has formed, which, on being opened, has discharged the foreign body. The records of surgery abound in facts of this kind. A fistula succeeds the opening of the abscess; the alimentary matter escapes; and if the aperture admit not of being healed by methodical compression, the intestinal canal between the fistula and the anus contracts; most of the contents of the bowels pass out at the preternatural opening, and the patient falls into a state of marasmus, the more quickly fatal, the nearer the injury of the intestinal canal is to the stomach.

A long continued pressure on the epigastric region may cause an adhesion of the stomach to the peritoneum, and suppuration taking place at the part, a fistula, communicating with the cavity of that organ, may be formed, and allow the victuals to escape externally. (See *Richerand, Physiologie, T.* 1. *Chymification: Nosographie Chirurg. T.* 3, *p.* 353—356, *Ed.* 4.)

I shall conclude, with repeating, that in the generality of injuries of the abdomen from external violence, whether wounds or contusions, the principal danger depends upon inflammation of the peritoneum. In the treatment, therefore, the most necessary thing is to prevent and oppose this perilous affection. Copious and repeated venesection, the application of leeches, mild aperient glysters, a low fluid diet, perfect rest, fomentations, and the warm bath, are amongst the most effectual antiphlogistic remedies, which, in such cases, are entitled to praise and confidence.

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WRY-NECK, (*Caput Obstipum; Torticollis.*) An involuntary and fixed inclination of the head towards one of the shoulders; a disorder not spoken of by the ancients. It should not be confounded with a mere rheumatic tension and stiffness of the neck, nor with the faulty position of the head, arising from deformity of the cervical vertebræ.

Tulpius, about the middle of the seventeenth century, recorded the cure of a boy, twelve years old, who, from his earliest infancy, had had his head drawn down towards the left shoulder, by a contraction of the scalenus muscle. Fomentations were applied in vain. The head could not be brought into the right posture, even with the aid of steel collars. A consultation was therefore held, in which it was decided to put the boy under the care of Minnius, a surgeon who had performed several operations with success in similar cases. A large eschar was first made with caustic; and the muscle, which drew the head to one side, was then divided with a knife. Tulpius, who has left a very confused account of the operation, observes, that it was performed with great slowness and circumspection, for fear of wounding the carotid artery, and jugular vein. However, he offers one good piece of advice, which is, not to make any preliminary application of caustic, as it only causes useless pain, and can not be of any service. He also recommends the operation not to be done little by little, at repeated times; and says, that the surgeon should make a complete division of the muscle at once, with the necessary degree of caution.

Job à Meeckren also treats of the operation for the cure of a wry-neck. He states, that he had seen it performed on a boy, fourteen years old. The tendon of the sterno-cleido-mastoideus muscle was skilfully divided with one stroke of a sharp pair of scissars, by a surgeon named Flurianus, and as soon as the incision was made, the head resumed its right position. (*Obs. Med. Chir. C.* 33.) Mr. S. Sharp believed, that the wry-neck mostly arose from a contraction of the sterno-cleido-mastoideus muscle, which he proposed the division of, whenever the disorder seemed to proceed from this kind of cause. However, he made an exception of cases, in which the disorder had existed a considerable time, or from infancy. He remarks, that, if the cervical vertebræ have grown in a distorted direction, the position of the head cannot be rectified. With these restrictions, the following is the operation, which he recommends: a transverse incision is to be made through the skin and fat, of a size somewhat more extensive than the breadth of the muscle, and about one-third of its length from the clavicle. A probed razor is then to be passed underneath the muscle, and to be drawn out, so as to make the requisite division of the part. After the incision has been made, Mr. Sharp recommends the wound to be filled with dry lint, and to be always dressed in a way, best calculated to keep the extremities of the muscle from growing together again. For this purpose, he directs the cut ends to be separated from each other as much as possible, with the assistance of a bandage to support the head, during the whole time of the cure, which he says, will generally be about a month. (*On the Operations of Surgery, Chap.* 35.)

According to Mr. Sharp's account, this operation ought to be common. However, if attention be paid to the nature and causes of the disease, and to the differences, resulting from whether the disorder be recent, or of long standing; constant, or periodical; idiopathic, or sympathetic; dependent on spasm, or merely on paralysis of the antagonist muscles; and, lastly, if it be recollected, that the affection may be produced by other muscles, besides the sterno-cleido-mastoideus; it will appear, that cases, in which the foregoing operation can be judiciously undertaken, are not frequent.

With regard to the manner, in which Mr. Sharp operated, Mr. B. Bell conceived, that it was attended with hazard of wounding the large blood-vessels. But, though it seems to me better to use a probe-pointed bistoury and a director, than the kind of razor which Mr. Sharp employed, I do not coincide with Mr. B. Bell in thinking, that the latter surgeon's plan was at all objectionable on the score of danger, in respect to wounding the vessels. Some practitioners may even think Mr. B. Bell's method most likely to injure the large vessels; for, he advises the operator to cut the muscle from without gradually inward, as deeply as necessary.

Perhaps, the most prudent method of operating, is to divide the clavicular portion of the contracted muscle, near the clavicle, and even to cut out a sufficient piece, to remove all chance of the two ends uniting again. This step would weaken the muscle considerably, and, perhaps, might answer every purpose. It could easily be accomplished, by means of a director, and curved bistoury, after making the requisite division of the skin with a common scalpel. Were this proceeding to produce only partial amendment, the sternal portion of the muscle might afterwards be divided. A director should be passed under it, and the division made with a probe-pointed curved knife. In operating on a female patient, it might be advisable, with the view of avoiding a large scar, to make only a puncture, and pass the knife flatly against, and close behind the sternal portion of the muscle, the posterior part of which could be divided by then turning the edge of the instrument forwards. In this manner, Dupuytren operated susccessfully in one instance. (See *Quarterly Journ. of Foreign Med. No.* 20, *p.* 623.)

Any cause, destroying the equilibrium between the sterno-cleido-mastoidei muscles, will produce a wry-neck. Thus, when one of them is affected with spasm, and acts more forcibly than the other, it draws the head towards the shoulder of its own side; but, when one sterno-cleido-mastoideus is paralytic, while the other retains only its natural power, the balance of action is equally destroyed, and the sound muscle inclines the head towards the nearest shoulder. In paralytic cases, electricity, (*Phil. Trans. Vol.* 68, *p.* 97; *Gilby, in London Med. Journ. Vol.* 4, 1790,) blisters, stimulating liniments, the shower bath, sea-bathing, issues, setons, the application of moxa, and attention to the health in general, are the means affording the best chances of relief.

Although the wry-neck may occasionally depend on the state of the sterno-cleido-mastoidei muscles, the case is far from being frequent. The deformity is much oftener owing to some affection of the integuments. Louis often successfully divided contractions of the skin, which had kept the head drawn to one side for many years, and had been occasioned by burns. Some of these contractions, he says, might easily have been mistaken for a part of the sterno cleido-mastoideus itself.

Mr. Gooch relates a case of wry-neck, which was caused by a contraction of the platysma myoides muscle. The patient was a young gentleman, fourteen years of age, who had always enjoyed very good health in every other respect. For several months, his head had been strongly drawn to one side by a constant contraction of the platysma myoides muscle, which was exceedingly rigid, especially about its insertion at the basis of the jaw, and from the angle of the os maxillare inferius to the chin, the skin presented an appearance like that of the cicatrix of a burn. The same side of the face, quite from the point of the chin, was much shrunk, and distorted by the contraction of the muscle, and the corner of the mouth, in particular, was so drawn to one side and downward, when the patient turned his head, that a vast deal of deformity was the consequence. From the inferior part of the eye-brow, at the internal angle of the eye, to near the top of the head, there was a kind of furrow upon the skin, about half an inch broad, with a shining, polished appearance, like the cicatrix of a wound, and destitute of hair, which had fallen off. From the corner of the eye downwards, there was the same kind of appearance in a less degree. The patient was subject to repeated attacks of spasms, which began at the insertion of the muscle, and terminated at the eye, attended with a great deal of pain. The ear, and, also, the temporal and frontal muscles, were sometimes affected in a similar manner. The parts, in the course of the insertion of the muscle into the jaw-bone, were considerably thickened, without being in the least inflamed externally, and when touched, but not stretched, they were little painful. The subjacent muscles did not seem at all affected.

It appears from the account, given by Mr. Gooch, that, in the treatment of this affection, every known means had been tried, by the advice of the most eminent practitioners; but without effect. Mr. Gooch determined to try what benefit would be produced by the division of the muscle. He first divided the integuments a little below the jaw, and thus exposed the whole breadth of the platysma myoides muscle, the fibres of which seemed to be in a state of violent extension, especially, when the patient's head was inclined towards the opposite side. Mr. Gooch then divided the muscle completely across, by a very careful dissection, until the fasciæ of the subjacent muscles were exposed. The patient was then directed to turn his head towards the opposite side, and Mr. Gooch had the satisfaction of observing, that the patient could perform this motion, without the face and corner of the mouth being affected, as they used previously to be. The wound was treated in the ordinary way, and no particular symptoms arose. As soon as the inflammation had subsided, the patient was directed frequently to move his head about, in order to prevent any kind of stiffness, which might ensue from the contraction of the muscular fibres, and the inelasticity of the cicatrix.

The patient was perfectly relieved by the foregoing operation, and had no return of the painful spasms, to which he had been previously subject. The side of his face, however, never recovered its proper degree of plumpness. (*Chir. Works of B. Gooch, Vol. 2, p. 1.*)

Whenever an attempt is made to cure a wry-neck, by dividing any of the muscles, or merely the integuments, it becomes necessary to take some measures for keeping the head in a proper position, during the treatment of the wound, lest, in consequence of the head inclining in the direction, in which it was before the operation, the divided parts grow together again, and bring the patient into the same condition, in which he was before any thing had been done. With a view of preventing this unpleasant circumstance, Mr. Sharp recommends filling the wound with lint, and making it suppurate. Mr. B. Bell, on the other hand, advises the employment of a proper machine for keeping the head in a due position. Some writers think the use of a bandage sufficient for the purpose. In Dupuytren's case, the cut edges of the muscle were kept asunder by depressing the clavicle, and inclining the head to the opposite side. The first object was fulfilled by binding the hand on the same side as the operation firmly to the foot, the knee being bent; the last, by means of a roller, applied round the head, and under the axilla of the opposite side. (See *Quarterly Journ. of Foreign Med. No. 20, p. 623.*) Sometimes, the removal of a small portion of the affected muscle may be necessary in the operation.

Boyer met with a case of paralysis of the extensor muscles of the head, attended with a constant approximation of the chin to the sternum. The disease resisted every plan of treatment, and an apparatus for supporting the head was the only thing found of any use. (See *Traité des Mal. Chir. T. 7, p. 61, 8vo. Paris,* 1821.) *Sharp's Treatise on the Operations of Surgery, chap.* 35. *Blasius, Obs. Med. Rar. p.* 2, *No.* 1. *Cure affected by operation. Mauchart, De Capite Obstipo, Tub.* 1737. *Chirurgical Works of B. Gooch, Vol.* 2, *p.* 81. *B. Bell's System of Surgery. Roonhuysen, Heylcuren, p.* 1, *No.* 22 *and* 33 : *successful operation. Encyclopédie Méthodique, Partie Chirurgicale, T.* 2, *Art. Torticollis. Joh. Christ. Gottfr. Jörg, über die Verrkrümmungen des Menschlichen Körpers, und eine rationelle und sichere Heilart derselben*; *Leipzig*, 1810. *Baron Boyer, Traité des Mal. Chir. T.* 7, *p.* 48, *&c.*, 8*vo. Paris*, 1821.

Z

ZINC. The preparations of this metal are of considerable use in surgery. With respect to the *sulphate of zinc*, it may be said to be generally the best emetic, in cases, where it is desirable to empty the stomach without the least delay, as in cases of poison, for which purpose, the common dose is ℈j. "As an external application, this salt dissolved in rose water, in the proportion of griss to ℥j. of rose-water, forms an excellent collyrium in the latter stage of ophthalmia, after the inflammatory action has subsided; it is a good injection in a similar stage of gonorrhœa; and a lotion in some kinds of superficial inflammations. Of double strength, this solution is the best application that can be used in scrophulous tumors, after they have suppurated, and the abscess been discharged." (*A. T. Thomson, London Dispensatory, Ed.* 2, *p.* 559.) The *unguentum zinci*, composed of an ounce of the oxide of zinc, and six ounces of prepared lard, is an useful astringent, mildly stimulant application; and is frequently employed in various cases of cutaneous diseases, ring-worm, sore nipples, and chronic inflammation of the conjunctiva of the eyelids.

THE END.

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